NEW VICTORIA
COMMUNITY WIND POWER PROJECT

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ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT

PROPONENT

CELTIC CURRENT LP.
10442 Route 19,
Southwest Mabou, Nova Scotia, Canada
B0E 1X0

Report Prepared by:
McCallum Environment Ltd.

McCallum Environmental Ltd.

July 2016

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ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT

Name of Project: New Victoria Community Wind Power Project

Location: New Victoria, Cape Breton County, Nova Scotia

Size of the Project: 2.35 MW

Proponent: Celtic Current LP

Report Prepared by: McCallum Environmental Ltd.

Date: July 27, 2016

McCallum Environmental Ltd.

July 28, 2016

Nova Scotia Environment
Environmental Assessment Branch
1903 Barrington Street
Suite 2085
PO Box 442
Halifax, NS B3J 2P8

Attention: **Helen Yeh**
Re: **New Victoria Community Wind Project**

The Proponent for the New Victoria Community Wind Project is Celtic Current LP. Contact information and authorized signature for this Project is provided.

Celtic Current LP
10442 Route 19,
Southwest Mabou, Nova Scotia, Canada
B0E 1X0

Martha Campbell
Chief Executive Officer (CEO)
Business: (902) 945-2300
Facsimile: (902) 945-2087
email: martha@celticcurrent.ca

X M. Campbell
Martha Campbell, CEO

Date: July 28, 2016

McCallum Environmental Ltd.

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EXECUTIVE SUMMARY

Celtic Current LP (Celtic Current) intends to construct a 2.35 MW (nameplate capacity) single turbine on private land [PID 15262371] within the community of New Victoria, on Cape Breton Island, Nova Scotia. This Project consists of a single access road and turbine pad, a system of above ground distribution lines and an Enercon E-92 2.35 MW turbine. The proposed schedule involves construction during Fall and Winter 2016/2017 with a tentative operation date of Spring 2017.

The field data, regulatory consultation and subsequent conclusions of this assessment indicate there are no expected significant residual environmental effects resulting from the New Victoria Community Wind Power Project once all appropriate mitigation and monitoring has been implemented and completed.

Standard construction mitigation methods will be implemented during all phases of the building of the Project to ensure there are no significant impacts of the Project on Valued Ecosystem Components (VECs). These methods were included in the development of the Environmental Protection Plan (EPP) which is included as part of this assessment.

Two Turbine Option Locations are being considered as part of the Project. **Turbine Option Location 1 is the preferred location** for the following reasons:

- The proposed access road alters a small, narrow portion of one wetland (WL3), whereas an access road to Turbine Option Location 2 would involve alteration of an additional wetland (WL4) for the purposes of an extended access road. This wetland alteration would be avoided entirely should Turbine Option Location 1 be the final turbine siting location;
- Turbine Option Location 1 has a greater setback (740m) from the closest residential receptor than Turbine Option Location 2 (669m).
- Turbine Option Location 1 has a greater setback from the New Waterford Municipal Water Supply Area (NWMWSA) (238m) than Turbine Option Location 2 (76m);
- The extended road required to access Turbine Option Location 2 would require additional vegetation clearing, and increased fragmentation of habitat.
- Turbine Option Location 2 has elevated Shadow Flicker modelling result using the standard bare earth methodology, compared to Turbine Option Location 1 which meets provincial maximum thresholds when modelling using "worst case" scenario (see Section 8.3 and Appendix VIII).

Turbine Option Location 1 is located within a mature mixed forest and Turbine Option Location 2 is located in a similar habitat type as Option 1, though the canopy coverage is dominated by different hardwood species. Both turbine option locations exist in-between, and adjacent to areas that have been historically harvested. An active quarry exists in the western third of the Project Area which comprises an existing access road. As part of the proposed Project, the existing access road will be upgraded, subsequently limiting potential effects to habitat and wildlife fragmentation.

Natural areas remaining following Project construction will continue to include disturbed and undisturbed tracts of forests, wetlands, and stands of trees or other vegetation within the Project Area. These forested natural areas are continuous outside of the Project boundaries, and provide suitable habitat, travelling corridors, thermal and security cover for wildlife. Habitat fragmentation will be minimal given the small size of the Project.

Species at risk inventories within the Project revealed that no flora species at risk exist. It is possible that Canada Lynx use the Project Area although this area of Cape Breton is not its expected preferred habitat, and the Project Area lies in close proximity to developed areas that would deter the presence of Canada Lynx. It is possible that three Species of Conservation Interest (SOCI) (Fisher, Rock Vole and Long-tailed Shrew) may use the Project Area based on habitat and geographical suitability. No evidence of any SAR and SOCI were identified during field evaluations. The small size of the Project and the construction of only a single access road are expected to result in low residual impact to SAR and SOCI.

No avian species at risk were identified within or near the Project Area. Bat monitoring confirmed the presence of bats within the Project Area, although in low numbers. The environmental assessment process has determined that residual environmental effects on birds and bats is expected to be low, post-mitigation, and Celtic Current is committed to completing follow up monitoring as recommended by CWS and NSDNR.

There are no areas of cultural significance identified with the Project Area during assessments of historical resources. As well, there are no adverse effects anticipated on health and socio-economic conditions, physical and cultural heritage areas, traditional land use, and traditional structures or sites as a result of environmental changes from the Project.

Celtic Current has exceeded residential setbacks with the closest residence or other sensitive receptor being located approximately 740 meters from the Turbine Option Location 1, and 669 meters from Turbine Option Location 2. Sound models indicate that the regulatory criterion of 40 dBA for sound output from either turbine option location, at any identified receptors within 1000m is not expected to be exceeded.

Shadow flicker modelling has been completed for both turbine option locations. Results of the modeling indicate that when using worst case scenario (including bare earth) modelling inputs, Turbine Option Location 1 is expected to comply with the shadow flicker thresholds of 30 minutes/day and 30 hours/year. Modelling results using the bare earth (worst case scenario) for Turbine Option Location 2 however, indicates that one receptor (84) exceeds the daily threshold of 30 minutes per day as required by NSE. Modelling was re-run for Turbine Option Location 2 but included relevant and current vegetation height data from the NSDNR Forest Cover Database. Results of the modelling using this methodology indicates that Turbine Option Location 2 is expected to comply with the shadow flicker thresholds of 30 minutes/day and 30 hours/year at all receptor locations. Due to the potential for vegetation to be removed in lands between Turbine Option Location 2 and receptor 84 in the future, Turbine Option Location 2 has been considered as a VEC with identified potential residual effects. In the eventuality that vegetation is removed during the operational lifetime of the Project, the Proponent in consultation with NSE has committed to completing follow up monitoring and mitigation.

The magnitude of disturbance and risk associated with the Project are all considered minimal given the size of the Project, abundance of similar VEC's within the Project Area and the mitigation techniques and technologies currently available. Furthermore, this assessment concludes there are no significant environmental concerns and no significant impacts expected that cannot be effectively mitigated through well established and acceptable practices, or ongoing monitoring and response. Residual environmental effects have been determined to be minimal or low for identified VECs.

The EA process has determined that Turbine Option Location 1 has reduced potential impact in comparison to Turbine Option Location 2, and as such, is the preferred turbine siting location for this Project.

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LIST OF ACRONYMS

ACCDC	Atlantic Canadian Conservation Data Centre
AGL	Above Ground Level
AL-PRO	AL-PRO Wind Energy Consulting Canada Inc.
AM	Amplitude modulation
AMO	Abandoned mine opening
AQHI	Air Quality Health Index
ATV	All-Terrain Vehicle
BOP	Balance of Plant
CanWEA	Canadian Wind Energy Association
CBC	Canadian Broadcasting Corporation
CEAA	Canadian Environmental Assessment Act
CEO	Chief Executive Officer
COMFIT	Community Feed in Tariff
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
dBa	Decibel
DNR	Department of Natural Resources
DND	Department of National Defense
DOE	Department of Environment
EA	Environmental Assessment

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EMI	Electro-Magnetic Interference
EPP	Environmental Protection Plan
FM	Frequency modulation
GDP	Gross domestic product
GE	General Electric
GHG	Greenhouse Gas
GIS	Geographic Information System
GPS	Global Positioning System
GRP	Glass-fibre Reinforced Plastic
GS	General Status
IBA	Important Bird Area
Igpm	Imperial gallons per minute
ISO	International Standards Organization
KM	Kilometer
kV	Kilovolt
kW	Kilowatt
MET	Meteorological
MEL	McCallum Environmental Ltd.
MHz	Megahertz
MW	Megawatt
NAD83	North American Datum of 1983
NAV	Navigation
NB	New Brunswick
NO_2	Nitrogen dioxide
NS	Nova Scotia
NSDE	Nova Scotia Department of Environment
NSDEL	Nova Scotia Department of Environment and Labour
NSDNR	Nova Scotia Department of Natural Resources
NSE	Nova Scotia Environment
NSESA	Nova Scotia Endangered Species Act
NSPI	Nova Scotia Power Inc.
NSTIR	Nova Scotia Transportation and Infrastructure Renewal
NWMWSA	New Waterford Municipal Water Supply Area
NWSWPC	New Waterford Source Water Protection Committee
O_3	Ozone
O/H	Overhead
PID	Property Identification Number
PM	Particulate Matter
RABC	Radio Advisory Board of Canada
RoW	Right-of-Way
SAR	Species at Risk
SARA	Species at Risk Act
SCADA	Supervisory control and data acquisition
SIA	Sound Impact Assessment

SOCI	Species of Conservation Interest
S-rank	Status rank
SSHD	Significant Species and Habitat Database
TBD	To Be Determined
TV	Television
UTM	Universal Transform Mercator
VEC	Valued Ecosystem Components
VOR	VHF Omni-Directional Range
WHMIS	Workplace Hazardous Material Information System
WL	Wetland
WNS	White Nose Syndrome
ZVI	Zone of Visual Influence

1.0 GENERAL INFORMATION

Table 1. Project Summary

General Project Information	Celtic Current LP (Celtic Current) intends to construct and operate a community wind power project with 2.35 MW of total capacity, located on PID 15262371.
Project Name	New Victoria Community Wind Power Project (the "Project")
Proponent Name	Celtic Current LP (Celtic Current)
Proponent Contact Information	10442 Route 19, Southwest Mabou, Nova Scotia, Canada B0E 1X0 Business: (902) 945-2300 Facsimile: (902) 945-2087 email: peter@celticcurrent.ca
Proponent Project Director	Peter Archibald Project Manager
Project Location	• The Project lands are located within the boundaries of PID 15262371 • The project lands are located approximately 1.5 km from the community of New Victoria, located 12 km southeast of Sydney in Cape Breton County, Nova Scotia • Project lands are located entirely within Cape Breton County, Nova Scotia; and, • The approximate centre of the Project lands are located at 720405 m E and 5125194 m N.
Landowner(s)	The project lands are located on freehold (private) land
Closest distance from a turbine to a residence	Two turbine option locations are being considered for the Project. The nearest house will be approximately **740 metres** from Turbine Option Location ,1 and **669 metres** from the proposed Turbine Option 2 location.
Expected rated capacity of proposed project in MW	2.35 MW consisting of one Enercon 2.35 MW (nameplate capacity) turbine.
Federal Involvement	No federal departments are providing funding. No Canadian Environmental Assessment Act triggers (*Section 5, CEAA*) occur or are expected.
Required Federal Permits & Authorizations	• Department of National Defense Authorization; • Transport Canada; • NAV Canada; • No other federal authorizations are anticipated at this time
Provincial Authorities issuing Approvals	a. Nova Scotia Department of Environment (DoE); b. Nova Scotia Department of Natural Resources (DNR); c. Nova Scotia Transportation and Infrastructure Renewal (NSTIR);

Required Provincial Permits & Authorizations	The following permits, authorizations and/or approvals may be required for this Project which will allow for the construction and operation of the Project 1. *Environmental Assessment Approval.* Approved pursuant to Section 40 of the *Environment Act* and Section 13 (1)(b) of the *Environmental Assessment Regulations* in Nova Scotia, Canada; *2.* Service Nova Scotia and Municipal Relations: *Special Move Permit for over dimensional and/or overweight vehicles and loads* 3. *Wetland Alterations* Pursuant to Activities Designation Regulations, Division I, Section 5(1)(na)
Provincial Regulatory Authorities Consulted during EA and Project Development Process	Nova Scotia Environment (NSE), Policy & Corporate Services: • Helen Yeh, Environmental Assessment Officer Nova Scotia Department of Natural Resources: • Mark Elderkin, Species at Risk Biologist Health Canada • Allison Denning, Regional Environmental Assessment Coordinator Office of Aboriginal Affairs: • Beata Dera, Senior Consultation Advisor • David Mitchell, Consultation Advisor
Municipal Authorities	Cape Breton County
Required Municipal Permits & Authorizations	*Development Permit* – Cape Breton County
Environmental Assessment Document Completed By:	McCallum Environmental Ltd. Meghan Milloy, MES Andy Walter, BSc Melanie MacDonald, MREM **McCallum Environmental Ltd.** Suite 135, 2 Bluewater Road Bedford, N.S. B4B 1G7

2.0 PROJECT INFORMATION

2.1 Proponent Profile

Celtic Current LP (Celtic Current) currently owns and operates four community based wind projects in northeastern Nova Scotia (Cheticamp, Bateston, Mulgrave and Point Aconi. Their goal is to generate an additional 2.35 MW of electricity annually under the Community Feed in Tariff (COMFIT) program in Nova Scotia by developing a wind energy project in the community of New Victoria, NS.

Celtic Current is committed to the development of renewable energy projects utilizing the best available wind technologies. Celtic Current constructs, develops and operates renewable energy generation facilities on behalf of its investors and in cooperation with the landowners and communities where the projects are located. Celtic Current is committed to using their combined strengths and capabilities to promote strong sustainable communities.

Celtic Current's Executive Management Team consists of:

- Leonard van Zutphen, President
- Martha Campbell, Chief Executive Officer (CEO)
- Peter Archibald, B. Eng, CSS, Director and Project Manager

The Environmental Assessment Project Team is:

- Meghan Milloy, MES, McCallum Environmental Ltd.
- Robert McCallum, P.Biol., McCallum Environmental Ltd.
- Andy Walter, BSc, McCallum Environmental Ltd.
- Melanie MacDonald, MREM, McCallum Environmental Ltd.
- Kirk Schmidt, Al-Pro Wind Energy Inc.
- Laura de Boer, Professional Archeologist, Davis McIntyre & Associates

2.2 Need for Project/Regulatory Framework

The Government of Nova Scotia committed to a target of 25% renewable electricity supply by 2015 as part of Nova Scotia's Renewable Energy Plan that was announced in 2010. Nova Scotia's total renewable electricity content is expected to more than double from 2009 levels to satisfy this target. Furthermore, the Government of Nova Scotia has committed to a target of 40% renewable electricity supply by 2020. The renewable energy production is expected to include hydro, wind, biomass, and tidal sources.

To support the province in achieving these goals, a minimum of 100 MWs was offered for procurement through the Community Feed in Tariff (COMFIT) program administered by the Nova Scotia Department of Energy. The Nova Scotia Community Feed-In Tariff, or COMFIT, is designed for locally-based renewable electricity projects. To be eligible, the projects must be community-owned and connected at the distribution level (*i.e.*, typically under 6 MW).

This Project is being developed in response to this government initiative, and has received COMFIT approval under this program from the Nova Scotia Department of Energy.

2.3 Project Location
The Project Area is defined in its entirety by PID 15262371.

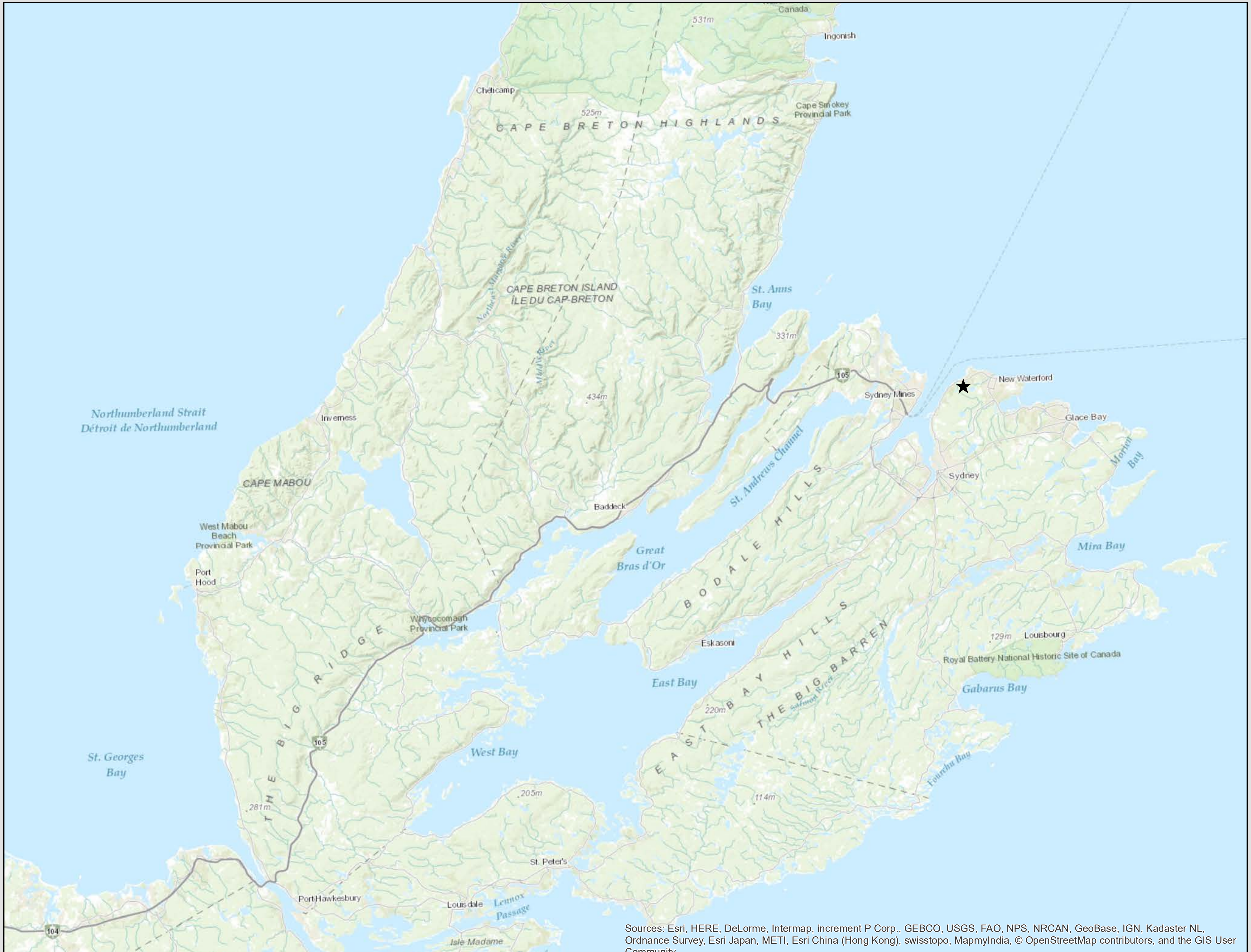
The Project Area is located approximately 1.5 km from the community of New Victoria, located 12 km southeast of Sydney in Cape Breton County, Cape Breton Island, Nova Scotia (Figure 1)**.** The Project Area is located on PID 15262371, located off of the New Waterford Highway. The approximate centre of the Project Area is located at 720552 m E and 5125150 m N.

Waterford Lake is located approximately 140m southeast of the Project Area. The New Waterford Highway is located north of the Project Area. The Atlantic Ocean is located approximately 370 m north of the Project Area.

Physical access to the Project Area will be from an existing road which accesses a gravel pit in the western half of the Project Area. The Project Area is located approximately 9.2 km north of the Whitney Pier Substation 82S. The turbine will be connected via the 12.47 kV distribution feeder circuit (82S-3040) supplied from Whitney Pier Substation. Approximately 1.8 km (from Turbine Option Location 1) of a new three phase 12.47kV distribution extension line will be constructed from the New Victoria Highway (Hwy#28) to the turbine site. Approximately 180m of additional collector system length would be required to connect to Turbine Option Location 2.

The Project Area is situated in a sparsely populated rural setting. The land proposed for the Project has portions in an early stage of re-growth after recent harvesting activity. The Project Area is set back from residences, roads and other public areas.

Two turbine option locations are being considered for the Project. The nearest house will be approximately **740 metres and 669 meters** from proposed turbine options 1 and 2, respectively.



Prepared For:

CELTIC CURRENT
COMMUNITY WIND DEVELOPMENT

FIGURE 1

New Victoria Community Wind Power Project

PID 15262371

New Victoria, Cape Breton, Nova Scotia

★ Site Location

Coordinate System: NAD 1983 UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

0 6,000 12,000 24,000 m

1:500,000 Scale when printed @ 11" x 17"

Drawn By: MMD

Date: 7/26/2016

McCallum Environmental Ltd.

Document Name: 160516_Fig1

2.4 Project Components

The New Victoria Community Wind Power Project will be powered by one Enercon E-92 turbine rated with a nameplate capacity of 2.35 megawatts (MW). Under optimal conditions, the turbine would operate 24 hours per day, 7 days per week. However, as is fairly typical in the wind industry, turbines usually only operate at a 30-40% capacity factor.

The key components of the Project include the wind turbine generator (the "turbine") with a total installed capacity of 2.35 MW, a pad-mounted or nacelle situated transformer, a 12.47 kilovolt (kV) electrical collector system with both overhead (1.8 km to Turbine Option 1, and 1.98 km to Turbine Option Location 2) and buried cable (50m), and a single access road to the turbine from the New Waterford Highway located west of the Project Area.

Two possible turbine locations for the one turbine are presented in the EA. To be conservative, this EA evaluates both turbine option locations.

2.4.1 Turbine

The representative values for the characteristics of the proposed wind turbine manufacturer are shown in Table 2.

Table 2. Turbine Characteristics Enercon E-92

OPERATING DATA	
Nominal power	2.35 MW
Cut-in wind speed	2.5 m/s
Rated wind speed	8.5 m/s
Cut-out wind speed	28 – 34 m/s (with activated storm control features)
Hub height	98 m
ROTOR	
Pitch system	Principle: Independent Blade Pitch Control Actuation: Individual Electric Drive
Diameter	92 m
RPM	5-16 min^{-1}
Blade material type	Glass-fibre reinforced plastic (GRP)/Epoxy
GENERATOR	
Type	Synchronous, direct drive ring generator
Rated power	2300 kW
Rated voltage	400 Volts
Frequency	60 Hertz
Protection	IP 23
BRAKING SYSTEM	
Aerodynamic brake	Electrically independent blade pitch systems with emergency supply
Rotor brake	Exists. But no technical details available

Wind turbines and supporting structures typically consist of eight key components:

1. tower foundations;
2. three or four tower sections of steel or concrete with service access provided by stairs and/or service person lifts;
3. stainless steel nacelle housing the mainshaft and generator,
4. three fibre glass or carbon fibre rotor blades;
5. cast iron hub;
6. tower mounted transformer;
7. electrical and grounding wires; and,
8. buried grounding grid at perimeter of foundation

The average cleared area required for the turbine, including assembly areas for the turbine components but <u>excluding</u> the access road, power line and temporary laydown area, will be 0.8 hectares.

The 2.35 MW turbine will be 98 metres in height from ground level to the hub ("98 metre hub height"). The swept diameter of each three bladed rotor will measure 92 metres. Therefore, all components will reach a maximum height of 144 metres. The rotors are variable speed, with revolutions per minute dependent upon wind conditions.

The nacelle includes bedplate/frame, stainless steel enclosure, rotor hub, mainshaft, generator, turbine control equipment, instrumentation, and cooling/heating equipment. These components are located at the top of the tower sections and are connected to the three bladed rotor via a main shaft and hub assembly. Tower foundations may range from three to eight metres in depth depending upon site-specific soil conditions.

A transformer and switch gear is located in the tower base of the turbine to transform the low voltage electricity created in the nacelle to medium voltage collection system level (*i.e.*, 400 V to 25 kV). The electrical collection system will be comprised of of a new three phase 12.47kV distribution extension line extending approximately 1.8 km to Turbine Option Location 1. Approximately 180 meters extra distribution line would be required to connect to Turbine Option Location 2. The cables will then go underground from the last riser pole to the turbine pad mounted transformer or directly into the turbine tower.

<u>2.4.2 Lighting</u>

Turbine lighting will meet the design requirements and quality assurance for lights required under *Canadian Aviation Regulations 2010-1* Part VI - General Operating and Flight Rules Standard 621.19 - Standards Obstruction Marking, Section. Transport Canada generally recommends the use of medium intensity flashing red beacon lights.

2.4.3 Electrical Collection System

A new 1.8km length of 12.47kV overhead collector line will be used to take the power from the wind turbine to the Nova Scotia Power distribution lines located along the New Victoria Highway, west of the Project Area.

An underground collection line (50 m) will be installed from the turbine out to the main access road. At the main road, an above ground collection system will be used.

2.4.4 Access Road

An existing access road to the gravel pit from Waterford Highway located north of the Project Area will be utilized to access the Project Area. The existing access road from Waterford Highway to the gravel pit is approximately 800 m long. New road construction will be required to continue the access road past the gravel pit to access the turbine option locations, approximately 650 m to Turbine Option 1 and approximately 830m to Turbine Option 2 (see Section 3.4.1 for turbine option location details).

The current access road will be upgraded as necessary and built to accommodate the size requirements of the crane and the load specifications to support the delivery of turbine and crane components. The final access road surface will be approximately 8m wide along straight sections, but may be widened through turns if necessary to allow adequate access for turbine components. Ditches and culverts will be added where required to allow for proper drainage. The surface soil and grubbing will be re-located in borrow areas along the road side and graded to prevent erosion and sediment runoff. The ditches will be constructed along the road edge following provincial guidelines and procedures to control for surface water runoff. No work has been completed on the existing access road.

2.4.5 Meteorological (MET) Towers

There is a single Meteorological Tower located within the Project Area. This MET tower carries meteorological instrumentation and anemometers (devices to measure wind speed) installed at different heights on the mast, and one or two wind vanes (devices to measure wind direction). These are connected to a data logger, at the base of a mast, via screened cables. This system is battery operated using a solar panel for recharge.

Signals that are recorded for each sensor with a ten-minute averaging period are as follows:

- Mean wind speed;
- Maximum gust wind speed;
- True standard deviation of wind speed;
- Mean wind direction;
- Mean temperature;
- Air Pressure; and,
- Logger battery voltage.

In recent years, it has become standard practice to download data remotely, via either modem or a satellite link. This approach has made managing large quantities of data from masts, on a range of prospective sites, significantly more efficient than manual downloading.

This MET tower was installed in April 2015 and has been collecting valuable wind and meteorological data for 15 months. The MET tower is located within the north portion of the gravel pit at 720239m E 5125322m N.

2.4.6 Temporary Components

During the construction phases of the Project, the following temporary Project components may be required:

1. A storage yard will be required to store construction equipment, the turbine, cranes, shacks, offices, parking and other necessary components. An operations building or trailers will be brought in prior to leasing or purchasing of a building for the operation and maintenance facility; and,
2. Temporary work space may be required along the access road and at the turbine site. These temporary work spaces will be used as required and will be reclaimed/restored following turbine erection.

2.5 Project Activities

2.5.1 Anticipated Schedule of Activities

The following milestone schedule (see
Table 3) outlines the typical project schedule.

Table 3. Schedule of Project Activities

Task	Anticipated Completion Date
Geotechnical Study	August 2016
Engineering Design	Summer 2016
Environmental Assessment Approval	September 2016
Commence Construction -Pour concrete mud slabs for turbine foundations -Turbine foundations, turbine delivery, erection	Fall 2016
Commission and Testing	Late spring to early summer 2017
Commercial Operation Date	Summer 2017

2.5.2 Activity Phases

The phases of construction are described in Table 4.

Table 4. Activity Phases

Phase	Details
Pre-Construction	
	• Notification of residents/landowner of construction commencement • Survey turbine site location in field • Trucking & set up of temporary facilities – construction offices, workers trailers, temporary washroom facilities, etc. • Construction equipment delivery
Construction	
General	• Clearing and Grubbing of overstory vegetation where necessary • Construction of storage yard • Construction of temporary work space
Civil	• Stripping of surface soils at turbine location and at other required work areas • Widening and final construction of access road • Construction of turbine location and crane pad • Installation of erosion and sediment control structures • Site grading • Excavation of foundation with blasting (as required) and excavator • Construction of crane pad using excavated material • Installation of site drainage (aka- weeping tile) at base of turbine foundation • Installation of concrete mudslab • Installation of reinforcing steel in turbine foundation • Installation of below ground electrical infrastructure • Installation of turbine base • Pouring and testing of concrete for foundation • Backfilling and compaction of foundation with previously excavated soils • Reclamation of surplus soils • Grading of site
Turbines	• Turbine component delivery • Crane delivery • Tower/turbine erection • Install turbine electrical cabinets, internal switchgear and transformer

Phase	Details
Collection System	• Installation of poles and guide wires for overhead (O/H) collection system • Run overhead wires and associated infrastructure • Install and connect underground (U/G) collector system from riser pole to switchgear and transformer inside turbine tower
Operations & Maintenance	
	• Reclamation of subsoils and disturbed surface soils • Weed Control • Re-seeding of disturbed soils • Grading of road • Road maintenance • Culvert maintenance • Turbine maintenance • Equipment testing
Decommissioning	
	• De-energize facility • Removal of above ground infrastructure which includes turbine blades, nacelles, tower components, O/H distribution lines, power poles, and other support structures • Removal of crane pad and gravel from access road • Recontouring of crane pad and access road grades • Reclamation of surface soils • Re-seeding or re-planting • Reclamation monitoring

2.5.3 Access Road Construction Methods

A pre-existing road to the Project Area was used for the installation of the site MET tower which is located in an existing quarry. Minimal upgrades to the existing access road may be necessary in order to facilitate turbine component delivery. Should upgrades be necessary, the Proponent will follow the following standard methodologies:

- Cutting, de-limbing and decking all salvageable timber, as necessary, using feller buncher, skidders, chainsaws and logging trucks;
- Following removal of overstory vegetation, lands will be brushed with a bulldozer and excavator to remove non-salvageable wood and brush. Scrub brush/grubbings will be piled along disturbance boundaries and will have breaks installed to allow for water flow where necessary. Limbs and non-merchantable material will be chipped or buried underground for natural decay; depending on the site conditions;
- Dozers will push soils to the edge of the access road boundary;
- Subsoils will be excavated with a backhoe from a trench line that parallels the access road alignment. These subsoils will be placed on the area of travel for the access road;
- Previously removed grubbings and topsoils will be placed into the excavated trench line and the trench line re-contoured;

- Subsoils placed on the access road traveling area will be spread out using a dozer;
- This new access road will be compacted with a roller;
- Crushed rock may be placed on the road and compacted with a roller;
- A second and final layer of crushed rock may be placed over top and compacted with a roller if required;
- Gravel may be placed on the access road and graded an as required basis during the construction and operational life of the turbine;
- The access road and crane pad will be compaction tested to ensure it meets the compaction requirements for the crane pad and turbine component delivery; and
- All ditches will be re-vegetated as per the Environmental Protection Plan (EPP), provided in Appendix I.

2.5.4 Turbine Site Construction

The erection of a turbine requires a large level work area for safe operation and the following site dimensions (see Table 5) will be typical for the project:

Table 5. Infrastructure and associated dimensions of workspace

Infrastructure	Dimensions of Workspace Required
Total Cleared Work Space Per Turbine (required for storage of turbine blades, nacelle, and tower sections during the erection process)	100 m x 100 m
Crane Pad	16 m x 25 m

Final construction of the turbine location will consist of the following:

- Surveying of the turbine site boundaries to 100-meter x 100-meter dimensions;
- Boundaries will be flagged by surveyors;
- Cutting, de-limbing and decking any salvageable timber using feller buncher within the turbine pad area;
- Following removal of overstory vegetation, lands will be brushed with a bulldozer and excavator to remove non-salvageable wood and brush. Scrub brush will be piled along disturbance boundaries and will have breaks installed to allow for water flow where necessary;
- The turbine site may require soil stripping and leveling using a two lift soil stripping method in areas where bedrock is not found at or immediately below the surface;
- Drainage patterns will be maintained by installing adequate crossing structures;
- If required, blasting of uneven surface bedrock and foundation areas will be completed as required. All blasting will be conducted in accordance with the *General Blasting Regulations, N.S. Reg. 77/90*, or any updated versions thereof;

- Following blasting of bedrock, blasted bedrock will be excavated and used for the development of a crane pad on the turbine location. The turbine base will be excavated to appropriate dimensions (determined by engineering requirements);
- The turbine base is anticipated to require installation of a support structure using approximately 500 m^3 of reinforced concrete;
- Installation of grounding and other required electrical infrastructure; and,
- Pouring and testing of concrete.

2.5.5 Turbine Erection

The erection of the turbine is based upon specific site conditions found at the turbine site. Engineering lift procedures will be required for the turbine and generated by the construction contractor.

- Lifting and construction equipment will be placed on the ground and leveling techniques will be used as required, for the safe operation of equipment;
- Two cranes will be used for each turbine component installation (one main lifting crane and one tailing crane). The main lifting crane will be situated on the leveled crane pad area immediately adjacent to the foundation pedestal. The tailing crane will be located nearby.
- Hydraulic torque wrenches will be used to tighten bolted connections between turbine tower sections.

2.5.6 Equipment Delivery

For the New Victoria Community Wind Project, turbine components are anticipated to be shipped to the Port in Sydney, Nova Scotia and then loaded onto trucks and transported by road along Highway 28 approximately 20 km to the Project Area in New Victoria.

This route has been chosen due to equipment and truck sizes, turning radii available on the route, avoidance of major traffic corridors, and road characteristics. The route will be subject to Nova Scotia Transportation and Infrastructure Renewal (NSTIR) approval and transportation company (TBD) approval and may therefore change.

The following types of construction vehicles are expected to be used to construct the proposed wind turbine:

Foundation Construction

- Excavator
- Loader
- Roller
- Concrete Trucks

- Concrete Pump Truck
- Tractor Trailer (rebar, anchor bolts& templates)
- Rock Trucks

Access Roads Construction (if necessary- final road construction)

- Bulldozer
- Grader
- Gravel Haul Trucks

Collection System Installation

- Excavator
- Tractor Trailers (delivery of poles, cable spools and electrical equipment)

Turbine Erection

- Tractor Trailers (required for delivering crane components to Project Area. Turbine components would be delivered using tractor trailers of various lengths, widths and axle configurations required to accommodate the heavy weights and over dimensional components).

Component deliveries / turbine include:

- Down Tower Assembly and Electrical Equipment
- Hub
- Generator
- Nacelle
- Tower Sections
- Blades
- Foundation Consumable
- Two support cranes will be required to offload each of the turbine components at their respective turbine site laydown area(s).
- Tower components will be either erected directly from delivery trailers or stored at the turbine laydown site.

2.5.7 Electrical Collection System

A new 1.8 km 12.47 kV overhead collector line will be constructed to the turbine. The Collection System will be installed within the Project boundaries, and will mainly consist of above ground utility wooden power poles, spaced approximately 50 metres apart. All power poles will be purchased from a supplier which has treated the poles in accordance with appropriate regulations.

Construction of the 1.8 km long collection system will consist of the following:

- Surveying of the pole locations;

  If necessary, drilling of borehole into bedrock to approximately 5 – 8 metres depending upon subsoil/bedrock conditions;

- Installation of power poles;
- Installation of cross arm supports and pole infrastructure;
- Unspooling and stringing of power lines; and,
- Installation of pole-mounted disconnect switches as may be required by the electrical design.

2.5.8 Waste Disposal

All hazardous materials on work sites are controlled under federal and provincial legislation. The legislation requires that employers provide specific information to workers for the safe use, handling, production and storage of hazardous materials on work sites.

There are limited waste by-products created from the wind energy generation process. Some waste will be produced from ongoing maintenance for the turbine (e.g., lube and hydraulic oils). Hazardous waste materials will not be generated in large quantities and will be disposed of through conventional waste-oil and hazardous waste disposal streams as regulated in the province of Nova Scotia.

All solid waste must be properly sorted for recycling, reuse, composting, or landfilling. The segregated materials must be stored in a manner so that they will not degrade, burn, or become buried on site until they are sent to the appropriate, provincially approved waste disposal, recycling, or composting facilities.

Non-hazardous waste will be disposed of through conventional, local waste handling facilities operated by the local municipalities. As appropriate, materials suitable for recycling will be reused and/or recycled.

Controlled products are products, materials, and substances that are regulated by Workplace Hazardous Materials Identification System (WHMIS) legislation. All controlled products fall into one or more of the six WHMIS classes, and each has specific handling, transport, storage, and safety requirements.

3.0 PROJECT SCOPE

3.1 Site Sensitivity

The determination of site sensitivity was undertaken in consultation with the Canadian Wildlife Service (CWS) and the Nova Scotia Department of Natural Resources (NSDNR).

Based on the document Nova Scotia Environment (NSE) *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document* (NSE September 2008), facility size and site sensitivity combine to determine the Level of Concern.

The Level of Concern for the Project was evaluated via species records (avifauna, terrestrial wildlife and vegetation) from various sources and databases, as well as from direct observations within the Project Area.

3.1.1 Avifauna

There are four Important Bird Areas (IBA) within 25km of the Project Area. (Bird Studies Canada, 2012).

1. Big Glace Bay Lake (IBA NS007) is located approximately 15km southeast of the Project Area. It is a coastal lagoon with a sandy barrier beach (one of very few in this area). During low tide, expansive mudflats are exposed. Due to the input of warm wastewater from nearby industrial facilities, this site typically remains ice free during the winter. The Big Glace Bay Lake IBA is a Federal Migratory Bird Sanctuary, primarily due to the important feeding grounds provided by the mud flats. Canada Geese are known to use this area during spring migration (Bird Studies Canada, 2012).
2. Northern Head and South Head (IBA NS 053) is located 22 km southeast of the Study Area. The steep, rocky cliffs found in Northern & Southern head range from 15m to 30m in height. They provide colonial breeding habitat for the Great Cormorant, and for the Black-legged Kittiwake (Bird Studies Canada, 2012). These species are listed as yellow under the NSDNR General Status of Wild Species, but lack Provincial or Federal designation as species at risk.
3. Central Cape Breton Highlands (IBA NS061) is located approximately 24km west of the Project Area. The highlands are mountainous and are interspersed with steams and small lakes and ponds. Bicknell's Thrush are found scattered throughout the forests (Bird Studies Canada, 2012).
4. Bird Islands (IBA NS001) is located approximately 24kms northwest of the Project Area and are 4 km off Cape Dauphin. There are two long, narrow islands, Hertford Island and Ciboux Island, both are orientated in a northeast/southwest straight line. Both islands have steep 20 m high cliffs, with numerous holes and ledges present. These islands support the largest colony of Great Cormorants in North America. It also has the largest concentration of Black-legged Kittiwakes, Razorbills and Atlantic Puffins within Nova Scotia (Bird Studies Canada, 2012). These species are listed as yellow under the NSDNR General Status of Wild Species, but lack Provincial or Federal designation as species at risk.

The habitats provided within these aforementioned IBAs are not consistent with habitat available within the Project Area. The IBAs are mainly associated with coastal colonial nesting species and shorebirds dependant on exposed mudflats.

The Project Area is not used as primary habitat for any of the species listed above within the IBA sections. The Project Area may be used by passing migrants en route to the IBAs, but the Project Area does not contain major islands, peninsulas, or ridgelines which may funnel bird movement.

The Project will not disrupt large contiguous wetland or forest habitat that may be of importance to birds. The closest significant migration staging area for waterfowl and shorebirds is Big Glace Bay Lake, approximately 15 km east of the Project Area. At this time, there is no knowledge of a large heron, gull or tern colony located near the site. Several colonial nesting locations for the Great Cormorant are found 22km and 24km away from the Project Area (Northern Head & South Head, and Bird Islands, respectively). Waterford Lake is the nearest water body, located approximately 140 m east of the Project Area and the Atlantic coastline is 370m to the north.

3.1.2 Priority Species

A priority list of species was compiled to identify potential species of conservation interest (SOCI) and Species at Risk (SAR) which may be using the Project Area and surrounding lands. Full details of the priority species list methodology is provided in Section 4.1 (Biophysical Assessment Methodologies). Table 6 presents a review of Atlantic Canada Conservation Data Centre (ACCDC) findings which confirms the presence of several priority species in proximity to the Project Area. A summary of federally and provincially protected species identified within 20km of the Project Area is provided below (Table 6). For avifaunal priority species, breeding status as documented in the Maritime Breed Bird Atlas square summary (square 20QS22) is also included. If the species was observed during atlas surveys, with no breeding evidence noted, this is indicated below as well.

Table 6. Summary of ACCDC observations of federally and provincially protected species within 20km of the Project Area.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	S Rank	Distance	MBBA
Bucephala islandica (Eastern pop.)	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern		S1N	5.9 ± 16.9	Not Obs.
Calidris canutus rufa	Red Knot rufa ssp	Endangered		Endangered	S2S3M	5.7 ± 0.5	Not Obs.
Charadrius melodus melodus	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	4.7 ± 7.07	Conf.
Chordeiles minor	Common Nighthawk	Threatened	Threatened	Threatened	S3B	11.5 ± 7.07	Obs.
Contopus cooperi	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3B	11.3 ± 7.07	Obs.
Contopus virens	Eastern Wood-Pewee	Special Concern		Vulnerable	S3S4B	11.3 ± 7.07	Obs.
Dolichonyx oryzivorus	Bobolink	Threatened		Vulnerable	S3S4B	4.7 ± 7.07	Prob.
Hirundo rustica	Barn Swallow	Threatened		Endangered	S3B	4.7 ± 7.07	Prob.
Riparia riparia	Bank Swallow	Threatened			S3B	2.0 ± 0.15	Prob.
Tryngites subruficollis	Buff-breasted Sandpiper	Special Concern			SNA	5.7 ± 0.5	Not Obs.
Wilsonia canadensis	Canada Warbler	Threatened	Threatened	Endangered	S3B	5.3 ± 7.07	Obs.
Myotis lucifugus	Little Brown Myotis	Endangered		Endangered	S1	12.8 ± 0.5	n/a
Glyptemys insculpta	Wood Turtle	Threatened	Threatened	Threatened	S2	13.4 ± 0.5	n/a

Scientific Name	Common Name	COSEWIC	SARA	NSESA	S Rank	Distance	MBBA
Anguilla rostrata	American Eel	Threatened			S5	5.7 ± 0.5	n/a
Danaus plexippus	Monarch	Special Concern	Special Concern		S2B	6.5 ± 5.0	n/a
Isoetes prototypus	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S2	10.7 ± 0.05	n/a
Fraxinus nigra	Black Ash			Threatened	S1S2	19.5 ± 0.01	n/a

3.1.3 Site Sensitivity Determination

Using the matrix provided in the *Wind Turbines and Birds. A Guidance Document for Environmental Assessment.* (Environment Canada, 2006), and the document Nova Scotia Environment (NSE) *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document* (NSE September 2008), the overall level of concern category associated with the Project was determined. The matrix matches the sensitivity of the site and the size of the proposed facility to rank projects into one of four possible categories (Tables 7 and 8).

Table 7. Facility Size

Size	Definition
Very Large	Contain more than 100 turbines
Large	Contain 41-100 turbines
Medium	Contain 11-40 turbines
Small	**Contain 1-10 turbines**

Table 8. Project Category

Facility Size	Site Sensitivity			
	Very High	High	Medium	Low
Very Large	Category 4	Category 4	Category 3	Category 2
Large	Category 4	Category 3	Category 2	Category 2
Medium	Category 4	Category 3	Category 2	Category 1
Small	Category 4	**Category 2**	Category 1	Category 1

Generic guidance is then provided on the nature and extent of baseline information and follow-up requirements for each category. The "level of concern" is therefore relative to other wind energy projects and does not reflect the threat to birds/bats posed by wind energy in comparison to other types of projects.

The characteristics of the region/area resulted in a potential sensitivity of "High" (Environment Canada, 2006). The criteria for a potential sensitivity of "High" are as follows:

- having landform factors that concentrate species (e.g., shoreline, ridge, peninsula or other landform that may funnel bird movement) or significantly increase the relative height of the turbines;

- a coastal island, or less than 5 km inland from coastal waters;
- an area of large local bird movements (between habitats) or is close to significant migration staging or wintering area for waterfowl or shorebirds;
- an area recognized as provincially or nationally significant for habitat conservation and/or protection;
- Having increased bird activity from the presence of an area recognized as nationally and/or provincially important habitat for birds (e.g., a National Wildlife Area, Migratory Bird Sanctuary, Important Bird Area, National Park, or similar area protected provincially or territorially because of its importance to birds); and
- Containing species of high conservation concern (e.g. Species listed as 'Yellow' under NS General Status of Wild Species.).

Based on the parameters identified above the Project should be classified as high (EC, 2006). The primary reasoning behind defining this Project as highly sensitive is the proximity to several IBAs and a Migratory Bird Sanctuary. It should be noted, however, that the habitat within the Project Area is not suitable for those species which depend on the IBAs (for instance, colonial nesting species such as the Great Cormorant, or coastal nesting species such as the Piping Plover or Red Knot).

With a high site sensitivity and small size (1 turbine), the Level of Concern Category for this Project will be Category 2. Projects in this category present a moderate level of potential risk to wild species and/or their habitat(s), and require basic surveys, usually spread over a one-year period, to obtain quantitative information on wild species and habitats on the site and to identify any potential mitigation measures to minimize environmental impacts during construction.

3.2 Assessment Scope

The EA planning process allows for the prediction of environmental effects of a proposed project. Furthermore, the EA identifies measures to minimize and then mitigate potential adverse environmental effects. Finally, the EA will attempt to predict significant residual adverse environmental effects once mitigation measures are implemented.

The EA focuses on specific environmental components called valued environmental components (VECs). VECs are specific components of the biophysical, social, and economic environments. A VEC is important (not only economically) to a local human population, or has a national or international profile. If altered, a VEC will be important for the evaluation of environmental impacts of industrial developments (NSE 2007, updated 2012). The scope of the assessment for this Project includes: the selection and assessment of potential VECs; evaluation of the potential VEC interactions with Project activities, identification of environmental effects if any for each VEC; and identification of thresholds to determine the significance of residual environmental effects.

3.3 Boundaries of the Assessment- Spatial and Temporal

Assessment of effects was undertaken within the Project Area [PID 15262371] (Figure 2). The Cape Breton Regional Municipality was considered for the purpose of data collection and the socioeconomic environment. Residences located within a 1.0 km buffer of the Project Area were assessed as potential receptors to evaluate sound.

The temporal boundaries of the study cover the construction, operation, and decommissioning phases of the Project, and associated activities.

3.4 Site Optimization and Constraints Analysis

A key aspect of planning a wind power project is the determination of project lands for the development and the subsequent identification of specific turbine location(s) within these lands.

This chapter details how Celtic Current determined project lands and the turbine location:

A. Site Optimization: determination of the most appropriate location for the project to minimize overall impact on the landscape.
B. Project Level Constraints Analysis: analysis used to determine appropriate lands for the Project.
C. Turbine Level Constraints Analysis: assessment within identified project lands to determine available lands for the placement of wind turbines.
D. Turbine Site Selection: final determination of optimal turbine locations based on the wind resource, engineering and turbine manufacturer requirements, and environmental and social considerations.

This section describes how multiple factors were considered in order to determine the project footprint for the New Victoria Community Wind Project. These factors include technical (e.g., wind resource), financial, construction, socio-economic, landowner and biophysical constraints.

This exercise was completed considering one turbine (one utility scale 2.35 MW machine). The Project Area and turbine location were chosen for the following reasons:

1. **Appropriate wind regime** to make the Project economically viable.
2. Presence of **freehold lands** for placement of the turbine.
3. **Detailed biophysical and technical assessment** of the Project Area allowed for identification of potential lands for the placement of this community wind project.
4. **Relatively level topography and land characteristics** to allow for placement of the turbine.
5. Ability to place turbine to **meet regulatory setbacks for sound and shadow flicker** from receptors.
6. Ability to place turbine to **meet and municipal setbacks from property lines and residences**.
7. **Proximity to the NSPI grid** to connect the Project without a significant length of interconnection, and,
8. **No unique or isolated habitat types** identified within the Project Area.

Once this more general process of site optimization was completed and a Project Area confirmed, more detailed and site specific process of constraints analysis was completed as a major component of project planning and final turbine micro-siting.

A constraint can be specified as something to *maintain* or something to *avoid*. Many constraints can be expressed either way, such as to maintain a certain separation between known classes of objects. The desired effect of constraints analysis is to reduce the number of possible non-compliant results of Project development, while at the same time increasing the proportion of acceptable ones. A constraint can be *independent* or *contextual*. Independent constraints consider only one object, e.g., the setback distance around a known species at risk. Contextual constraints consider relations between objects, e.g. Use of a habitat area by a species at risk, resulting in expansion of the constraint.

Site specific constraints that were used for the New Victoria Community Wind Power Project are as follows:

- Wind regime mapping was used to identify optimal wind resource areas within the land base. This allows for effective placement of the turbine to maximize power generation from the wind resource for the Project based upon expected energy outputs within the modeled wind regimes. The mapping was completed using meteorological tower data which has been collected continuously for 15 months;
- Once wind resource mapping and optimization of the wind resource models were completed, different wind turbine manufacturers were selected for modeling. As each manufacturer has different engineering inputs, designs, and outputs, each manufacturer had to be modeled independently. Each turbine type was then placed within the wind regime and mapped within the available lands according to specific engineering criteria for power production, yield, energy loss;
- Geographic Information System (GIS) mapping of the Project lands was completed using datasets for landform, land use, topography, watercourses, historical resources, and wildlife. In addition, aerial photography was used to complement the GIS datasets, with the final goal of building a robust, dynamic, and temporally valid constraints map that could be modified as turbine selection is finalized;
- Within the GIS datasets the following parameters were mapped:

    1. Project Area;
    2. Topography;
    3. Land Use;
    4. Existing infrastructure;
    5. Broadcasting (T.V. & Radio);
    6. Meteorological Towers;
    7. Residences;
    8. Existing roads (classified & unclassified) and including ATV trails;
    9. Existing distribution lines;
    10. Known wildlife sites;

11. Known species at risk locations;
12. Known heritage sites;
13. Lakes, ponds or other visible open water bodies;
14. Watercourses;
15. Wetlands; and
16. Property boundaries (PIDs);

- Once mapping of the above parameters was complete, setbacks were placed on the datasets for planning purposes:
    - A minimum thirty (30) metre setbacks from lakes, ponds, open water, watercourses, and wetlands were imposed;
    - The Cape Breton Municipality Utility Scale Wind Turbine setback requirements were considered. For the Project turbine, the set back to residences was determined to be 244m (800 feet) (based on height of turbine);

Once known site specific setbacks were incorporated, the Project lands GIS map was created to show available lands for Project development after setbacks were imposed (Figure 3);

- The wind analysis was completed, resulting in the turbine location being placed onto this setback map;
- GPS coordinates were then used to field verify the turbine location. Further constraints analysis was completed during field assessments;
- Using the above noted information, Balance of Plant (BOP) was created (BOP includes all remaining infrastructure requirements such as the access road and distribution lines using the same datasets and field data to ensure regulatory setbacks are maintained for all phases of the Project);
- Constraints analysis using GIS based systems, and subsequent field verification methodologies allowed development of the layout and BOP in an environmentally sustainable and regulatory compliant manner.

Figure 3 indicates the constraints identified for the New Victoria Community Wind Project. Celtic Current understands the importance of minimization of the project footprint in order to protect habitat and reduce overall fragmentation of the landscape for wildlife, at risk species, and general ecosystem health.

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COMMUNITY WIND DEVELOPMENT

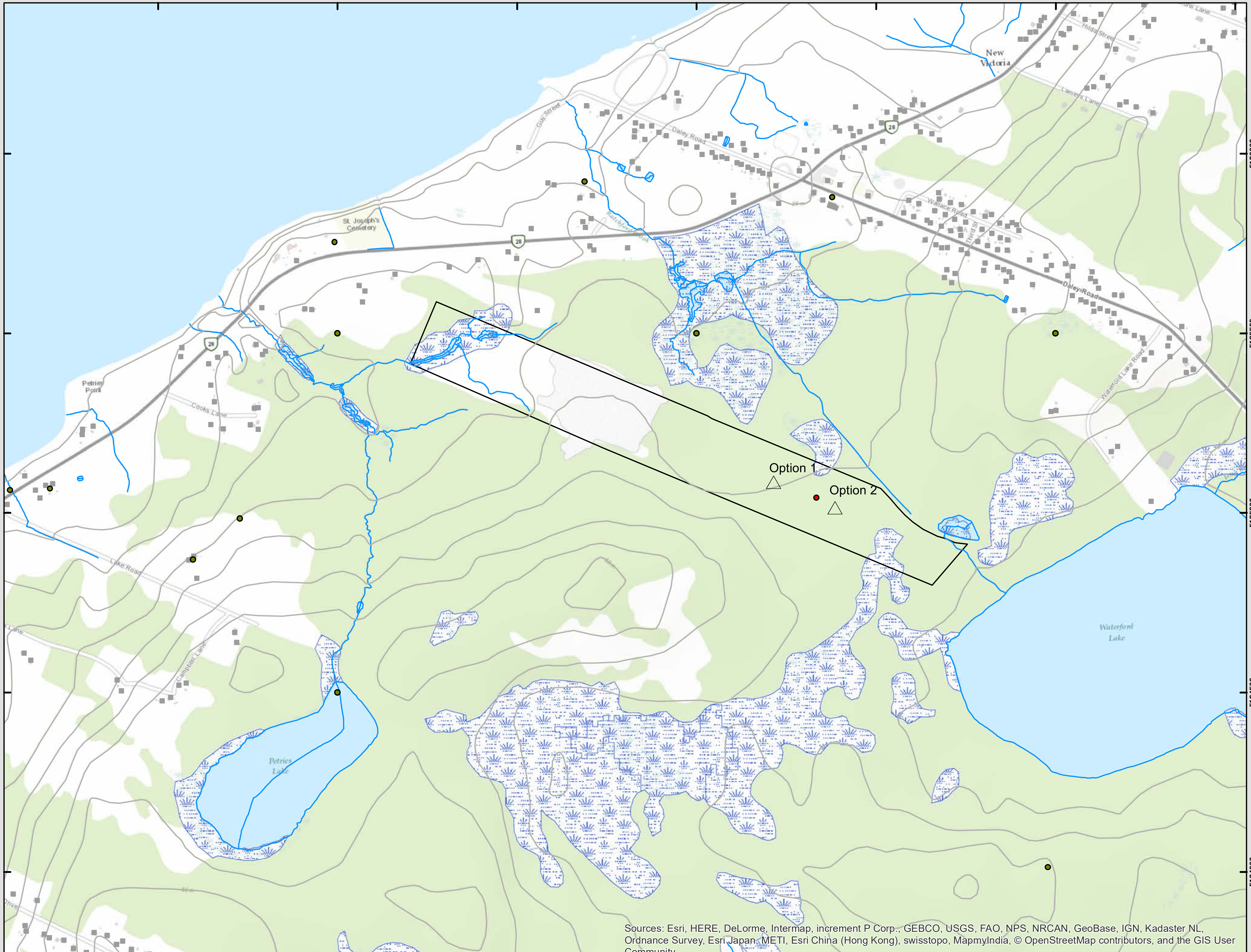
FIGURE 2

Project Area

New Victoria Community
Wind Power Project

PID 15262371

New Victoria, Cape Breton, Nova Scotia



- Water Wells (mapped)
- Incorrectly Located Water Well (mapped)
- Watercourses (mapped)
- Wetlands (mapped)
- Turbine Locations
- Study Area

Coordinate System: NAD 1983 UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

0 125 250 500 m

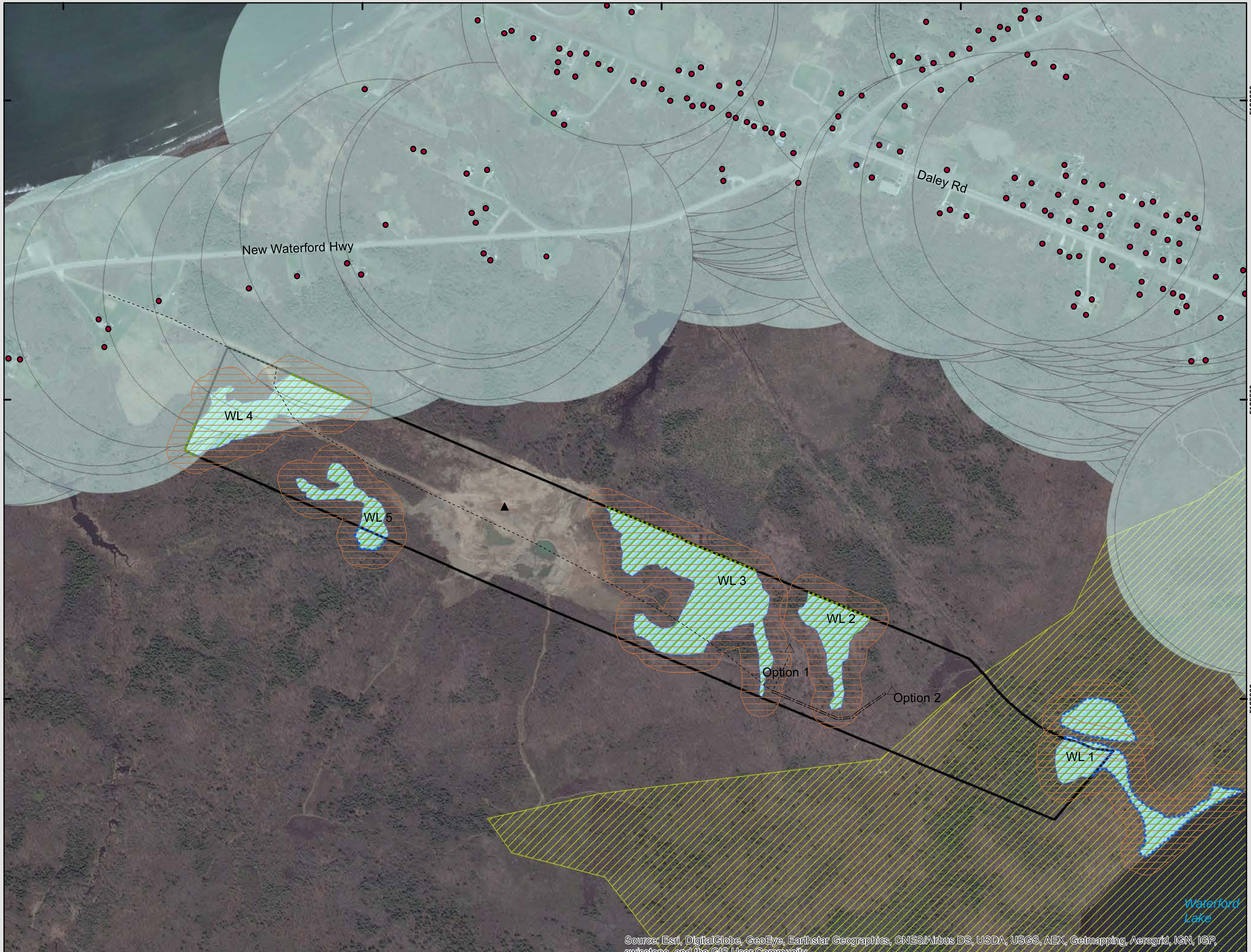
1:10,000 Scale when printed @ 11" x 17"

Drawn By: MMD

Date: 5/31/2016

McCallum Environmental Ltd.

Document Name: 160516_Fig2



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CELTIC CURRENT COMMUNITY WIND DEVELOPMENT

FIGURE 3

Project Setbacks

New Victoria Community Wind Power Project

PID 15262371

New Victoria, Cape Breton, Nova Scotia

- Dwellings
- Turbine Locations
- MET Tower
- Proposed Access Road (Option 2)
- Proposed Access Road (Option 1)
- Dwelling Setback (244m)
- 30m Water Feature Buffer
- New Waterford Protected Water Area
- WL Outside of Project Boundary
- WL Field Identified
- WL Continues Outside of Project Boundary
- Study Area

Coordinate System: NAD 1983 UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

0 75 150 300 m

1:6,000 Scale when printed @ 11" x 17"

Drawn By: MMD

Date: 7/12/2016

McCallum Environmental Ltd.

Document Name: 160516_Fig3

3.4.1 Turbine Location Options
Based on the results of the constraints analysis, a preferred turbine location (known as Turbine Option 1) was determined. Turbine Option 1 satisfies all regulatory and municipal setbacks and is located approximately 740 meters from the closest residential receptor.

Micro-siting completed during biophysical field assessments in 2015 within the Project Area revealed the existence of wetland habitat either side of the proposed turbine location (see Section 5.4.8 for additional details related to wetland habitat). The areas of wetland identified during the detailed wetland delineation task exist approximately 38 meters to the west of Turbine Option Location ,1 and 60 meters east of Turbine Option Location 1 (Figure 3). In consultation with NSE and NSDNR, it was communicated to the proponent that typical setbacks between wind turbines and areas of wetland habitat are required to be a minimum of 30 meters (measured from the tip of the blade), unless otherwise approved by NSE. The Enercon E-92 has a rotor radius of 46 meters, therefore a 76 meter setback would be required from the wetland habitat. NSDNR and NSE advised the proponent prior to the submission of this EA that the location of Turbine Option Location 1 would be considered as part of the EA review process, and would take into account the function and characteristics of the adjacent wetland habitat prior to determining if the setback can be reduced.

As a result of these discussions, the proponent committed to investigating a second turbine option location (known as Turbine Option Location 2). Both turbine option locations are evaluated as part of this EA.

4.0 ENVIRONMENTAL ASSESSMENT METHODOLOGIES

The EA registration document for the New Victoria Wind Project will describe the biophysical, social, and economic environment, as well as outline other considerations considered important for wind power projects. All VECs will then be identified, and the potential for interaction between individual VECs and Project activities will be determined. Methods to minimize and mitigate environmental effects resulting from the Project will be provided.

Through an evaluation of the VECs, the project team identified project environmental effects that, post-mitigation, have the potential for a residual effect on the environment. The significance of these residual effects was then determined and evaluated (Section 10.2).

This chapter details the following key aspects of the environmental assessment methodologies:

A. Biophysical: birds and bats, species at risk, wildlife, vegetation, watercourse identification, aquatic habitats, and wetland assessment and delineation.
B. Electro-magnetic interference assessment
C. Archaeological Resource Assessment;
D. Sound Assessment; and,
E. Visual Influence Assessment.

4.1 Biophysical Assessments

The field components of the biophysical environmental assessment were initiated in Spring 2015 and carried through until Spring 2016 complying with the *Category 2* requirements listed in Section 3.1. These studies were aimed at highlighting the ecological linkages within the Project Area, as well as with the habitats surrounding the Project Area. This work included:

1. Fall bird migration surveys 2015; Spring migration surveys 2015 and 2016; Breeding bird surveys (Summer 2015);
2. Vegetation surveys for priority species across the Project Area (June and September 2015);
3. Bat monitoring using an ANABAT detector (August to September 2015);
4. Opportunistic herpetofauna and mammal survey for priority species across the Project Area (Spring 2015 to Spring 2016);
5. Winter wildlife surveys (Winter 2015); and,
6. Wetland and watercourse identification and surveys (September 2015) across the Project Area.

Assessment of wildlife, including vegetation and habitat was completed based on the requirements outlined in the Nova Scotia Environment (NSE) Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSE September 2008). A priority species list was created in accordance with the proponents Guide to Addressing Wildlife Species and Habitats in an EA Registration Document as outlined below (NSE, 2009), with additional input from NSDNR Species at Risk Biologist, Mark Elderkin. As per conversations with Mark Elderkin during the early spring of 2015, it was requested that all priority species lists be built using status ranks (SRanks, S1, S2, S3) rather than general status ranks (GS Ranks Red and Yellow), as outlined in the NSE 2009 guidance document. The desktop priority list was based on general species habitat requirements and the broad geographic area that individual species are known to occur.

This priority list of species was narrowed by broad geographic area (for the New Victoria Wind Project- the geographic area considered was Cape Breton Island). The priority list of species was then further narrowed by identifying specific habitat requirements for each species. For example, if a listed NSESA species required open water lake habitat, and no open water lake habitat is present inside the Project footprint, this species was not carried forward to the final list of priority species for field assessments within the Project Area.

Development of a priority list of species for each taxonomic group was completed based on a compilation of listed species from the following sources:

1) Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Federal Species-at Risk Act (SARA 2003). All species listed as Endangered, Threatened, or of Special Concern.
2) Nova Scotia Endangered Species Act (NSESA 1999). All species listed as Endangered, Threatened, or Vulnerable.

3) Nova Scotia General Status Ranks. All species designated as S1, S2 or S3 as defined by the Atlantic Canadian Conservation Data Centre.

Data was requested from the ACCDC to obtain records of rare species existing or historically found within the general location of the property. The results of the database search were also reviewed to identify priority species that could be potentially located within the Project Area (based on recorded sightings, and general geographic and habitat requirements).

An in-text short list was created to outline those SAR with the highest potential of occurring within the Project Area, based on distribution and documentation by the ACCDC. The in-text priority species shortlist provided herein was developed by identifying SAR which have been documented within 20km of the development area by the ACCDC. The in-text list is provided in Section 3.1.2.

The final priority list of species used for field assessments is attached in Appendix II. The ACCDC report is included as Appendix III.

Field surveys were completed in Summer 2015 and 2016 to assess for all identified priority species across the Project Area. For this survey, a list of all rare species records found within 100 km of the Project Area was also assembled prior to the survey being undertaken (from Atlantic Canada Conservation Data Centre- ACCDC data results) to provide additional information regarding the potential presence of priority species within the Project Area.

4.1.1 Avian Monitoring

Bird surveys were completed from Spring 2015 to Spring 2016 by MEL biologists, Ms. Tiffany Gilchrist and Ms. Melanie MacDonald. Avian surveys were conducted in accordance with methodologies outlined in *Wind Turbines and Birds: A guidance Document for Environmental Assessment* (Environment Canada/Canadian Wildlife Service, 2006) and the protocols recommended by CWS (2007).

4.1.1.1 Fall Migration

Fall migration surveys were completed by MEL biologists and in accordance with the methods outlined by the Canadian Wildlife Service (CWS) in the *Migratory Birds Environmental Assessment Guidelines* (Milko, 1998).

Surveys began at, or within, half an hour of sunrise and were completed within four-and-a-half hours or by 10:00 a.m., whichever came first. Weather conditions (*i.e.*, precipitation and visibility) were monitored and confirmed to be within the parameters required by monitoring programs such as Environment Canada's (EC) Breeding Bird Survey. Ten-minute point counts were conducted between August 26 and October 9, 2015, during peak migration. Bird observations were recorded at four distance regimes, within a 50 m radius, 50 to 100 m radius, outside the 100 m radius, and flyovers. For each point count, a record was made of the start time and a hand held GPS unit was used to georeference its location. General observations including the temperature, visibility, wind speed, date, start and end time and point count were also recorded. Species recorded outside of the 100 m radius and between point counts were recorded as incidentals.

An additional two 20-minute watch count survey stations were established at both the Atlantic Ocean coastline northwest of the Project Area, and at Waterford Lake beyond the southeastern extent of the Project Area. Watch count surveys were established to identify potential congregation areas for waterbirds. Migration surveys were completed by MEL biologists and in accordance with the methods outlined by the Canadian Wildlife Service (CWS) in the Migratory Birds Environmental Assessment Guidelines (Milko, 1998).

4.1.1.2 Spring Migration

Spring migration surveys were conducted by MEL from April 7 to May 18, 2015 and May 18, 2016. The survey was conducted using the same methodology as the fall migration survey. Early morning point count surveys were conducted from 30-minutes before sunrise till 10:00 a.m. Species and number of birds observed at each point count location were recorded. Twenty-minute watch count surveys were completed along Waterford Lake and the Atlantic Ocean, in accordance with methods outlined above for Fall Migration.

4.1.1.3 Breeding Birds

Surveys for breeding birds were conducted in June, 2015. These surveys included point count surveys. Breeding birds were conducted by MEL using the same methodology as the fall and spring migration surveys. Early morning point count surveys were conducted from 30-minutes before sunrise till 10:00 a.m. Species and number of birds observed at each point count location were recorded.

4.1.1.4 Incidental Winter Observations

A transect was walked across the Project Area, and all observations of birds and other wildlife were recorded. Locations of observations were recorded with a GPS unit.

4.1.2 Vegetation Surveys

As described in the *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document* (NSE, Sept 2008), a full vascular plant survey was not completed. The vascular plant surveys focused on identifying general vegetative communities, with particular focus on identifying priority species. The vegetation surveys were completed concurrently with wetlands and habitat surveys.

4.1.3 Bat Monitoring

Monitoring for bats occurred on the Project Area in 2015 as part of the baseline assessments. The methodologies used were as follows:

McCallum Environmental Ltd. used an Anabat bat detectors in August and September 2015 (Titley electronics, Ballina, NSW, Australia) to passively record the echolocation calls of bats at the MET tower location.

Table 9. Anabat Monitoring Location, Fall 2015

Anabat #	Coordinate NAD83 UTM Zone 20T	Date Deployed	Date Removed	Notes
Anabat 1	720604 m E 5125126 m N	August 12, 2015	September 25, 2013	Hoisted on 3 m pole within cleared area for the MET tower

Anabat 1: located within Wetland 3, hoisted on a 3 m pole near the forest edge. No significant water was identified near this location.

The Anabat detector was deployed to cover the Project Area in order to gain a general understanding of bat species present in the area. The location was identified to reflect where the 2.35 MW turbine will be placed.

The detecting distance of the Anabat is affected by a number of factors, the most important one being the species of bat. Bats with high frequency, quiet or directional calls (such as horseshoes or long eared bats) may only be detected at distances of typically less than 5 metres. Bats with low frequency and loud calls such as Noctules and Serotines may be detected as far away as 100m or more. The detection range is therefore dependent on the sound characteristics of the call rather than the detector, although the most receptive zone of the Anabat is within a 90-degree cone in front of the microphone.

The raw acoustic files collected by MEL were then analysed by Boreal Environmental Ltd. (Mr. Derrick Mitchell). The objectives of this Project were:

1. To provide information on occurrence and relative magnitude of activity level in the proposed development area, based on analysis of acoustic data;
2. To provide relevant information on resource requirements of local species that might be useful for informing the decision-making process on the proposed development; and,
3. To make any relevant recommendations based on the results of this Project and any recent developments in the field.

Identification of many bat species is possible because of the distinctive nature of their echolocation calls (Fenton and Bell, 1981; O'Farrell et al., 1999). Species were qualitatively identified from echolocation sequences by comparison with known echolocation sequences recorded in this and other geographic regions. In the case of species in the genus *Myotis* (northern long-eared bat and little brown bat), there was no attempt to identify sequences to the species level, as their calls are too similar to be reliably separated. Identifications were accomplished using frequency-time graphs in ANALOOK software (C. Corben, www.hoarybat.com). An Anabat echolocation file approximates a call sequence, defined as a continuous series of greater than two calls (Johnson et al., 2004), and this was used as the unit of activity

4.1.4 Herptofauna Surveys
No targeted herptofauna surveys were undertaken, rather incidental observations of herptofauna or herptofauna signs across the Project Area were documented and photographed during field surveys. Herptofaunal incidental observations were collected throughout the field surveys in 2015 and 2016.

4.1.5 Wildlife Surveys
A winter wildlife survey was completed in January 2016 and involved the completion of a transect that crossed the entire Project Area to observe any signs, including tracks, scat and hair snags that were present.

Other than the winter survey, no targeted wildlife surveys were undertaken. Incidental observations of mammals and signs across the Project Area were documented and photographed during field surveys. Signs included such features as dens and nests, scat, tracks, and forage evidence. Mammal observations were collected throughout the field surveys in 2015 and 2016.

4.1.5.2 Habitat Surveys
During June 2015, a habitat assessment was completed within the Project Area. Using available forestry and wetlands databases, habitat survey routes were created with the goal of assessing all of the major habitat types and landscape features throughout the Project Area. The habitat survey focused on assessing upland habitats, as detailed evaluation of all wetland habitat is completed as part of the surface water evaluation.

One surveyor walked through the Project Area on June 19, 2015, following a meandering transect that reached all major habitat types expected within the Project Area. The Forest Ecosystem Classification for Nova Scotia guides (Keys, Neily, Quigley and Stewart, 2011) were used to identify the ecosites and vegetation types present throughout the Project Area. Dominant vegetation and level of disturbance were noted, and photos of representative habitats were taken. Stand age classification (Over-mature, Mature, Immature and Regenerating) was determined through qualitative observations of multiple factors such as total basal area, level of canopy coverage, and species composition of the understory herb and shrub layers. The level of anthropogenic disturbance was described; particularly the presence of logging roads and harvested trees (clear-cut or selective harvest, and approximate time since harvest). Vegetation types were identified throughout the Project Area as described in the Forest Ecosystem Classification for Nova Scotia guides (Neily, Basquill, Quigley, Stewart & Keys, 2011).

4.1.6 Wetlands & Aquatic Surveys
A desktop review of available topographic maps, appropriate provincial databases and aerial photography was completed to aid in determination of wetland habitat and watercourses in the Project Area. Predicted wetland areas were identified from the NSDNR Wetland Inventory Database. Topography maps were reviewed (1:50,000, 1:30,000, and 1:10,000) to identify all mapped watercourses.

The field surveys were conducted in September 2015 across the Project Area for the presence of wetland habitat and compared against the predicted wetland areas from the desktop review. Delineation was completed based on micro-topography, and observed surface hydrology and vegetation and soils in accordance with Nova Scotia Environment wetland delineation methodology. Wetlands were delineated by approved wetland delineators. Wetland boundaries were documented using an SXBlue GPS unit and hand held field computer capable of sub 1m accuracy. Any inlet and outlet streams or features to each wetland were marked during the delineation processes and walked and mapped as necessary where stream crossings may be required for access.

4.2 Archaeological Resource Assessment

Davis MacIntyre and Associates Limited completed an archaeological resource impact assessment for the New Victoria Community Wind Power Project in July 2015 and June 2016. This assessment consisted of two components:

i. Phase I archaeological resource impact assessment
ii. Field reconnaissance Phase II archaeological resource impact assessment

The methodologies of these two components are described below.

4.2.1 Phase I

The assessment included consultation of historic maps, manuscripts, and previous archaeological assessments as well as the Maritime Archaeological Resource Inventory in order to determine the potential for archaeological resources in the Project Area.

As part of this assessment, a historic background study was also conducted. Historical maps and manuscripts and published literature were consulted at Nova Scotia Archives and Records Management in Halifax. The Maritime Archaeological Resource Inventory, held at the Nova Scotia Museum's Heritage Division, was searched to understand prior archaeological research and known archaeological resources neighboring the Project Area.

4.2.2 Phase II

A field reconnaissance of the proposed impact areas (access road and Turbine Option Location 1)[1] was directed by Laura de Boer on July 06, 2015. The Project Area was re-visited on June 15, 2016 to evaluate Turbine Option Location 2[1].

[1] – Details related to turbine option locations are provided in Section 3.4.1.

GPS tracklogs of all reconnaissance areas were retained for records, and any sites determined to have potential for archaeological resources were recorded with photographs and GPS coordinates. The terrain and vegetation was noted in the interest of recording negative evidence for historic cultural activity.

4.3 Sound Impact Assessment

The objectives of the Sound Impact Assessment (SIA) are to:

1. Confirm the sound level limit requirements for the Project;
2. Predict the noise levels generated by the Project and adjacent existing projects at all Points of Reception within 1 km of the turbines.
3. Compare the predicted sound level from the Project with the sound level limit.

The SIA also provides information on the noise sources, the prediction method and the parameters used for the assessment.

Eighty-five receptor locations (*i.e.,* Points of Reception) for the Project were validated within 1 km of each the two New Victoria Community wind turbine option locations, and were considered in the analysis.

The predicted overall (cumulative) sound pressure levels at each critical noise receptor for the wind turbine associated with the Project were calculated based on the ISO 9613 method, using the Wind Pro Version 3.0.639 software.

4.4 Visual Influence

In general, the degree of visibility of wind turbine(s) depends on their number, their relative distance, and on the span of their layout. The visibility of a project is evaluated with two tools.

The first tool is the zones of visual influence (ZVI) cartography. It illustrates the degree of visibility across the overall study area by taking into account the locations of the wind turbine(s) and the topography of the study area. Vegetation cover and existing structures are not considered.

The second tool is the photomontages. Photomontages are produced by the superimposition of a technical drawing that shows wind turbine(s) on the photograph of a landscape. Photomontages allow the appreciation of the degree of perception from specific viewpoints that are selected for their representativeness or for their sensitivity (inhabited areas, road of moderate to high traffic, trails and/or tourist attractions). Photomontages underline the importance of land components such as topography, vegetation cover and existing structures which all influence the degree of visibility of the wind turbines.

4.5 Electro-magnetic Interference (EMI) Assessment

A system inventory was compiled for potential receptors surrounding the New Victoria Community Wind Project Area.

This system inventory is consistent with the requirements of the documents: *Technical Information and Coordination Process Between Wind Turbines and Radio communication and Radar Systems, Radio Advisory Board of Canada and Canadian Wind Energy Association, 2010* (RABC/CanWEA, 2010) and *the Guidelines for a Technical Engineering Report on the Impacts* *of Wind Turbines on CBC/Radio-Canada Services, Canadian Broadcasting Corporation - Société Radio-Canada Services, June 2008* (CBC, 2008).

4.6 Shadow Flicker

Shadow flicker caused by wind turbines is defined as alternating changes in light intensity due to the moving blade shadows cast on the ground and objects (including through windows of residences). The effects of shadow flicker are more prevalent when the sun is low in the sky at either sunrise or sunset. The shadow flicker footprint is largest during the winter solstice (December 21st) and is smallest during the summer solstice (June 21) when the suns arc through the sky is higher.

The shadow flicker assessment was completed by AL-PRO and involves the completion of a modeling exercise which utilizes the turbine specifications for the New Victoria Wind Project to determine potential shadow flicker associated with the Project. The potential shadow flicker at multiple Points of Reception surrounding the Project Area was also calculated.

The shadow flicker analysis was completed using WindPro 3.0.639 which provides a comprehensive suite of wind farm design and modeling software. Typically, the shadow flicker analysis is based on a worst case scenario which assumes that:

- The sun shines 100% of the time when it is above the horizon;
- The turbine rotor is always perpendicular to the sun;
- Shadow flicker starts as the sun moves above 3 degrees of the horizon;
- The shadows dissipate at a maximum distance from the blade as a result of atmospheric conditions and light diffusion,
- No obstructions are present that may obscure shadows;
- Receptor windows are oriented toward the turbine; and;
- The rotor blades are always spinning.

Shadow Flicker modelling was completed in 2015 for Turbine Option Location 1 (results discussed further in Section 8.3), however due to the requirement for an alternate turbine option to be considered as part of this EA (refer to Sections 3.4.1 and 5.4. for details), modelling was repeated for Turbine Option Location 2.

5.0 BIOPHYSICAL ENVIRONMENT

5.1 General Spatial Setting for Project

The proposed Project is located in the Northumberland Bras d'Or Lowlands Ecoregion, as defined by the Nova Scotia Department of Natural Resources (Neily, Quigley, Benjamin and Stewart, 2003).

The Northumberland Bras d'Or Lowlands Ecoregion is a lowland ecoregion that extends through the Sydney coalfield and follows the shores of the Bras d'Or Lakes follows the Northumberland Shore from Port Hasting to the New Brunswick border. This ecoregion is relatively low lying, elevations ranging between 25-50m above sea level along the Northumberland Strait and Bras d'Or Lakes, however elevations exceed 150m within the hills of the Antigonish County. It is also a significant area within eastern and northern Nova Scotia (Neily et al., 2003).

The underlying geology is readily erodible Carboniferous sandstone, shale, limestone and gypsum. Within the ecoregion, the soils range from fine textured glacial tills (sandy clay loams) dominating the Bras d'Or Lakes and northern Cumberland county to well drained, moderately coarse to medium textured alluviums (sandy loams) common near Oxford, Pictou and Heatherton. Imperfectly to poorly drained soils are common in large areas throughout in the ecoregion.

Black spruce forests are found throughout the ecoregion, due to the large areas poorly drained soils. On hillier topography, mixed wood stands consisting of red spruce, hemlock, yellow birch, beech and sugar maple occur on slopes where improved drainage occur. On better drained soils, common in Cumberland County, pure stands of red spruce are common. On the lowland sites along Bras d'Or Lakes, black spruce dominates and where the Cape Breton Hills steeply drop to the lake tolerant hardwoods are found. Along the steep slopes of the stream and rivers, red spruce and hemlock occur in the dissected valleys and on the valley floors but rare elsewhere in the forests along the Bras d'Or Lakes. The total area of the Northumberland Bras d'Or Lowlands Ecoregion is 8394 km_2 or 15.2 % of the province (Neily et al., 2003).

5.1.1 Natural Subregion

The Northumberland Bras d'Or Lowlands Ecoregion is further subdivided into six Ecodistricts. The New Victoria Wind Power Project exists in the Bras d'Or Lowlands Ecodistrict. Lowland areas around Bras d'Or Lakes and Sydney coalfield, Boularderie Island and the Salmon River Valley are encompassed within the ecodistrict. Due to the ecodistrict proximity to the large body of inland salt water and by protection from the surrounding uplands of the Cape Breton Hills Ecodistrict, Bras d'Or Lowlands Ecosdistrict has a moderate climate. The total area of this ecodistrict is 2,793 km^2 or 33% of the ecoregion.

White gypsum cliffs and red sandstone is observed throughout the ecodistrict and especially along the shoreline of the lakes. Shallow stony, moderately coarse-textured sandy loam glacial till is observed on the eastern half whereas imperfectly drained loam to clay loam soils are observed on the western half of the ecodistrict.

Within the lowlands of the ecodistrict black and white spruce dominant, while on steeper slopes white pine is dominant. Red spruce and hemlock are dominant within the valley canyons, steep ravines and along watercourses originating from the uplands. Tolerant hardwoods, sugar maple, yellow birch and beech are found on well drained hills (Neily et al., 2003).

5.1.2 Land Use and Habitat

Table 10 displays the land use components and area (in hectares) of each component within the Project Area:

Table 10. Calculations of Land Use

Land Use/Land Type	Area (hectares)	% of Project Area
Wetland Habitat	2.7	9.0
Gravel Pit	8.7	29.0
Productive Forest	17.6	58.7
Recently Harvested	1.0	3.3
TOTAL	30.0	100%

Land use within the Project Area is dominated by the gravel pit and forest. The total area of forests (including recently harvested) accounts for 62% of the Project Area land base. Figure 4 shows land use within and adjacent to the Project Area.

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FIGURE 4

Land Use

New Victoria Community Wind Power Project

PID 15262371

New Victoria, Cape Breton, Nova Scotia

MET Tower	Alders <75%
Turbine Locations	Alders >75%
Proposed Access Road (Option 1)	Clear Cut
Proposed Access Road (Option 2)	Partial Depletion
Study Area	Wetlands, Bogs
Watercourse	Inland water
Forest	Ocean
Softwood >75%	Rock Barren
Mixed Forest 25 -75%	Agriculture
Hardwood >75%	Urban (developed)
Non-forest	Miscellaneous (eg Mines)
Natural Stand (Unclassified)	Gravel Pit
Brush	Road or Rail Corridors

Coordinate System: NAD 1983 UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

0 125 250 500 m

1:10,000 Scale when printed @ 11" x 17"

Drawn By: MMD Date: 5/31/2016

McCallum Environmental Ltd.

Document Name: 160516_Fig4

5.2 Atmospheric Environment

5.2.1 Weather and Climate

Northumberland Bras d'Or Lowlands Ecoregion's climate is quite variable. The province's warmer summer temperature and cooler areas in winter are found on the Northumberland Shore. The Northumberland Strait waters stay relatively warm in late August, which with the contrast between the air and water temperature creates on-shore sea breezes which delays frost for a few weeks. The Strait eventual freezes over and any marine influence is cut off for the next few months of winter. Cool winters and cooler summer temperatures are experience in Bras d'Or lowlands relative to the Northumberland Strait. Due to the proximity to the warmer salt water of the Northumberland Strait and the Bras d'Or Lakes, the ecoregion has warmer benefits compared to the ecoregions closer to the colder waters of the Bay of Fundy and the Atlantic. Annual precipitation ranges between 1100-1400 mm, with Northumberland Strait being the drier area (Neily et al, 2003).

The average low temperature (based on statistics from the past 30 years) was recorded at -11.1 degrees Celcius in February and the average high temperature was recorded at 23 degrees Celcius in July (recorded in Sydney Nova Scotia) located 13 km southeast of the Project Area (The Weather Network, 2013). Average annual rainfall is 1212 mm with maximum rainfall levels in October of each year (average 144mm in October). Average annual snowfall has been measured at 298 cm with the maximum snowfall occurring each year in January (71 cm).

According to the NS Wind Atlas (NSDE 2007), average wind speeds at 30 m above the ground at the Project site range from 6.51-7.0 m/s. At 50 m, the average wind speeds range from 7.01-7.5 m/s to and from 7.51-8 m/s at 80 m above the ground.

5.2.2 Air Quality

In Nova Scotia, about half of total greenhouse gas (GHG) emissions come from electricity use and nearly 90% of electricity comes from fossil fuels (NSDE 2010). As a result of this reliance on fossil fuels for electricity, every MW of wind power installed in Nova Scotia reduces GHG emissions by as much as 2,500 tonnes per year (NSDE 2011).

Measured air quality parameters across Nova Scotia include ground-level ozone (O3), particulate matter (PM2.5), and nitrogen dioxide (NO2), and these values are used to calculate a score in the Air Quality Health Index (AQHI) (EC 2011). The AQHI is a scale from 1-10+, representing the following health risk categories: Low (1-3), Moderate (4-6), High (7-10), and Very High (10+). The monitoring station closest to the Project Area is located in Sydney, Cape Breton. The AQHI at this site is usually low at all times of the year (EC 2011).

5.3 Geophysical Environment

5.3.1 Physiography and Topography

The dominant forest within this Ecodistrict is the balsam fir, white spruce, and black spruce. Where forested lands have been disturbed either by harvesting or natural causes such as blow down, insect defoliation or fire, balsam fir re-establishes. Black and white spruce dominates the lowlands area. White pine is found on steeper slopes whereas red spruce and hemlock are found within the valley canyons, steep ravines and along some watercourses coming off the uplands. Lower quality tolerant hardwoods, sugar maple, yellow birch and beech are found on the better drained hills. Where early settlers cleared the land and subsequently abandoned the field and pastures, large areas of old white spruce are have established (Neily et al., 2003).

5.3.2 Surficial Geology

Within this ecodistrict eastern and western halves of undulating to rolling lowland plain, underlain by Carboniferous sediments, are separated by the Bras d'Or Lake. The shores of Bras d'Or Lake rise up into a series of hills which are encompassed by the lowland plain. Carboniferous sediments are found under the lowland plain; the western half is underlain with moderately fine textured glacial till derived from the underlying shale, sandstone, limestone, and gypsum of the Windsor, Canso, and Riversdale groups and the eastern half is underlain shallow, stony, moderately coarse-textured glacial till derived primarily from the underlying sandstones of the Pictou and Morien groups. Bordering the rivers draining the valley bottom are alluvial floodplains and associated with the major rivers is ice-contact stratified drift. Within the northeast portion of the ecodistrict extensive peatlands are found (Webb and Marshall, 1999).

The surficial soils within the Project Area are dominated by stoney till plain (ground moraine) consisting of till (stony, sandy matrix, material derived from local bedrock sources) depths from 2-20 m (NSDNR 2012).

5.3.3 Bedrock Geology

The Project Area overlies bedrock formations of the Morien Group within the Sydney Mines Formation and the South Bar Formation. The Sydney Mines Formation consists of fluvial and lacustrine mudstone, shale, siltstone, sandstone, limestone and coal. The South Bar Formation consists of fluvial sandstone, minor conglomerate, mudstone and coal.

Surficial geology and bedrock geology within the Project Area are shown on the following two figures (Figure 5 and Figure 6)

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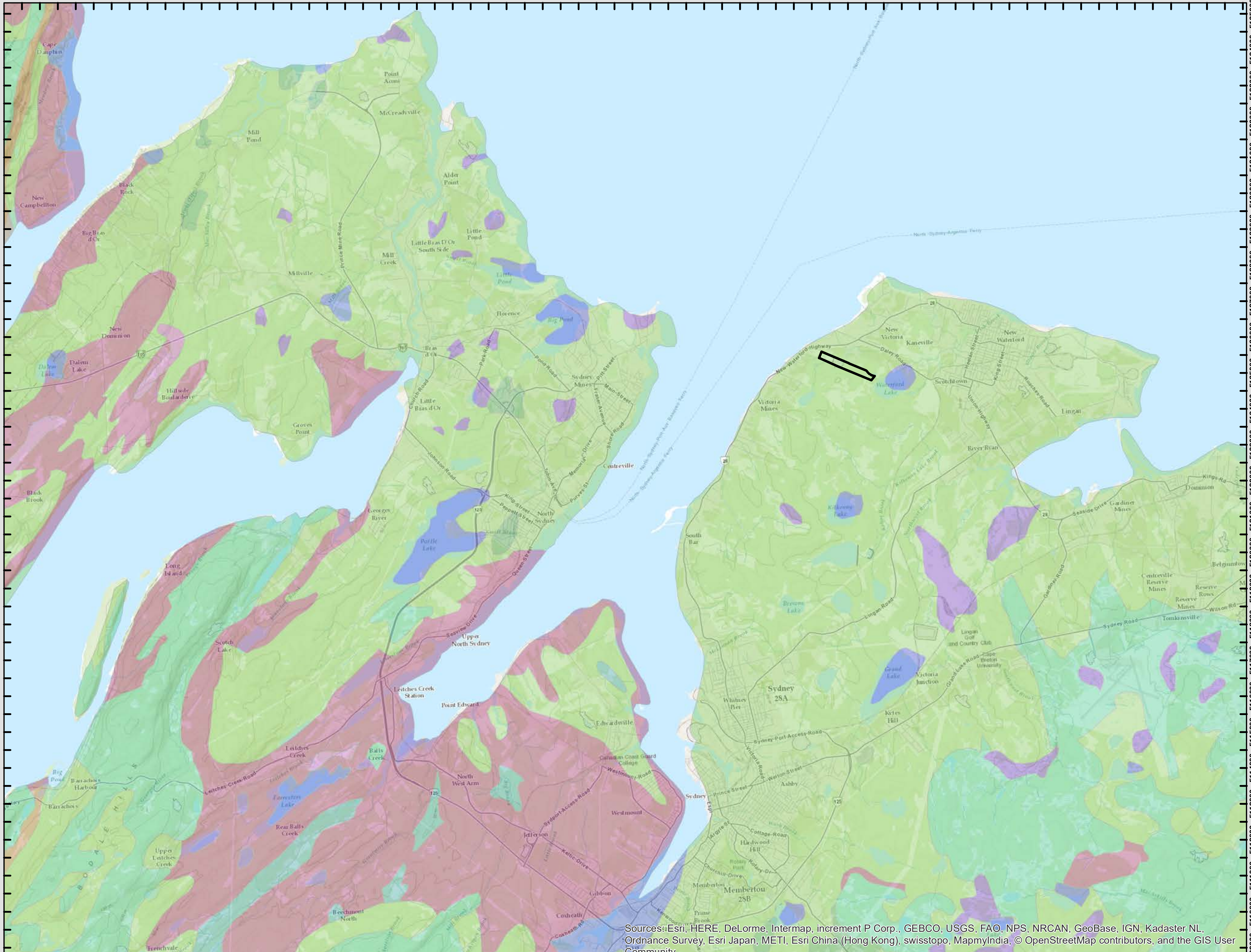
FIGURE 5

Surficial Geology

New Victoria Community Wind Power Project

PID 15262371

New Victoria, Cape Breton, Nova Scotia



- Alluvial Deposits
- Bedrock
- Colluvial Deposits
- Kame Fields and Esker Systems
- Organic Deposits
- Outwash fans, Deltas, and Valley Train Deposits
- Silty Drumlin
- Silty Till Plain
- Stony Till Plain
- None
- Property Boundary

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China

Coordinate System: NAD 1983 UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

0 1,200 2,400 4,800 m

1:100,000 Scale when printed @ 11" x 17"

Drawn By: MMD Date: 5/30/2016

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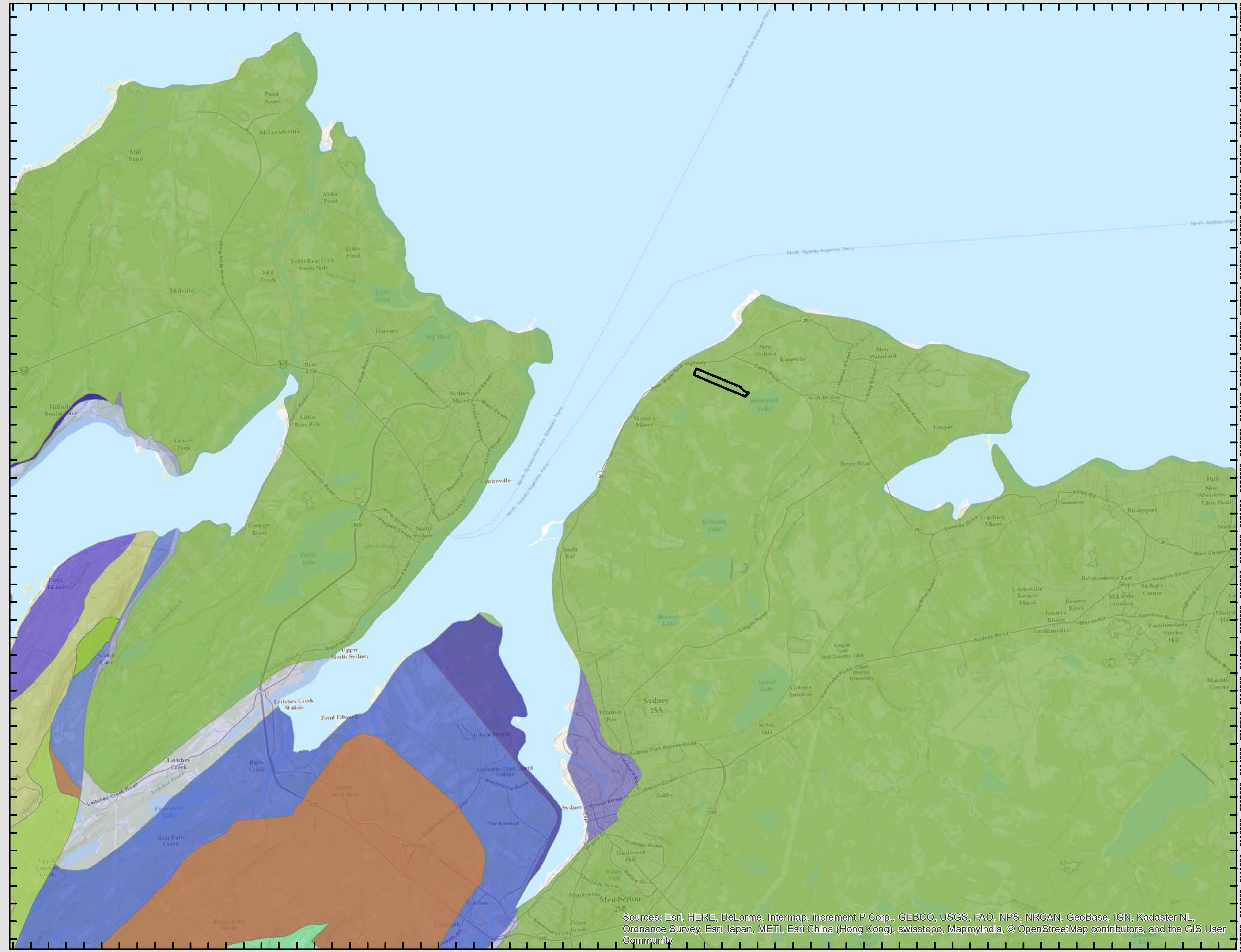
Document Name: 160516_Fig5



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COMMUNITY WIND DEVELOPMENT

FIGURE 6

Bedrock Geology

New Victoria Community Wind Power Project

PID 15262371

New Victoria, Cape Breton, Nova Scotia

- 4 units
- Bourinot Group
- Bras d'Or
- Coxheath Hills Group
- Horton Group
- Intrusives
- Mabou Group
- Morien Group
- Windsor Group
- Property Boundary

Coordinate System: NAD 1983 UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

0 1,200 2,400 4,800 m

1:100,000 Scale when printed @ 11" x 17"

Drawn By: MMD

Date: 5/30/2016

McCallum Environmental Ltd.

Document Name: 160516_Fig6

5.3.4 Hydrogeology and Groundwater

Water supplies for individual homes near the Project Area are provided by individual drilled or dug on-site potable wells.

Details associated with individual drilled or dug wells within a 4 km radius of the Project Area were identified through a review of the NS well logs database (NSE 2016). This database provides information on more than 100,000 water wells in the province, including information on well locations, geology and well construction, well depth and yield. A search of this database was completed for the Project Area in Cape Breton County. A total of 23 well logs were available for review. General conclusions relating to the groundwater resource in the Project Area were derived from this information.

The geology of the Project Area was described from the drilling processes as consisting of clay till with boulders overlying quartzite or granite bedrock. The average depth to bedrock based on drilling data was generally 25-35 feet. Wells appeared to be drilled to an average depth of 120 feet below grade, and were constructed as 6 inch wells with standard 50-60 feet depths of casing. Information provided on depth of water bearing fractures during drilling activities indicated that the average depth to the shallowest water bearing fractures was approximately 40 feet below grade. Static water levels were not always recorded in the well logs, but information that was provided indicated an average static depth to water of 35 feet. A general review of water yields for these wells indicated an average yield of approximately 12 imperial gallons per minute (igpm).

Groundwater resources within the Project Area are not used to supply residential potable water as there are no residential dwellings within the Project Area. According to the information available in the Well Logs Database, there are several drilled groundwater wells used for potable purposes located north, east and southwest of the Project Area; however, it is known that well locations within the database are not always fully accurate. The closest verified well locations are associated with residences along the New Waterford Highway, just over 1000m away from the turbine location.

Please note however that the locations of wells in the well log database do not provide exact geographic coordinates. Older references indicate a map number only. Newest references are accurate within 50 m. This well log database also only identifies drilled wells. Dug wells may be present in closer proximity to the turbine location. Please refer to Figure 2 for the location of domestic drilled potable wells surrounding the Project Area.

Surface water located on the western extent of the Project Area and west of the gravel pit drains southwest towards watercourses beyond the Project Area and eventually to the Atlantic Ocean. The surface water present within the center and on the east side of the gravel pit drains northwest towards watercourses beyond the Project Area, that eventually lead to the Atlantic Ocean. On the eastern extent of the Project Area, the surface waters drain east into Waterford Lake.

5.3.4.1 New Waterford Municipal Water Supply Area
The New Waterford Municipal Water Supply Area (NWMWSA) extends approximately 540m into the eastern extent of the Project Area, approximately 240 meters east of Turbine Option Location 1 and approximately 70 meters from Turbine Option Location 2. The location of the NWMWSA is provided on Figure 3. In support of the Public Consultation Process, a review of potential interactions between the Project and water quality and quantity was completed. A review report was submitted to the New Waterford Source Water Protection Committee in June 2016. The review document is provided in Appendix IV.

The review document determined that impacts to water supply and quality within the NWMWSA are not expected. Conclusions included in the review report regarding potential impacts to local groundwater, water quality and quantity are not expected to differ for the local area surrounding the Project Area.

5.4 Terrestrial Environment

5.4.1 Vegetation
During the field season in 2015, an assessment of vegetation was completed at proposed Turbine Option Location 1, and throughout the Project Area. Turbine option Location 2 was evaluated during May 2016. The forest cover within each proposed turbine location was classified by forest cover and age class.

The Project Area contains a mosaic of natural and disturbed habitat, exhibiting evidence of both natural and anthropogenic disturbance regimes. Five wetlands are present throughout the Project Area, (described in detail within Section 5.4.8). Overall, the site falls within the Acadian Ecosites AC10 and AC11. These ecosites (described by Keys et al., 2011) represent moderate soil richness, and fresh to moist moisture regimes depending on topographic position, slope gradient, and soil drainage. Generally, these ecosites support early- to mid-successional forests within the Project Area.

The western extent of the Project Area is considered disturbed habitat, with earthworks, quarry activities, an access road, and a meterological tower (MET). Within central portions of the Project Area, the habitat is forested yet disturbed by timber harvesting activities. This area is in the early to mid-regenerating stage with abundant Red Maple, White Birch, Balsam Fir and Blackberry saplings, emerging from a ground cover dominated by Sphagnum moss and a variety of herbaceous species. The eastern portion of the Project Area contains a mosaic of intact forests and lands disturbed by historic timber harvesting, along with a small network of ATV trails and an abandoned railbed.

Undisturbed upland habitat present in the Project Area encompasses a range of vegetation types (as defined by Neily et al., 2011), such as Mixed Wood (MW4 and MW5), Intolerant Hardwood (IH6a) and Tolerant Hardwood (TH8). The vegetation types are consistent with expectations based on ecosite conditions. The mixed wood treed swamp vegetation types follow stand-replacing disturbance events, such as fire, windthrow and harvesting. In areas with slightly richer nutrient regime, tolerant hardwood forests with Red Maple, Yellow Birch and Striped Maple are present (TH8). White Birch, Red Maple, Aspen Variant (IH6a) intolerant hardwood stands are also present in small patches through the eastern extent of the Project Area. These hardwoods dominated vegetation types represent mid- to late-successional forest stands with moderate nutrient regimes.

The two potential turbine option locations were assessed during the habitat and vegetation survey. Turbine Option Location 1 is located within a mature mixed forest, containing White Birch, Red Maple and Balsam Fir in the overstorey. Shrubby vegetation is not abundant. Ground cover is dominated by Sasparilla, False Lily-of-the-valley, Clintonia, Bunchberry and Velvet-leaved Blueberry. Turbine Option Location 2 is located in a similar habitat type as Option 1, though the canopy coverage is dominated by White Birch, Red Maple and Trembling Aspen, with only occasional coniferous species. Wild Raisin is occasional in the shrub and sapling layer.

A list of all species identified within the Project Area is provided in Table 11 below.

Table 11. Vegetation List New Victoria Community Wind Project

Latin Name	Common Name	Indicator Status	Srank
Abies balsamea	Balsam Fir	FAC	S5
Acer pensylvanicum	Striped Maple	FACU	S5
Acer rubrum	Red Maple	FAC	S5
Acer saccharum	Sugar Maple	FACU	S5
Acer spicatum	Mountain Maple	FAC	S5
Agrostis perennans	Upland Bent Grass	FAC	S4S5
Alnus incana	Speckled Alder	FACW	S5
Amelanchier laevis	Alleghany Service-berry	FAC	S5
Aralia nudicaulis	Wild Sarsaparilla	FAC	S5
Betula alleghaniensis	Yellow Birch	FAC	S5
Betula papyrifera	Paper Birch	FACU	S5
Betula populifolia	Gray Birch	FAC	S5
Calamagrostis canadensis	Bluejoint Reed Grass	FACW	S5
Calla palustris	Wild Calla	OBL	S4
Carex atlantica ssp. Atlantica	Atlantic Sedge	FACW+	S4
Carex brunnescens	Brownish Sedge	FAC	S5
Carex canescens	Silvery Sedge	OBL	S5
Carex crinita	Fringed Sedge	OBL	S5
Carex debilis	White-edged Sedge	FAC	S5
Carex gynandra	Nodding Sedge	FACW	S5
Carex leptonervia	Finely-nerved Sedge	FAC	S5
Carex lurida	Sallow Sedge	OBL	S5
Carex nigra	Black Sedge	FACW	S5

Latin Name	Common Name	Indicator Status	Srank
Carex stipata	Awl-fruited Sedge	OBL	S5
Carex stricta	Tussock's Sedge	OBL	S5
Carex trisperma	Three-seeded Sedge	OBL	S4?
Chamaedaphne calyculata	Leatherleaf	OBL	S5
Chamerion angustifolium	Fireweed	FAC	S5
Chelone glabra	White Turtlehead	FACW+	S5
Circaea alpina	Small Enchanter's Nightshade	FAC	S5
Clintonia borealis	Yellow Bluebead Lily	FAC	S5
Coptis trifolia	Goldthread	FAC	S5
Corallorhiza trifida	Early Coral-root	FACW	S4
Cornus canadensis	Bunchberry	FAC	S5
Cypripedium acaule	Pink Lady's-Slippers	FAC	S5
Danthonia spicata	Poverty Oat Grass	FACU	S5
Daucus carota	Queen Anne's Lace	FACU	SNA
Dennstaedtia punctilobula	Hay-scented Fern	FAC	S5
Doellingeria umbellata	Hairy Flat-top White Aster	FAC	S5
Drosera rotundifolia	Round-leaved Sundew	OBL	SNR
Dryopteris campyloptera	Mountain Wood Fern	FAC	S5
Dryopteris carthusiana	Spinulose Wood Fern	FAC	S5
Dryopteris cristata	Crested Wood Fern	FACW	S5
Eleocharis tenuis	Slender Spikerush	FACW	S5
Empetrum nigrum	Black Crowberry	FAC	S5
Epigaea repens	Trailing Arbutus	FACU	S5
Epilobium leptophyllum	Bog Willowherb	FACW+	S5
Equisetum arvense	Field Horsetail	FAC	S5
Equisetum sylvaticum	Woodland Horsetail	FAC	S5
Eriophorum virginicum	Tawny Cotton-grass	OBL	S5
Eupatorium perforatum	Common Boneset	FACW	S5
Euthamia graminifolia	Grass-leaved Goldenrod	FAC	S5
Fagus grandifolia	American Beech	UPL	S5
Fallopia japonica	Japanese Knotweed	FACU	SNA
Fragaria virginiana	Wild Strawberry	FAC	S5
Fraxinus americana	White Ash	FAC	S5
Gaylussacia baccata	Black Huckleberry	FAC	S5
Glyceria canadensis	Canada Manna Grass	FACW	S5
Glyceria grandis	Common Tall Manna Grass	OBL	S4S5
Glyceria striata	Fowl Mannagrass	FACW	S5
Ilex verticillata	Common Winterberry	FACW+	S5

Latin Name	Common Name	Indicator Status	Srank
Iris versicolor	Harlequin Blue Flag	FACW+	S5
Juncus brevicaudatus	Short-tailed Rush	OBL	S5
Juncus canadensis	Canada Rush	OBL	S5
Juncus effusus	Soft Rush	FACW	S5
Juncus tenuis	Path Rush	FAC	S5
Juniperus communis	Common Juniper	FAC	S5
Kalmia angustifolia	Sheep Laurel	FAC	S5
Kalmia polifolia	Pale Bog Laurel	OBL	S5
Larix laricina	Larch	FAC	S5
Ledum groenlandicum	Common Labrador Tea	FACW+	S5
Linnaea borealis	Northern Twinflower	FAC	S5
Lycopus americana	American Water Horehound	OBL	S5
Lycopus uniflorus	Northern Water Horehound	OBL	SNR
Maianthemum canadense	False Lily-of-the-valley	FAC	S5
Maianthemum trifolium	Three-leaved False Solomon's Seal	OBL	S5
Malus pumila	Common Apple	FACU	SNA
Myrica gale	Sweet Gale	OBL	S5
Myrica pensylvanicum	Northern Bayberry	FAC	S5
Nemopanthus mucronatus	Mountain Holly	FAC	S5
Nymphaea odorata	Fragrant Water-lily	OBL	S5
Oclemena acuminata	Whorled Wood Aster	FACU	S5
Oclemena nemoralis	Bog Aster	OBL	S5
Onoclea sensibilis	Sensitive Fern	FACW	S5
Orthilia secunda	One-sided Wintergreen	FAC	S5
Osmunda cinnamomea	Cinnamon Fern	FAC	S5
Osmunda claytoniana	Interrupted Fern	FAC	S5
Oxalis montana	Common Wood Sorrel	FAC	S5
Persicaria sagittata	Arrow-leaved Smartweed	OBL	S5
Phegopteris connectilis	Northern Beech Fern	FAC	S5
Photinia pyrifolia	Red Chokeberry	FACW	S4
Picea glauca	White Spruce	FAC	S5
Picea mariana	Black Spruce	FACW	S5
Plantago major	Common Plantain	FAC	SNA
Platanthera clavellata	Club-spur Orchid	FACW	S5
Populus tremuloides	Trembling Aspen	FAC	S5
Prenanthes trifoliolata	Three-leaved Rattlesnakeroot	FACU	S5
Ranunculus acris	Common Buttercup	FAC	SNA
Ranunculus repens	Creeping Buttercup	FAC	S5

Latin Name	Common Name	Indicator Status	Srank
Rhododendron canadense	Rhodora	FAC	S5
Rosa miltiflora	Multi-flora Rose	SNA	FACU
Rosa nitida	Shining Rose	OBL	S4
Rubus alleganiensis	Blackberry	FACU	S5
Rubus canadensis	Smooth Blackberry	FACU	S5
Rubus hispidus	Bristly Dewberry	FACW	S5
Rubus ideaus	Red Raspberry	FAC	S5
Rubus pubescens	Dwarf Red Raspberry	FAC	S5
Rumex acetosella	Sheep Sorrel	FACU	SNA
Salix bebbiana	Bebb's Willow	FAC	S5
Salix pyrifolia	Balsam Willow	FACW	S5
Scirpus cyperinus	Common Woolly Bulrush	FACW	S5
Scutellaria galericulata	Marsh Skullcap	OBL	S5
Solidago canadensis	Canada Goldenrod	FAC	S5
Solidago gigantea	Giant Goldenrod	FAC	S5
Solidago rugosa	Rough-stemmed Goldenrod	FAC	S5
Solidago uliginosa	Northern Bog Goldenrod	OBL	S5
Sorbus americana	American Mountain Ash	FAC	S5
Sparganium americanum	American Bur-reed	OBL	S5
Spiraea alba	White Meadowsweet	FAC	S5
Spiraea tomentosa	Steeplebush	FAC	S5
Taraxacum officinale	Common Dandelion	FAC-	SNA
Thelypteris noveboracensis	New York Fern	FAC	S5
Thelypteris simulata	Bog Fern	OBL	S5
Triadenum virginicum	Virginia St. John's Wort	OBL	S5
Trientalis borealis	Northern Starflower	FAC	S5
Trifolium pratense	Red Clover	FACU	SNA
Trillium undulatum	Painted Trillium	FAC	S5
Tussilago farfara	Coltsfoot	FAC	SNA
Typha latifolia	Broad-leaved Cat-tail	OBL	S5
Vaccinium angustifolium	Late Low-bush Blueberry	FAC	S5
Vaccinium macrocarpon	Large Cranberry	FACW+	S5
Vaccinium myrtilloides	Velvet-leaved Blueberry	FAC	S5
Vaccinium oxycoccos	Small Cranberry	OBL	S5
Vaccinium vitis-idaea ssp. minus	Mountain Cranberry	FAC	S5
Veronica officinalis	Common Speedwell	FACU	S5
Viburnum nudum	Northern Wild Raisin	FAC	S5
Vicia cracca	Tufted Vetch	FAC	SNA

Latin Name	Common Name	Indicator Status	Srank
Viola cucullata	Marsh Blue Violet	FAC	S5
Viola macloskeyi	Small White Violet	FACW	S5

An area of approximately 1 hectare is proposed to be cleared of vegetation at the final turbine location, in addition to a right of way (ROW) approximately 15 meters wide for new access road construction. The total anticipated area requiring clearing (based on Turbine Option Location 1) is therefore 1.5 hectares which accounts for approximately 0.05% of the total Project Area lands. The habitat present at both turbine option locations does not currently provide significant resources for wildlife, and similar habitat is present in adjacent lands and within the local region.

5.4.1.1 Species of Conservation Interest (SOCI) and Species at Risk (SAR)
The Project Area was assessed for rare, sensitive and at-risk vegetation during the field surveys in 2015 and 2016. Early spring ephemeral surveys and late season surveys were completed throughout the Project Area, and focussed on the proposed turbine locations and access routes. Care was taken to assess for potential rare vegetation species and habitats that were identified from the ACCDC data search. Based on data provided by the ACCDC, the 100km buffer around the study area contains 4161 records of 271 vascular, 242 records of 28 nonvascular flora.

During field studies at the Project Area, no flora species of conversation interest (SOCI) or species at risk (SAR) were identified.

5.4.2 Herpetofaunal Species
Herpetofaunal species were inventoried at the Project Area through incidental observations. Specific focus was given to priority species identified as having appropriate habitat within the Project Area. The following three species (Table 12) were identified during field surveys, neither of which are a SOCI or a SAR:

Table 12. Herpetofaunal species inventoried during 2015 field surveys.

Scientific Name	Common Name	ACCDC Prov. Rank
Lithobates sylvaticus	Wood frog	S5
Pseudacris crucifer	Spring peeper	S5
Thamnophis sirtalis pallidulus	Garter Snake	S5

The Project Area provides limited herpetofaunal habitat. The limitation for many turtle and amphibian species is the lack of open water habitats, particularly associated with wetlands. Although there are several wetlands across the Project Area, they do not exhibit vernal pool and open channel habitat. In those wetland areas where there is limited open water habitat, it is extremely unlikely that fish are present, and therefore predation would be low. Species that may use intermittent stream channel habitats are more likely to find adequate habitat within the Project Area.

No herpetofaunal species at risk or species of conservation interest were observed within the Project Area during 2015 and 2016 field surveys.

5.4.3 Mammals

Incidental observation of mammal species was documented during all field survey activities during 2015 and 2016 across the Project Area. Specific focus was given to priority species identified as having appropriate habitat within the Project Area.

Table 13 lists those species that were confirmed within the Project Area either visually or by sign (scat, footprints, etc.). Presence of bats in the Project Area is described in Section 5.4.5.

Table 13. Confirmed mammalian species during 2015 field surveys.

Scientific Name	Common Name	ACCDC Prov. Rank
Tamiasciursus hudsonicus	American Red Squirrel	S5
Ondatra zibethicus	Common muskrat	S5
Lepus americanus	Snowshoe hare	S5
Alces alces	Eastern Moose	S1*

*S1 rank for Eastern Moose refers to the Nova Scotian mainland population, not the population of Moose in Cape Breton

Ungulate species expected to inhabit the vicinity of the Project were established by examination of distribution maps, comparison of preferred habitat with that in the vicinity of the proposed location and field assessments. Mammal species observed within the Project Area include the white-tailed deer (*Odocoileus virginianus)* and Eastern Moose (*Alces alces*). Optimal habitat for deer species occurs within young forest stands and riparian and shoreline areas within drainage systems within the Project Area. White-tailed deer forage on grasses, forbs and shrubby browse, and require large amounts of easily digested food (Buckmaster et al., 1999).

Common carnivore/omnivore species such as Raccoon (*Procyon lotor*), Coyote (*Canis latrans*), American Porcupine (*Erithizon dorsatum*), Red Fox *(Vulpes vulpes),* Bobcat (*Lynx rufus),* American Mink (*Mustela vision),* Striped Skunk (*Mephitis mephitis)*, Short-tailed Weasel (*Mustela erminea)* may inhabit the Project Area or surrounding areas, at least periodically.

5.4.3.1 Rare, Sensitive, At-Risk Mammals

Table 14 provides a summary of mammalian SOCI and SAR with potential to be found within the Project Area, based on habitat preference. Bat species are discussed in further detail in Section 5.4.5.

Table 14. Potential Mammalian Species of Conservation Interest within Project Area

Scientific Name	Common Name	ACCDC Provincial Rank	NS Protection
Lynx canadensis	Canada lynx	S1	Endangered
Martes pennanti	Fisher	S2	
Sorex dispar	Long-tailed Shrew	S1	
Microtus chrotorrhinus	Rock Vole	S2	

Canada Lynx

Canada Lynx (*Lynx canadensis)* is the only mammalian SAR that may potentially be located within the Project Area. Lynx on the mainland of Nova Scotia were extirpated by the beginning of the twentieth century. Lynx numbers fluctuate depending on cyclical highs and lows of its primary prey, the Snowshoe Hare (*Lepus americanus*), which comprises most of its diet (NSDNR 2007). The habitat requirements for Lynx in Nova Scotia are not well defined and therefore habitat deficiencies, if they exist, are as yet unknown. Prolonged deep snow cover and coniferous forest cover are important factors in the distribution of Lynx in eastern North America.

The historic breeding range of Lynx in Nova Scotia included areas with relatively high elevations such as the Pictou Uplands, Cobequid Mountains, and Musquodobit Hills as well as Cape Breton. The current breeding population of Lynx is considered to be restricted to Cape Breton; it has been roughly estimated at 50 to 500 animals. The largest area of contiguous Lynx habitat is the Cape Breton Highlands, but traditional knowledge suggests that concentrations of Lynx also occur at Boisdale Hills, East Bay Hills, and South Mountain in Richmond County (NSDNR 2007). The likelihood of the presence of Lynx within the Project Area is low, based on traditional knowledge of where concentrations of Lynx are present on Cape Breton Island as well as the relative proximity of the Project Area to the community of New Victoria.

No observations of Lynx were recorded as incidental sightings during field assessments throughout Spring, Summer and Fall 2015 and Spring 2016 within the Project Area.

Fisher

The Fisher is ranked as S2 by the ACCDC in Nova Scotia. These rankings suggest the species is both rare and sensitive to human or natural disturbance.

Fishers inhabit upland and lowland forests, including coniferous, mixed, and deciduous forests. They occur primarily in dense coniferous or mixed forests, including early successional forest with dense overhead cover. Fishers commonly use hardwood stands in summer but prefer coniferous or mixed forests in winter. They generally avoid areas with little forest cover or significant human disturbance and conversely prefer large areas of contiguous interior forest. The habitat preferences for the fisher are not present within the Project Area as the New Victoria

Wind Project is located within a disturbed forest type. Portions of the Project Area has been recently harvested and does not contain blocks of contiguous interior forest.

Long Tailed Shrew

The Long-tailed Shrew is ranked as S1 in the province of Nova Scotia by the ACCDC. Long-tailed Shrew are found in mountainous, forested areas with loose talus. They will use artificial talus created by road construction and pit mines. They also use rocky damp areas with deep crevices. The habitat preferences for Long-tailed Shrews are not present within the Project Area as the New Victoria Wind Project is not located within mountainous terrain.

Rock Vole

The ACCDC ranks the Rock Vole as S2 for the Province. Habitat for Rock Voles include fern/mossy debris near flowing water in coniferous forest, spruce clear-cuts (mainly recent cuts), grassy balds near forest and sterile-looking rocky road fills. This habitat is not present within the Project Area.

5.4.4 Avian Use Assessment

Baseline assessment for birds was completed during the EA process for the New Victoria Community Wind Power Project from June 2015 to May 2016 by MEL bird experts, Ms. Tiffany Gilchrist and Ms. Melanie MacDonald.

Summary of avian surveys and conclusions are provided below. Detailed results of bird surveys are provided in Appendix V.

5.4.4.1 Breeding Bird Surveys

Breeding bird monitoring was conducted on two dates, June 19 and July 4, 2015. Seven 10-minute point count survey stations were established across the Project Area (200 to 270-meter width), approximately 300 meters apart, to ensure coverage of all major habitat types represented within the Project Area. Breeding bird surveys were completed by MEL biologists in accordance with the methods outlined by the Canadian Wildlife Service (CWS) in the Migratory Birds Environmental Assessment Guidelines (Milko, 1998). All point count station locations are shown in Figure 7.

During breeding season, 153 individuals, representing 28 species, were observed during the dedicated 10-minute point count survey periods. An additional six species were observed incidentally: Lesser Scaup, Grouse sp., Wilson's Snipe, Blue Jay, Black-throated Blue Warbler, and Common Grackle. Two SOCI, Common Loon (S3B, S4N) and Common Tern (S3B), were observed during the dedicated survey period. One SAR, Savannah Sparrow (SARA and COSEWIC SC; S-Rank S1B), was observed during the dedicated survey period. Two SOCI were observed incidentally, Wilson's Snipe (S3S4B) and Common Loon (S3B, S4N).

The species most commonly observed during the spring bird migration point count survey was Red-eyed Vireo (*Vireo olivaceus*; n=20), followed by White-throated Sparrow (*Zonotrichia albicollis*; n=19). The majority of species observed during dedicated breeding bird surveys were of the order Passeriformes (96.10%), this group also consisted of the highest percent of individual birds observed (79.31%). Other land birds (Mourning Dove and unknown Woodpecker) and other waterbirds (Common Loon and Common Tern), were the next most abundant group (6.9 % of species each), followed by waterfowl (3.45%) and diurnal raptors (3.45%). Detailed results of breeding bird surveys are provided in Table 1 (Appendix V).

5.4.4.2 Fall and Spring Migration Surveys

Fall migration monitoring was conducted on eight dates between August 26 and October 20, 2015. Spring migration monitoring was conducted on seven dates between April 7 and May 18, 2016. Fall and spring migration surveys followed the same methodology. Seven 10-minute point count survey stations were established across the Project Area (200 to 270-meter width), approximately 300 meters apart, to ensure coverage of all major habitat types represented within the Project Area. An additional two 20-minute watch count survey stations were established at both the Atlantic Ocean coastline northwest of the Project Area and at Waterford Lake on the southeastern extent of the Project Area. Watch count surveys were established to identify potential congregation areas for waterbirds. Migration surveys were completed by MEL biologists and in accordance with the methods outlined by the Canadian Wildlife Service (CWS) in the Migratory Birds Environmental Assessment Guidelines (Milko, 1998). All point and watch count station locations are shown in Figure 7 attached to this report.

Bearings (in degrees) were taken for SOCI and SAR observed both during dedicated survey periods and incidentally the locations of which are presented on Figure 7.

Spring Migration Survey Results

During spring migration, 673 individuals, representing 47 species, were observed during the dedicated 10-minute point count survey periods; an additional four species were observed incidentally, Cooper's Hawk (*Accipiter cooperii*; S-rank S1?B, SNAN), Northern Harrier (*Circus cyaneus*), Spotted Sandpiper (*Actitis macularius*) and Barred Owl (*Strix varia*). Another 146 individuals, representing 17 species, were observed during the dedicated 20-minute watch count survey periods. In total, four SOCI, Common Loon (S-rank S3B, S4N), Greater Yellowlegs (S-rank S3B, S5M), Wilson's Snipe (S-rank S3S4B), and Fox Sparrow (S-rank S3S4B) were observed during the dedicated spring bird migration point count surveys. No SAR were observed. Three SOCI were observed incidentally: Common Loon (S-rank S3B, S4N), Greater Yellowlegs (S3B, S5M), and Cooper's Hawk (S1?B, SNAN). One SOCI, Common Loon (S-rank S3B, S4N), was observed during the spring bird migration watch count surveys. No SAR were observed during watch count surveys.

The species most commonly observed during the spring bird migration point count survey were White-throated Sparrow (*Zonotrichia albicollis*; n=97) and Black-capped Chickadee (*Poecile atricapillus*; n=97), followed by American Robin (*Turdus migratorius*; n=82) and American Crow (*Corvus brachyrhynchos*; n=40). The majority of observations were of single individuals, and the largest groups of birds observed were two flocks of American Robins (n=10; n=12) on April 7th, a flock of Ring-necked Ducks containing 12 individuals on May 18th. The majority of species observed during dedicated spring bird migration point count surveys were of the order

Passeriformes (64%), this group also consisted of the highest percent of individual birds observed (82.32%). The second most abundant group of species were other waterbirds and landbirds (each 11%), waterfowl (9%), diurnal raptors (4%), and shorebirds (2%).

The majority of species observed during dedicated spring bird migration watch count surveys at both Waterford Lake and the Atlantic Ocean coastline were from the Other Waterbirds group (53%). This group also consisted of the highest percent of individual birds observed (84.25%). The next most observed group of species were Waterfowl (24%), followed by Passerines (12%), and then Shorebirds and Diurnal Raptors, each consisting of 6% of species observed. Small numbers of birds were observed on Waterford Lake, including Common Loon, American Black Duck, Mallard, Belted Kingfisher. Along the Atlantic Ocean coastline, the large majority of birds were observed at or coming to and from a small rock peninsula located approximately 630 meters east of the watch station. The birds observed consisted primarily of Double-crested Cormorants and gulls. Bird abundance was much higher along the Atlantic Ocean coastline than on Waterford Lake.

Detailed results of spring bird surveys are provided in Table 2 (Appendix V).

<u>Fall Migration Survey Results</u>

During fall migration, 278 individuals, representing 28 species, were observed during the dedicated 10-minute point count survey periods; an additional five species were observed incidentally, Canada Goose, Common Loon, Common Raven (*Corvus corax*), Blackburnian Warbler (*Setophaga fusca*) and Ovenbird (*Seiurus aurocapilla*). The Common Loon was the only priority species observed incidentally. Another 370 individuals, representing 13 species, were observed during the dedicated 20-minute watch count survey periods. One SOCI, Common Loon (S-rank S3B, S4N), was observed during fall bird migration watch count surveys. No SAR were observed.

The species most commonly observed during the spring bird migration point count survey was American Goldfinch (*Spinus tristis;* n=51), followed by Black-capped Chickadee (n=35). The majority of observations were of single individuals, and the largest groups of birds observed was a flow of American Goldfinch (n=6) on September 1, 2015. The majority of species observed during dedicated fall bird migration surveys were of the order Passeriformes (64%). This group also consisted of the highest percent of individual birds observed (91.37%). Other land birds, which consisted of woodpecker species and Ruby-throated Hummingbird, were the next most abundant group (14% of species), followed by waterbirds (excluding shorebirds and waterfowl; 11% of species), waterfowl (7% of species) and shorebirds (4% of species). By the end of October, the number of individual bird observed was near a quarter of those observed at the beginning of the fall migration period and the number of species observed reduced to half; the majority of which were resident over-wintering species.

The species most commonly observed during the fall bird migration watch count surveys were seen along the Atlantic Ocean coastline gathered on a nearby long rock peninsula and consisted primarily of Double-crested Cormorants (*Phalacrocorax auritus*) and Herring Gulls (*Larus* *argentatus*). No large groups of birds were observed on Waterford Lake. The majority of species observed during dedicated fall bird migration surveys were from the Other Waterbirds group (46%). This group also consisted of the highest percent of individual birds observed (93.03%). The next most observed group of species were Waterfowl (15%) and Shorebirds (15%), and then Passerines, Diurnal Raptors and Other Landbirds, each consisting of 8% of species observed.

5.4.4.3 Summary of Bird Surveys

The number of species observed, as well as number of individuals, increased over the course of the spring migration monitoring period. Early in the spring, moderate numbers of early migrants and over-wintering residents were present within the Project Area. These early spring species primarily included American Crow, American Robin and Black-capped Chickadee. Fox Sparrows were only observed during the first visit in early April; breeding birds of this species in Nova Scotia are largely restricted to scattered small offshore islands along the coast (Naugler and Smith, 1991). Pine Grosbeaks were also only observed in the spring, at the end of April, and this may be due to a lack of food resource within the Project Area, or because they moved in search of more suitable nesting habitat (*i.e.*, spruce woods or in mature deciduous forests with a few large spruces). The number of species observed in the first week of monitoring tripled by the end of the spring monitoring period, with mid-May exhibiting the greatest influx of migrants. Abundance during this period is generally highest west of the proposed turbine locations, where the habitat is disturbed (*i.e.,* a combination of earthworks, quarry activities, an access road, a meterological tower (MET), and timber harvesting within the forested areas). Bird abundance was also consistently higher at the location of Turbine Option Location 2, which consists of mature mixed-wood forest dominated by White Birch, Red Maple and Trembling Aspen, with only occasional coniferous species.

Forty-seven percent (47%) of the species observed during spring surveys were also recorded during the breeding season, suggesting that a number of species use the site as a spring stopover during migration but do not establish breeding territories. Forest dwelling birds breed within the Project Area at moderate densities. Warblers were the most abundant group, but Red-eyed Vireo and White-throated Sparrow were the most abundant species observed during the breeding season, followed by Alder Flycatcher and Ovenbird. Unlike the spring migration period, bird abundance during the breeding season was relatively uniform across the Project Area, though the largest number of species and individuals was recorded during the first visit at PC1; the most western survey station.

A variety of migrant and resident species occur within or near the Project Area during the fall migration period, but in lower abundances and species composition than during the spring migration period. By the end of October, the number of individual birds observed was near a quarter of those observed at the beginning of the fall migration period and the number of species observed reduced to half; the majority of which were resident over-wintering species.

During both the spring and fall migration watch count surveys, bird abundance was much higher along the Atlantic Ocean coastline than at Waterford Lake. Almost double the number of individual birds were observed in the fall, but slightly more species were observed in the spring

(Table 15). Only small numbers of birds were observed flying over the Project Area during the spring and fall migration periods.

Table 15. Avian species observed during dedicated watch count surveys (excluding incidentals)

Common name	Scientific name	Waterford Lake		Atlantic Ocean		Total	
		Spring	Fall	Spring	Fall	Spring	Fall
American Black Duck	*Anas rubripes*	4	6	0	12	4	18
Mallard	*Anas platyrhynchos*	7	0	0	0	7	0
Common Merganser	*Mergus merganser*	0	0	6	0	6	0
Red-breasted Merganser	*Mergus serrator*	2	0	0	0	2	0
Unknown Duck	n/a	0	2	8	26	8	28
Common Loon*	*Gavia immer*	10	5	0	0	10	5
Northern Gannet	*Morus bassanus*	0	0	0	1	0	1
Double-crested Cormorant	*Phalacrocorax auritus*	0	36	18	89	18	126
Bald Eagle	*Haliaeetus leucocephalus*	1	0	0	0	1	0
Red-tailed Hawk	*Buteo jamaicensis*	0	1	0	0	0	1
Semipalmated Plover	*Charadrius semipalmatus*	0	0	0	8	0	8
Solitary Sandpiper	*Tringa solitaria*	1	0	0	0	1	0
Least Sandpiper	*Calidris minutilla*	0	0	0	1	0	1
Black-legged Kittiwake	*Rissa tridactyla*	0	0	1	0	1	0
Bonaparte's Gull	*Chroicocephalus philadelphia*	0	0	2	0	2	0
Ring-billed Gull	*Larus delawarensis*	4	1	0	6	4	7
Herring Gull	*Larus argentatus*	1	6	72	113	73	119
Iceland Gull	*Larus glaucoides*	0	0	2	0	2	0
Great Black-backed Gull	*Larus marinus*	2	0	9	13	11	13
Unknown Gull	*n/a*	7	5	15	73	22	78
Belted Kingfisher	*Megaceryle alcyon*	2	1	0	0	2	1
Pileated Woodpecker	*Dryocopus pileatus*	0	1	0	0	0	1
American Crow	*Corvus brachyrhynchos*	0	0	0	1	0	1
Common Raven	*Corvus corax*	1	0	0	0	1	0
Savannah Sparrow	*Passerculus sandwichensis*	1	0	0	0	1	0

Note: ** SOCI*

Overall, there were 56 species identified within or near the Project Area during dedicated point count surveys from Spring to Fall (Table 16).

Table 16. Species observed during dedicated point count surveys (excluding incidentals)

Common name	Scientific name	Spring	Fall	Summer	Total
Canada Goose	*Branta canadensis*	2	0	0	2
American Black Duck	*Anas rubripes*	11	3	1	15
Mallard	*Anas platyrhynchos*	16	1	0	17
Ring-necked Duck	*Aythya collaris*	18	0	0	18
Unknown Duck	n/a	6	1	0	7
Ruffed Grouse	*Bonasa umbellus*	13	0	0	13
Common Loon*	*Gavia immer*	6	0	1	7
Double-crested Cormorant	*Phalacrocorax auritus*	0	5	0	5
Greater Yellowlegs*	*Tringa melanoleuca*	0	4	0	4
Common Tern*	*Sterna hirundo*	0	0	1	1
Bald Eagle	*Haliaeetus leucocephalus*	1	0	0	1
Red-tailed Hawk	*Buteo jamaicensis*	1	0	0	1
Wilson's Snipe*	*Gallinago delicata*	1	0	0	1
Unknown Shorebird	*n/a*	1	0	0	1
Ring-billed Gull	*Larus delawarensis*	1	0	0	1
Herring Gull	*Larus argentatus*	13	1	0	14
Great Black-backed Gull	*Larus marinus*	2	0	0	2
Mourning Dove	*Zenaida macroura*	6	0	1	7
Ruby-throated Hummingbird	*Archilochus colubris*	0	2	0	2
Belted Kingfisher	*Megaceryle alcyon*	1	2	0	3
Downy Woodpecker	*Picoides pubescens*	4	3	0	7
Hairy Woodpecker	*Picoides villosus*	3	1	0	4
Northern Flicker	*Colaptes auratus*	20	13	0	33
Unknown Woodpecker	n/a	1	1	1	3
Merlin	*Falco columbarius*	0	0	1	1
Alder Flycatcher	*Empidonax alnorum*	1	0	15	16
Blue-headed Vireo	*Vireo solitarius*	0	0	1	1
Red-eyed Vireo	*Vireo olivaceus*	6	12	20	38
Blue Jay	*Cyanocitta cristata*	22	19	0	41
American Crow	*Corvus brachyrhynchos*	40	25	5	70
Common Raven	*Corvus corax*	5	0	1	6
Black-capped Chickadee	*Poecile atricapillus*	97	35	4	136
Red-breasted Nuthatch	*Sitta canadensis*	0	1	0	1
Winter Wren	*Troglodytes hiemalis*	2	0	0	2
Ruby-crowned Kinglet	*Regulus calendula*	9	0	1	10
Swainson's Thrush	*Catharus ustulatus*	4	0	0	4
Hermit Thrush	*Catharus guttatus*	7	1	1	9

Common name	Scientific name	Spring	Fall	Summer	Total
American Robin	*Turdus migratorius*	82	1	7	90
Cedar Waxwing	*Bombycilla cedrorum*	0	11	0	11
Ovenbird	*Seiurus aurocapilla*	17	0	15	32
Black-and-white Warbler	*Mniotilta varia*	2	3	10	15
Common Yellowthroat	*Geothlypis trichas*	6	17	10	33
Northern Parula	*Setophaga americana*	2	0	5	7
Magnolia Warbler	*Setophaga magnolia*	4	1	2	7
Yellow Warbler	*Setophaga petechia*	2	0	10	12
Chestnut-sided Warbler	*Setophaga pensylvanica*	5	0	1	6
Palm Warbler	*Setophaga palmarum*	4	0	0	4
Pine Warbler	*Setophaga pinus*	0	1	0	1
Yellow-rumped Warbler	*Setophaga coronata*	4	21	1	26
Black-throated Green Warbler	*Setophaga virens*	12	0	11	23
Savannah Sparrow	*Passerculus sandwichensis*	0	0	1	1
Fox Sparrow*	*Passerella iliaca*	1	0	0	1
Song Sparrow	*Melospiza melodia*	33	19	4	56
White-throated Sparrow	*Zonotrichia albicollis*	97	19	19	135
Dark-eyed Junco	*Junco hyemalis*	26	0	3	29
Red-winged Blackbird	*Agelaius phoeniceus*	7	0	0	7
Common Grackle	*Quiscalus quiscula*	9	0	0	9
Pine Grosbeak*	*Pinicola enucleator*	3	0	0	3
Purple Finch	*Haemorhous purpureus*	7	3	0	10
American Goldfinch	*Spinus tristis*	38	51	1	89
Unknown Bird	*n/a*	0	10	0	10

Note: ** SOCI*

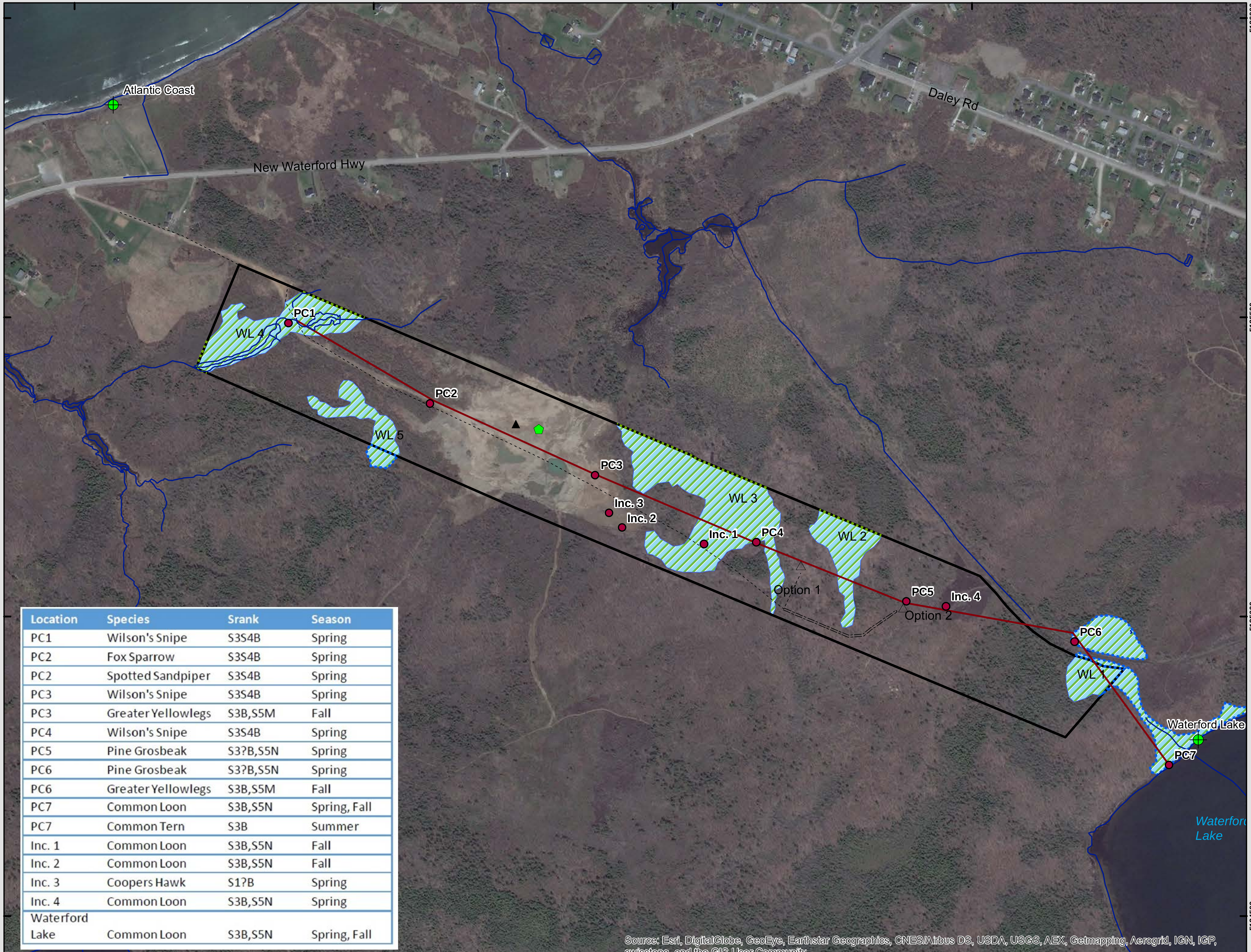
Prepared For:

CELTIC CURRENT
COMMUNITY WIND DEVELOPMENT

FIGURE 7

Wildlife Survey Locations
Wetland Delineation Results, and
SAR/SOCI Observations

New Victoria Community
Wind Power Project
PID 15262371
New Victoria, Cape Breton, Nova Scotia



Location	Species	Srank	Season
PC1	Wilson's Snipe	S3S4B	Spring
PC2	Fox Sparrow	S3S4B	Spring
PC2	Spotted Sandpiper	S3S4B	Spring
PC3	Wilson's Snipe	S3S4B	Spring
PC3	Greater Yellowlegs	S3B,S5M	Fall
PC4	Wilson's Snipe	S3S4B	Spring
PC5	Pine Grosbeak	S3?B,S5N	Spring
PC6	Pine Grosbeak	S3?B,S5N	Spring
PC6	Greater Yellowlegs	S3B,S5M	Fall
PC7	Common Loon	S3B,S5N	Spring, Fall
PC7	Common Tern	S3B	Summer
Inc. 1	Common Loon	S3B,S5N	Fall
Inc. 2	Common Loon	S3B,S5N	Fall
Inc. 3	Coopers Hawk	S1?B	Spring
Inc. 4	Common Loon	S3B,S5N	Spring
Waterford Lake	Common Loon	S3B,S5N	Spring, Fall

- Bird Migration Watch Count
- Turbine Locations
- Bat Detector Location
- Bird Survey Locations
- MET Tower
- Winter Wildlife Transect
- Proposed Access Road (Option 1)
- Proposed Access Road (Option 2)
- Watercourses
- WL Continues Outside of Project Boundary
- WL Outside of Project Boundary
- WL Field Identified
- Study Area

Coordinate System: NAD 1983 UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

0 75 150 300 m

1:6,000 Scale when printed @ 11" x 17"

Drawn By: MMD Date: 7/26/2016

McCallum Environmental Ltd.

Document Name: 160516_Fig7

5.4.4.4 Avian Species of Conservation Interest and Species at Risk

Six (6) SOCI (see Table 17) were identified within the Project Area during the dedicated baseline avian use assessment from Breeding 2015 to Spring 2016. An additional two species were observed incidentally: Spotted Sandpiper (S-rank S3S4B) and Cooper's Hawk (S1?B, SNAN). No SAR were identified.

Table 17. SAR and SOCI observed during dedicated survey periods

Common Name	Scientific Name	SARA	COSEWIC	NSESA	NS S-Rank
Common Loon	*Gavia immer*	-	-	-	S3B,S4N
Common Yellowlegs	*Tringa melanoleuca*	-	-	-	S3B,S5M
Common Tern	*Sterna hirundo*	-	-	-	S3B
Wilson's Snipe	*Gallinago delicata*	-	-	-	S3S4B
Fox Sparrow	*Passerella iliaca*	-	-	-	S3S4B
Pine Grosbeak	*Pinicola enucleator*	-	-	-	S3?B,S5N

A SAR is one which is legally protected under the federal Species at Risk Act (SARA) or the provincial Nova Scotia Endangered Species Act (NSESA), while a SOCI is one which is listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or one which is classified as red or yellow by NSDNR) general status of wild species (Province of Nova Scotia, 2013). The species observed include:

Six species observed were listed as S3 (Vulnerable) by the ACCDC. The potential for these species to be impacted by this project is evaluated below.

Common Loon

A pair of Common Loons were regularly observed on Waterford Lake and are likely breeding there, though no confirmed evidence of breeding was observed. Common Loon nest on the ground by shores of lakes larger than 40 ha in area, mainly where plant growth in sparse. There are no locations within the Project Area that provide suitable breeding habitat for Common Loon. Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 10.2.2.

Greater Yellowlegs

Greater Yellowlegs were observed during the fall migration period and most commonly in the small ponds found within the disturbed habitat surrounding the MET tower in the western extent of the Project Area. This species was also observed foraging in the unnamed water feature approximately 180-meters north of Waterford Lake (beyond the Project Area). No suitable breeding habitat is available within the Project Area for this species, therefore it is likely using it as a stop-over site during migration. Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 10.2.2.

Common Tern
Only a single Common Tern was observed foraging over Waterford Lake during breeding season. The range of the Common Tern includes inland as well as coastal areas, where shallow waters for fishing occur near sandy or gravelly shores for nesting; it does not forage far out to sea. There is no habitat within the Project Area for breeding Common Terns, although this species may fly-over the Project Area from the Atlantic coastline to Waterford Lake to forage. Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 10.2.2.

Wilson's Snipe
A Wilson's Snipe was heard during the spring migration period. During spring and fall migration, Wilson's Snipe utilize marshes (including cattails), swamps, wet meadows, wet pastures, wet fallow fields, and marshy edges of streams and ditches. Suitable breeding habitat for this species is provided in the wetland complexto the north of the Project Area and an unnamed water feature north of Waterford Lake, however this species was not observed during the breeding season. Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 10.2.2.

Fox Sparrow
Fox sparrows were only observed during the first visit in early April; breeding birds of this species in Nova Scotia are largely restricted to scattered small offshore islands along the coast (Naugler and Smith, 1991). Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 10.2.2.

Pine Grosbeak
In the Maritimes, the pine grosbeak approaches the southern limit of its range. Pine Grosbeaks were observed in the forested areas north of the unnamed water feature found approximately 180-meters north of Waterford Lake. Pine Grosbeaks were only observed in the spring, at the end of April, and this may be due to a lack of food resource within the Project Area, or because they moved in search of more suitable nesting habitat (*i.e.,* spruce woods or in mature deciduous forests with a few large spruces). Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 10.2.2.

5.4.5 Bat Use
An assessment of bat species composition and activity for the New Victoria Wind Project was completed by McCallum Environmental Ltd. in August and September 2015.

Consistent with the requirements as set out by the Nova Scotia Department of Environment (NSE, 2007, updated 2012) the following four objectives were established for the proposed New Victoria Wind Project:

(1) To review of the potential impacts of wind turbine developments on bats;
(2) To provide a summary of the ecology of the bat species that are likely to be present in the area that is relevant to the proposed development;

(3) To assess whether there are any known bat hibernacula within 25 km of the proposed development site; and,
(4) To conduct a survey to count local species richness and assess the level of bat activity levels at the site (as bat passes/night).

In Nova Scotia there are occurrence records for seven bat species, and each have been documented to have experienced fatalities at wind turbine sites (Arnett et al. 2008). Nova Scotia is at, or near the periphery of the current known range for each of these species, except the northern long-eared bat and the little brown bat (van Zyll De Jong, 2011). These two species, as well as the tri-colored bat, appear to be the only bat species with significant populations in Nova Scotia (Broders et al., 2003; Farrow and Broders 2011). Little brown bats and northern long-eared bats have been known to exist across Nova Scotia but the population of tri-colored bats appear to be restricted to southwestern region (Broders et al., 2003; Farrow and Broders 2011; Rockwell, 2005). The low number of echolocation recordings of migratory species (*i.e.*, red, hoary and silver-haired bats; 15 out of 30 000 echolocation sequences) by Broders (2003) and other unpublished work suggests there are no significant populations or migratory movements of these species in southwest Nova Scotia. As for big brown bats, there is only one unconfirmed observation of 2 individuals of this species hibernating at Hayes Caves, there are no other confirmed records (Moseley, 2007; Taylor, 1997).

In July 2013, the three resident species of bat in Nova Scotia (Little brown bat, Northern long-eared bat, and Tri-colored bat), were listed as endangered species under the Nova Scotia Endangered Species Act (NSESA) as a result of a major outbreak of the disease known as White Nose Syndrome (WNS), which is caused by the fungus, *Geomyces destructans*.

Little brown bat, which was once the most common bat in Nova Scotia is now endangered as a result of WNS. The disease has killed nearly 7 million bats in eastern North America in the past 8 years and estimates of a 90% decline in Nova Scotia have taken place in just 3 years since the disease was first recorded (NSDNR 2013). There is no known cure for the disease which is lethal and affects all bat species that congregate in caves and abandoned mines used for hibernation through the winter (NSDNR 2013). The Northern long-eared bat is Nova Scotia's second most common bat. It usually hibernates in association with the Little Brown Bat in caves and abandoned mines and at other times of the year is a true forest bat. Northern Myotis are also endangered by WNS (NSDNR 2013).

The Tri-colored Bat, or Eastern Pipistrelle is the rarest of three congregatory bats that occur in the province. The Nova Scotia population is thought to be geographically isolated (disjunct) from others in eastern North America. Little is known about the ecology of tri-colored bats in the province, but research shows that it uses rivers and streams for feeding. Although WNS has not been confirmed in this species in Nova Scotia (likely because the bat was always rare), evidence in the north east US indicates the species has been seriously impacted (NSDNR 2013).

Details related to bat species recorded in Nova Scotia are provided in Table 18.

Table 18. Bat species recorded in Nova Scotia

Species	Overwintering Strategy	Documented fatalities at wind farms?	Federal, Provincial or ACCDC Ranking
Little brown bat	Resident hibernator (NS and NB)	Yes	NSESA (endangered)
Northern long-eared bat	Resident hibernator (NS and NB)	Yes	NSESA (endangered)
Tri-colored bat	Resident hibernator (NS and NB)	Yes	NSESA (endangered)
Big brown bat	Resident hibernator (NB)	Yes	N/A
Hoary bat	Migratory	Yes	S2
Silver-haired bat	Migratory	Yes	S1
Eastern red bat	Migratory	Yes	S2

1 Bat species documented in fatality events from carcass surveys conducted at wind energy development sites in N.A.
2Global ranking based on the NatureServe Explorer (NatureServe, 2008), G5= **Secure**—Common; widespread and abundant: G4= **Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
3Atlantic Canada Conservation Data Centre ranking, based on occurrence records from NB and NS; S1= **Extremely rare**--May be especially vulnerable to extirpation (typically 5 or fewer occurrences or very few individuals; S2= **Rare**--May be vulnerable to extirpation due to rarity or other factors (6 to 20 occurrences or few remaining individuals); S4= **Usually widespread--** fairly common and apparently secure with many occurrences; (?) qualified as inexact or uncertain.
NSESA ranking: http://novascotia.ca/natr/wildlife/biodiversity/species-list.asp

5.4.5.1 Potential for Hibernacula in Project Area

The guide to wind development prepared by the Nova Scotia Department of Environment and Labour (NSDEL, 2007, updated January 2012) states that wind farm sites within 25 km of a known bat hibernaculum have a 'very high' site sensitivity.

The Point Edward Cave in Westmount, NS, is the closest site known to potentially have bats (12 km SW of the site); bats were observed in 1985, but it is unknown whether or not bats have been observed there more recently. The Coxheath Copper Mine had 18 bats in 2012 and is located 24 km SW of the site. Finally, there is an old illegal mine in Donkin that had hibernating bats, which is located approximately 22 km SE of the site (MacKinnon, 2016).

There are >20 AMOs located within 5km from the Project Area. These are associated with the urban areas of New Victoria and New Waterford. There are >100 government records of abandoned mine openings (AMO) within 25 kms of the proposed development site. A majority of these openings are within the urban area of Glace Bay Nova Scotia approximately 11 km from the Project Area. These sites would not be significantly affected by the development of the New Victoria Wind Project. To the knowledge of the project team, none have been surveyed for bats.

5.4.5.2 Acoustic Detection Results

An echolocation survey was conducted at one location within the New Victoria study area for 44 days from August 12th until September 24th, 2015. The location of Anabat echolocation detector is indicated on **Error! Reference source not found.**. A total of 17,682 files recorded o ver the survey period and 237 of the files were determined to be generated by bats.

Extraneous noise was very high with 17,445 files determined to be noise and not generated by bats. Noise correlated with rain showers, drizzle and fog obtained from historical weather data from the Sydney Airport (Environment Canada 2015). Almost half of all extraneous noise files recorded (8,378) were on the nights of September 10th, 11th and 17th these nights were characterized by light winds, rain showers, drizzle and fog. Precipitation can interfere with sensitive electronic ultrasound detection equipment resulting in the creation of a 'noisy' files.

The echolocation calls were mostly associated with *Myotis* species bats (*i.e.*, little brown bat (*Myotis lucifugus)* and northern long-eared bat (*Myotis septentrionalis*) (Table 19). The remaining calls detected were classified as unknown with the exception of a silver-haired bat (*Lasionycteris noctivagans*) recorded on the evening of September 17, 2015. Most likely an individual migrating through the area. Unknown calls were likely bat generated ultrasound; however, the quality of the files was not sufficient to render a definitive identification. No attempt to identify each of the *Myotis* species call to species was made because of the difficulty in achieving defensible identification (Broders 2011). Despite this, echolocation calls with characteristics consistent with both northern long-eared and little brown bats were observed.

Table 19. Number of echolocation calls by species between August 12th and September 24th, 2015

Date	MYOT*	LANO*	UNK*	Date	MYOT*	LANO*	UNK*
2015-08-12	2	0	0	2015-09-04	3	0	0
2015-08-13	0	0	0	2015-09-05	12	0	1
2015-08-14	4	0	0	2015-09-06	5	0	1
2015-08-15	2	0	0	2015-09-07	2	0	0
2015-08-16	2	0	0	2015-09-08	28	0	5
2015-08-17	3	0	1	2015-09-09	4	0	0
2015-08-18	8	0	3	2015-09-10	0	0	0
2015-08-19	2	0	0	2015-09-11	2	0	0
2015-08-20	14	0	12	2015-09-12	0	0	4
2015-08-21	17	0	3	2015-09-13	1	0	0
2015-08-22	15	0	2	2015-09-14	0	0	0
2015-08-23	4	0	1	2015-09-15	1	0	0
2015-08-24	9	0	3	2015-09-16	3	0	1
2015-08-25	26	0	10	2015-09-17	1	2	0
2015-08-26	0	0	0	2015-09-18	1	0	0
2015-08-27	0	0	0	2015-09-19	1	0	1
2015-08-28	3	0	1	2015-09-20	1	0	0

Date	MYOT*	LANO*	UNK*	Date	MYOT*	LANO*	UNK*
2015-08-29	0	0	0	2015-09-21	0	0	1
2015-08-30	1	0	1	2015-09-22	0	0	0
2015-08-31	0	0	0	2015-09-23	0	0	0
2015-09-01	0	0	0	2015-09-24	0	0	0
2015-09-02	6	0	0	**Total**	**183**	**2**	**52**
2015-09-03	0	0	1				

* MYOT = *Myotis* spp., LANO =*Lasionycteris noctavigans,* UNK = Unknown

The echolocation identified 183 *Myotis* species calls, two silver-haired bat calls and 52 unidentified bat calls.

5.4.6 Wildlife Habitat

Habitat across the Project Area is described in detail in Sections 5.1.2 and 5.4.1. The majority of the Project Area is forested with a small portion that has been recently harvested, and is in early stages of regeneration. These recently harvested areas generally lack tree cover, and are dominated by early colonizing species. Intact forest within the site generally falls within the Acadian Ecosites AC10 and AC11. These ecosites (described by Keys et al., 2007) represent moderate soil richness, and fresh to moist moisture regimes depending on topographic position, slope gradient, and soil drainage. Generally, these ecosites support early- to mid-successional forests within the Project Area.

Habitat within the Project Area is currently fragmented by a gravel pit and associated access road ATV trails, small logging roads and historical forestry operations.

The extent of habitat fragmentation within the Project Area limit the habitat quality for species which prefer interior, mature, undisturbed habitats, such as Lynx and Fisher. Habitat within the Project Area is suitable for those wild species which thrive in fragmented, diverse landscapes, such as White-tailed Deer, Coyote, and Snowshoe Hare. This fragmented, diverse landscape provides edge habitat for foraging, and patches of full canopy coverage for refuge and cover through all seasons. Wildlife habitat observed is neither unique nor rare in the local or regional landscape context.

5.4.7 Aquatic Habitats/Fisheries

There are no lakes or areas of open water in the Project Area. However, Waterford Lake is located approximately 110m southeast of the Project Area and one shallow open water wetland is located approximately 20m from the eastern Project Area boundary (WL1). Two mapped watercourses systems are present within the Project Area (Figure 2). This first exists in the western extent of the Project Area and flows through Wetland 4 in a southwesterly direction (Figure 7). This watercourse initiates to the north of the existing quarry access road, draining through it via a plastic corrugated culvert. From there it flows downgradient through WL4 towards offsite waterbodies, prior to draining into the Atlantic Ocean. No barriers to fish passage were observed within the Project Area, therefore, it is assumed that the watercourse is fish bearing. A second mapped watercourse is visible on Figure 2, and appears to drain into the above described watercourse and Wetland 4. Field verification confirmed however that no watercourse is present in this location. Rather, a wetland exists (Wetland 5) (Figure 7) which drains passively overland, north towards Wetland 4 and its associated watercourse. Wetland 5 is not accessible to fish as it lacks a surface water connection to Wetland 4 and its watercourse.

Alteration to areas of open water or watercourses is not required as a result of the Project, therefore impacts to fish habitat is not expected.

5.4.8 Wetlands

The NS Environment Act defines wetlands as:

> *Land referred to as a marsh, swamp, fen, or bog that either periodically or permanently has water table at, near, or above the land surface or that is saturated with water, and sustains aquatic processes as indicated by the presence of poorly drained soils, hydrophytic vegetation, and biological activities adapted to wet conditions.* (Environment Act, 2006)

Wetland functions are the natural processes associated with wetlands and include water storage, pollutant removal, sediment retention and provision of nesting/breeding habitat. Functions may also include values and benefits associated with these natural processes and include aesthetics/recreation, cultural values, and subsistence production. The discussions of wetlands presented herein primarily uses terminology associated with the Canadian Wetlands Classification System (Warner and Rubec 1997) or in line with the methodologies adapted by Nova Scotia for wetland delineation.

A review of the NSDNR Wetlands Inventory Database (SSHD, 2010) identified portions of three wetlands within the Project Area (Figure 3). One area of wetland habitat associated with a surface watercourse system was identified in the eastern extent of the Project Area, while portions of two wetlands were identified in the eastern extent. During field surveys across the Project Area, the location and extent of the larger western wetland and one of the eastern wetlands were confirmed, however the wetland at the eastern extent of the Project Area was confirmed not to exist (Figures 3 and 7). Several additional wetlands were observed, including a mixed wood treed swamp (Wetland 1) which drains to Waterford Lake at the eastern extent of the Project Area. One wetland (WL4), located in western portions of the Project Area is contiguous with a watercourse which drains through it from northeast to southwest. Based on a lack of barriers to fish passage in the Project Area, the watercourse has been determined to be fish bearing. Due to the undefined nature of the watercourse and evidence of surface water within WL4 directly adjacent to the watercourse, portions of WL4 may also provide potential fish presence.

The boundaries of the wetlands were delineated in the field to confirm wetland edges across the Project Area. A total of five wetlands were identified within the Project Area as indicated on Figures 3 and 7. Characteristics of each wetland is provided in Appendix VI.

Wetlands identified within the Project Area are in throughflow and headwater positions, with one isolated wetland present as well. Two wetland complexes are present within the Project Area, one consisting of soft and hardwood treed swamp types, and the second consisting of shrub swamp and fresh water marsh. Treed swamps are the dominant wetland type on the landscape within the Project Area. The dominant tree species in the overstorey layer within the wetlands are Red Maple and Tamarack, which are also found in the understory. In addition to Red Maple and Tamarack, Winterberry, Mountain Holly and Speckled Alder are also found within the shrub layer. A variety of herbaceous species are found within the ground cover, depending on local hydrology, disturbance regime, and nutrient regime. Three-seeded Sedge, Cinnamon Fern, Northern Bugleweed and Whorled Aster are common in more natural areas, while Soft Rush, Common Woolly Bullrush and Broad-leaved Cat-tail are common in areas that have been subject to historical tree harvesting.

Additional details related to water quality and quantity, including surface water flows within the Project Area are provided in a review report which was submitted to the New Waterford Source Water Protection Committee in June 2016 (Appendix IV).

Wetlands within the Project Area are all similar in that they have limited to no open water areas, are generally treed with minimal sapling/shrub understory. These wetlands generally lack deep organic soil. Hydric soil within on-site wetlands is typically indicated by depleted mineral soil indicators, such as histic epipedon, depleted matrix, and depleted soil below dark surface (hydric soil indicators A2, F3 and A11).

The characteristics of the wetland systems encountered within the Project Area were similar in the following respects:

- Soils display evidence of either periodic or sustained saturation;
- It is expected that the recharge wetlands within the Project Area, the surrounding lands watershed complex, and the surface topography contribute to the aquifer quality throughout the region. None of the encountered wetlands areas are expected to contribute to aquifer water quality to a greater extent than surrounding areas;
- No water supplies are withdrawn from the wetlands;
- The quality and quantity of vegetation surrounding the wetlands (generally speaking) provide limitations to erosion potential of surrounding lands into the watershed system.
- Encountered wetlands do not appear to provide erosion control as a function;
- The quantity of vegetation, the low slopes surrounding the wetlands, and the lack of distinguishable flow channels which directly influence water levels suggests that sediment flow to the wetlands are limited and sediment flow stabilization is not a significant characteristic of the wetlands encountered;
- During periods of low precipitation, the wetlands provide nutrient supplies to dependant wildlife. Wildlife indicators adjacent to the assessed wetlands (*i.e.,* tracks, browse utilization, visible sightings) suggest that the habitat is important for species in the area.

Vegetation is consistent with neighbouring wetland areas and as such the wetlands do not appear to provide regionally or locally unique habitat; and,

- Based upon the results of the public consultation and field assessments, there is no evidence to suggest that any social/commercial/or cultural values are influenced by the wetlands encountered.

5.4.8.1 Wetland Alteration

No wetlands are proposed to be altered by either turbine option location. Additionally, no blasting or disturbance to the aquifer or sources of water adjacent to wetlands is anticipated as part of the construction process. Therefore, hydrological integrity within adjacent wetland is not expected as a result of turbine construction.

A minor wetland alteration would be required within WL3 to facilitate the extension of the existing access road to Turbine Option Location 1. An additional small alteration would be required in WL4 should Turbine Option Location 2 be the chosen turbine location. Design and location of the proposed access road will determine the exact impact area to wetlands, but it is not expected to surpass 900m^2 within WL3, and 400m^2 in WL4 (should it be required). A provincial alteration permit will be sought for alteration locations, as required by the Nova Scotia Alteration Application process. As part of this process, detailed mitigation and best management practices will be outlined, including the methods by which hydrological connectivity either side of the alteration area will be maintained. Compensation for direct wetland loss will be provided as part of this process.

5.4.8.2 Wetland Setbacks

As part of the Site Optimization and Constraints Analysis discussed in Section 3.4, the proponent has committed to placing a minimum thirty (30) metre setback between lakes, ponds, open water, watercourses, and wetlands and the proposed turbine. However, as outlined in Section 3.4.1 of this EA, unless otherwise approved by NSE the proposed turbine is to be a minimum of 30 m (measured from the tip of the blade) from wetland habitat. The Enercon E-92 has a rotor radius of 46 m, therefore a 76 m setback would be required from wetland habitat.

Turbine Option Location 1 is the preferred location for the turbine, however the setback between the proposed turbine location and the eastern edge of WL3 is 38 metres, and 60 metres to the western edge of WL2.

As outlined in Section 5.4.8 and detailed in Appendix VI, the portions of the two wetlands in question (WL3 and WL2) both exist as outflow, mixedwood treed swamps which drain (seep) water to a larger expanse of wetland habitat located off site to the northwest. Characteristics within both wetlands are very similar in that they generally lack standing water, but they have saturated soils and high (dry season) water table. Additionally, vegetation composition is similar, and the species found within them commonly frequent swamp habitat in the regional and provincial setting. Multiple field surveys were completed during 2015 and 2016 within the Project Area including the two areas of wetland being discussed. Field surveys included wetland evaluation and functional assessment, vegetation surveys, SAR surveys, and wildlife and avian surveys. Neither of the wetlands provide significant wildlife habitat provision, and no evidence of SAR or SOCI were observed.

The NovaWet (Version 3.0) Functional Assessment Tool was used to evaluate wetland function in support of future provincial permitting. Results of the evaluation indicate that wetlands which may require alteration (WL2 and WL3) are in natural condition, with the exception of some timber harvesting activity within the wetland and adjacent uplands. The wetlands extend off site, and it is presumed that they are in a headwater position, based on mapped wetland and watercourse habitats downstream. As such, WL2 and WL3 are important for maintaining stream flow, based on the NovaWet functional assessment. Functional Assessment worksheets for WL2 and WL3 are provided in Appendix VI.

As a result of discussions between the proponent, NSE and NSDNR the proponent committed to investigating a second turbine option location (known as Turbine Option Location 2). Turbine Option Location 2 is setback approximately 90m from the nearest area of wetland habitat (WL2) and as such, meets the 30m plus tip of turbine blade setback required by NSE.

In summary, it has been determined that should Turbine Option Location 1 be the final turbine siting location, the function and characteristics of Wetlands 2 and 3 are not expected to be impacted.

Although Turbine Option Location 2 has a greater setback to the nearest adjacent wetland, Turbine Option 1 is considered the preferred turbine option location for the following reasons:

- The proposed access road alters a small, narrow portion of one wetland (WL3), whereas an access road to Turbine Option Location 2 would involve alteration of an additional wetland (WL4) for the purposes of an extended access road. This wetland alteration would be avoided entirely should Turbine Option Location 1 be the final turbine siting location;
- Turbine Option Location 1 has a greater setback (740m) from the closest residential receptor than Turbine Option Location 2 (669m).
- Turbine Option Location 1 has a greater setback from the NWMWSA (238m) than Turbine Option Location 2 (76m);
- The extended road required to access Turbine Option Location 2 would require additional vegetation clearing, and increased fragmentation of habitat.
- Turbine Option Location 2 has elevated Shadow Flicker modelling result using the standard bare earth methodology, compared to Turbine Option Location 1 which meets provincial maximum thresholds when modelling using “worst case” scenario (see Section 8.3 and Appendix VIII).

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6.0 SOCIO-ECONOMIC CONDITIONS

The Project is located in New Victoria, Cape Breton, Nova Scotia, west of New Waterford and east of Victoria Mines. Although the Project location is entirely contained in Cape Breton County, impacts and benefits will be attributed to communities across Cape Breton. Background on the area and populations of the county and nearby centres are summarized below.

6.1 Population and Demographics

Cape Breton County, the 2nd most populous county in Nova Scotia, had a total census population of 101,619 in the year 2011, approximately 11.0% of the Provincial population. Over the past six years, the population of the county has declined 4.1% while the population for the Province increased by 0.9%. Statistics on the population and demographics of Cape Breton County and Nova Scotia are presented in Table 20.

Cape Breton County has several main towns, the largest being Sydney, part of the Cape Breton Regional Municipality. The Project location is to the north-east of Louisbourg, and to the south of the larger population centres of Sydney, Glace Bay, and New Waterford.

Table 20. Population and Demographics for Cape Breton County and Nova Scotia.

	Cape Breton County	Nova Scotia
Population in 2011	101,619	921,727
Population in 2006	105,928	913,462
2006-2011 Population Change (%)	-4.1	0.9
Total private dwellings (2011)	45,371	442,155
Total number of households (2011)	41,120	390,280
Population density per square km (2011)	41.1	17.4
Land area (square km) (2011)	2,470.6	52,939.4
Median Age of the Population (2011)	46.6	43.7

The population of Cape Breton County has a median age of 46.6 years, slightly older than that of the province as a whole, which has a median age of 43.7. The population by age cohort in Cape Breton County is presented in Figure 8.

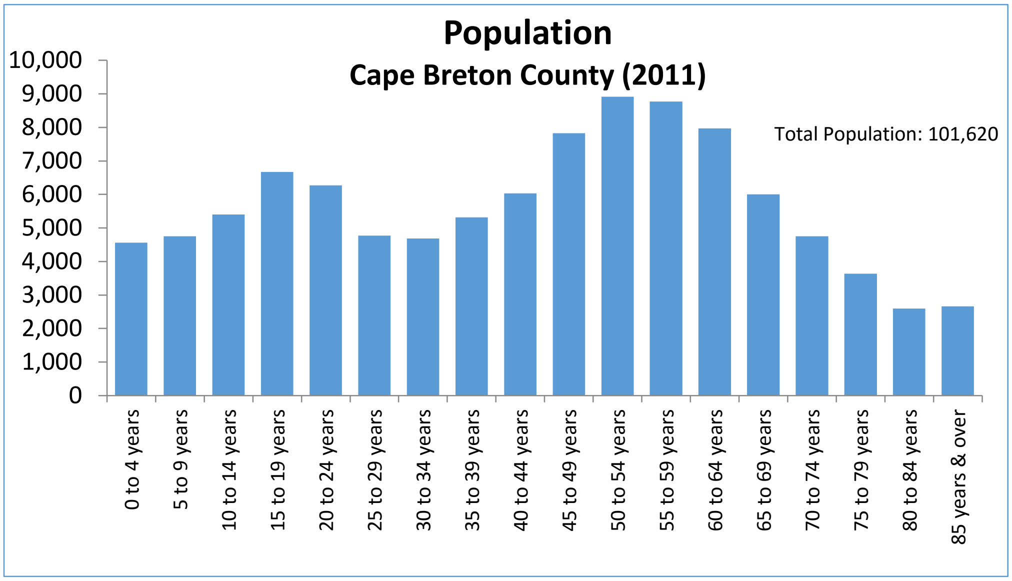

Figure 8. Population by Age Cohort, Cape Breton County

Source: Statistics Canada 2011 Census of Population Community Profiles

Median income in Cape Breton County (2011) for persons 15 years and older with income was $23,984. Earnings accounted for 63.3% of income, while 23.9% came from Government Transfers.

6.2 Health, Industry and Employment

As of April 1, 2015, Nova Scotia consolidated their health services into one Health Authority, the Nova Scotia Health Authority. The Project Area is in the Cape Breton, Guysborough and Antigonish Area. Labour Force by Industry statistics are provided for Cape Breton in Table 21. The Project Area is served by the New Waterford Consolidated Hospital and the nearby Cape Breton Regional Hospital. There are various facilities in Glace Bay, North Sydney, Sydney Mines, as well as facilities farther away (Neil's Harbour, Baddeck, Cheticamp, Inverness and the Port Hawkesbury area). Some 3,500 staff members and 270 medical staff are employed by the health authority in regional facilities.

Table 21. Labour Force by Industry, Cape Breton County

Industry	Total	Male	Female
Agriculture; forestry; fishing and hunting	1,170	990	185
Mining; quarrying; and oil and gas extraction	825	745	80
Utilities	470	415	50
Construction	3,370	3,135	230
Manufacturing	1,450	1,170	285
Wholesale trade	1,120	915	210
Retail trade	6,095	2,835	3,260

Industry	Total	Male	Female
Transportation and warehousing	1,810	1,540	265
Information and cultural industries	605	380	225
Finance and insurance	1,025	325	700
Real estate and rental and leasing	510	380	130
Professional; scientific and technical services	1,395	735	660
Management of companies and enterprises	0	0	0
Administrative and support; waste management and remediation services	3,685	1,800	1,885
Educational services	4,120	1,315	2,810
Health care and social assistance	7,500	1,380	6,120
Arts; entertainment and recreation	1,100	595	500
Accommodation and food services	3,470	1,015	2,455
Other services (except public administration)	1,555	795	760
Public administration	3,475	1,700	1,775

Source: Statistics Canada 2011 National Household Survey

About 50% of the experienced labour force in Cape Breton County is male. In 2011, the majority of the labour force worked in the service producing industries. Health care and social assistance and retail trade are the largest employer occupations. Accommodation and food services and other services would be included in the tourism sector, which would also be supported by the Wholesale and Retail trade industries. Eleven percent of the labour force in the county worked in the construction and manufacturing industry combined.

The participation rate (*i.e.,* the percentage of working age population in the labour force) in 2011 for the county was 55.0%, slightly lower than the provincial average of 63.1%. The unemployment rate for Cape Breton County in 2011 was 16.6%, substantially higher than the provincial average of 10.0%.

6.3 Tourism and Cape Breton

Nova Scotia markets itself as a tourism destination, with a tourism industry that contributes more than $722 million to provincial GDP (2010), and with 34,400 direct and spinoff jobs. In 2013, tourism revenues were an estimated $2.34 billion for the province as a whole.

Drawing visitor revenues of $251 million in 2010, the tourism industry is important to Cape Breton, with vast wild areas, the scenic Bras d’Or lakes, and Cabot Trail that skirts the top of Cape Breton Island, where the Cape Breton Highlands National Park lies. Provincial parks in the area include Dundee, Burnt Island, Port Michaud beach, Battery, and the Isle Madame parks (*i.e.,* Lennox Passage and Pondville Beach).

The greater Cape Breton region boasts heritage sites, and provides many types of all-season tourism. The eastern part of the Island is home to Isle Madame, home to the largest number of lighthouses in Canada. Golf destinations and premiere accommodations are popular destinations for tourists. Historic and cultural destinations such as the Alexander Graham Bell museum in Baddeck, the Fortress of Louisbourg and the Gaelic College of Celtic arts and crafts are important to the rich cultural history of the area. The region is popular for paddling, fishing and hiking.

6.4 Property Values

There were 42,325 private dwellings in Cape Breton County in 2011, with an average value of $129,412 (35.9% lower than the Provincial average). Seventy-one of dwellings in Cape Breton County were owned, and the majority (75.5%) of dwellings was constructed prior to 1990.

The concern that property values will be adversely affected by the Project is a concern raised at other wind power projects throughout North America. In 2009, the most comprehensive study known (at that time) was commissioned by the U.S. Department of Energy to determine if this impact does in fact exist. (Hoen et al., 2009). The study collected data on almost 7,500 sales of single family homes situated within 10 miles of 24 existing wind facilities in nine different U.S. states (Hoen et al., 2009). In addition, the study reviewed a number of data sources and published material. Although that reviewed information addressed concerns about the possible impact of wind energy facilities on the property values of nearby homes, Hoen et al. found that "*the available literature that has sought to quantify the impacts of wind projects on residential property values has a number of shortcomings*". The list of shortcomings identified in that study (Hoen et al., 2009) are as follows:

1. Studies relied on surveys of homeowners or real estate professionals, rather than trying to quantify real price impacts based on market data;
2. Studies relied on simple statistical techniques that have limitations and that can be dramatically influenced by small numbers of sales transactions or survey respondents;
3. Studies used small datasets that are concentrated in only one wind project study area, making it difficult to reliably identify impacts that might apply in a variety of areas;
4. Many studies had no reported measurements of the statistical significance of their results;
5. Many studies have concentrated on an investigation of the existence of Area Stigma, and have ignored Scenic Vista and/or Nuisance Stigma;
6. Only a few studies included field visits to homes to determine wind turbine visibility and collect other important information about the home (e.g., the quality of the scenic vista); and,
7. Only two studies have been published in peer-reviewed academic journals.

Ultimately, the Hoen et al. study indicated that "none of the models uncovers conclusive evidence of the existence of any widespread property value impacts that might be present in communities surrounding wind energy facilities. Specifically, neither the view of the wind facilities nor the distance of the home to those facilities is found to have any consistent, measurable, and statistically significant effect on home sales prices. Although the analysis cannot dismiss the possibility that individual homes or small numbers of homes have been or could be negatively impacted, it finds that if these impacts do exist, they are either too small and/or too infrequent to result in any widespread, statistically observable impact." (Hoen et al., 2009)

Critiques have been developed in response to the Hoen report, notably by Wayne Gulden at Wind Farm Realities (2010) and Albert Wilson in 2010. These both outline concerns with methodology in the Hoen report including the conclusion that the analytical methods can not be shown to be reliable or accurate (Gulden 2010 and Wilson 2010). Another study completed by Gardner Appraisal Group Inc. in Texas, USA (Gardner 2009) states that *"market data and common sense tell us property values are negatively impacted by the presense of wind turbines*." (Gardner 2009). This study was completed for a conference in February 2009.

As a follow up to the Hoen et al. study, completed in 2009, a recent study published in August 2013 was conducted to address these apparent gaps in data. This study, completed by Berkeley National Laboratory, involved the collection of data from 51,276 homes across 27 counties and nine states in the USA relating to 67 different wind facilities (Hoen et al, 2013). All homes included in the study were within a 10-mile radius of a wind power project and 1,198 homes were within a one-mile (1.6 km) radius of a wind power project.

The study results revealed no statistical evidence that residential property values near turbines were affected in the post-construction or post-announcement/pre-construction periods. Therefore, the authors conclude that if effects do exist, either the impacts are sporadic and impact only a small subset of homes, or are relatively small and are present within the margin of error in the models (Hoen et al. 2013).

Further review of available literature did not find significant additional studies to aid in determining effect of wind projects on surrounding property values.

6.5 Recreation

Land use is dominated by historical timber harvesting and commercial activity in the eastern third of the Project Area by way of an active quarry. There is only limited hiking, birding and general human activity within the Project Area as a result of lack of access. There are no public trails within the Project Area, but a small ATV trail does extend through the eastern extents of the Project Area, ultimately connecting to Waterford Lake Road. No other public recreational lands exist within the Project Area boundaries.

The closest Provincial Park to the Project Area is Dominion Beach Provincial Park located near River Ryan, approximately 5km southeast of the Project Area. This Provincial Park provides sandy beaches windsurfing opportunities and protected sand dunes.

Marconi National Historic site is located 14km west of the Project Area, in Table Head, Glace Bay, NS. This site signifies the location Guglielmo Marconi triumphed at his first permanent transatlantic wireless station at Table Head.

7.0 ARCHAEOLOGICAL RESOURCES

Two phases of the archaeological resource impact assessment were completed for the New Victoria Community Wind Project. The first, Phase I, was a historical assessment of the potential for archaeological resources to be present inside the Project Area. The second, Phase II, was the field reconnaissance program and was completed for all infrastructure associated with the proposed turbine location of this project. It should be noted that both turbine option locations were assessed. The results described below are taken directly from the assessment completed by Davis McIntyre & Associates.

7.1 Phase I

The Maritime Archaeological Resource Inventory, managed by the Nova Scotia Culture and Heritage Development Division, was consulted in 2015 and then re-checked in June 2016 to determine if known archaeological resources exist near the Project Area. No archaeological sites were identified through this process.

It was recommended that an archaeological reconnaissance be conducted once the location of the turbine, access road, and other necessary infrastructure were known, and before any ground disturbance (Phase II).

7.2 Phase II

An archaeological field reconnaissance was conducted on July 06, 2015, to assess Turbine Option Location 1, and a site re-visit was completed on June 15, 2016 to evaluate Turbine Option Location 2 and the associated access road. The assessment was directed by Laura de Boer of Davis MacIntyre & Associates Limited. The reconnaissance included all proposed impact areas.

During the field reconnaissance, no areas of heightened archaeological potential were noted and no cultural features, aside from some historical skidder tracks, historical logging evidence, and a well used ATV trail approximately 25m southeast of proposed Turbine Option Location 2.

The 2015 and 2016 reports in their entirety can be found in Appendix VII.

8.0 ADDITIONAL CONSIDERATIONS

8.1 Sound

Wind turbines generate sound from two primary sources: The mechanical equipment (gearbox and generator), and the aerodynamic sound from the interaction of the air with the turbine parts, primarily the blades (NRC 2007). In modern turbine designs, much of the mechanical sound is mitigated through the use of noise insulating materials.

Aerodynamic noise, produced by the flow of air over blades, is created by blades interacting with eddies created by atmospheric inflow turbulence and is thus an unavoidable aspect of wind power operations (NRC 2007). The movement of sound from the turbine source to a receptor, such as a residential dwelling, is influenced not only by the sound power level emitted from the turbine, but also by local factors such as distance to the receptor, topography, and weather conditions (Hau 2006). For example, increases in wind speed result in increases in ambient, natural noise (from vegetation movement) that can mask the sounds emitted from the turbine(s) (NRC 2007).

Nova Scotia has no specific sound regulations for wind projects. Through the environmental assessment process, NSE requires that noise levels at identified residential receptors are modeled to predict sound pressure output. The sound output at each residential receptor should not exceed 40 dBA. NSE guidance also recommends sound modelling for camps/cottages, hospitals, schools, and daycares. This guideline was used in the current sound assessment for the New Victoria Community Wind Project.

Construction and decommissioning activities will generate noise from the use of heavy machinery and vehicles, and potential blasting if necessary during the construction period and decommissioning phase. These impacts will occur during normal working hours, be short in duration, and due to the small size of the Project are not expected to occur for a long period of time (*i.e.*, fall 2016 to spring 2017). Noise from the construction phase is not expected to be a significant impact on the surrounding communities.

A Sound Impact Assessment (SIA) has been completed for this Project by AL-PRO Wind Energy Consulting Canada Inc. (AL-PRO). This report can be found in Appendix VIII.

A total of 85 receptors, including single and multiple family dwellings as well as a church, were identified within 1000 m of the Project Area. Characteristics of each residence (*i.e.,* number of stories, permanent residence, seasonal, hunting camp) were recorded.

The closest receptor to the 40 dBA limit associated with Turbine Option Location 1 is receptor 45. This receptor is located northeast of the Project Area on the project side (south) of Daley Road. This receptor is expected to receive a combined sound pressure of 37.4 dBA from the New Victoria Community Wind Project.

The closest receptor to the 40 dBA limit associated with Turbine Option Location 2 is receptor 84. This receptor is also located northeast of the Project Area on the project side (south) of Daley Road. This receptor is expected to receive a combined sound pressure of 38.7 dBA from the New Victoria Community Wind Project.

The noise levels at each Point of Reception within 1000 m of the turbine option locations being considered for the New Victoria Community Wind Project was calculated and can be viewed in the attached report (Appendix VIII). The results indicate that the New Victoria Community Wind Project complies with the applicable NSE environmental sound threshold of 40 dBA at both turbine option locations. The SIA was modelled for the Enercon E-92 turbine. Sound iso-contour maps illustrating the contribution of the wind turbine at both turbine option locations is shown in Figures 9 and 10.

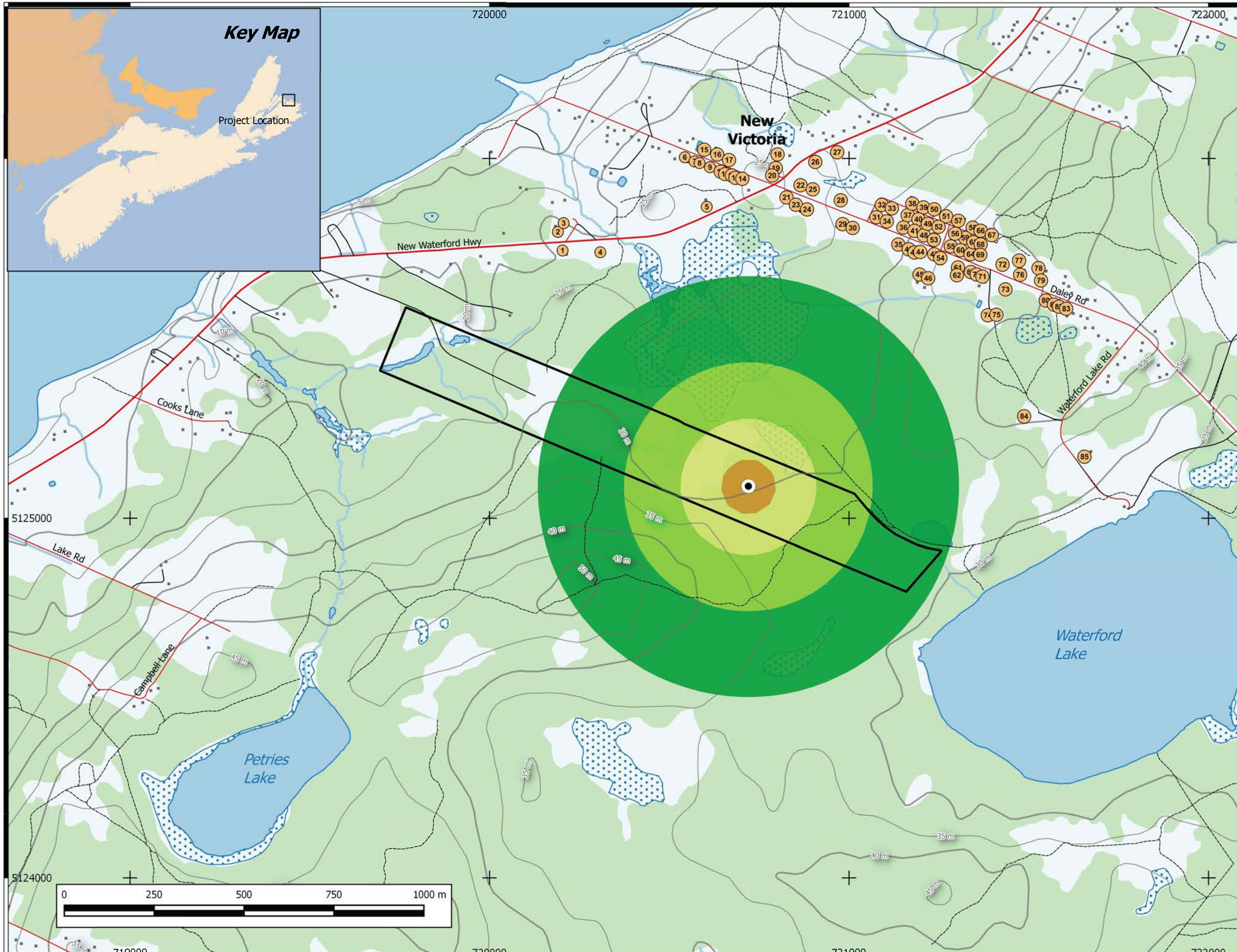

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Figure 9 Option 1 Sound Pressure Levels

7 m/s Wind Speed

Legend

- Modeled Receptor
- Proposed Turbine
- Building
- Study Area

Predicted dBA Levels

- 40.0 - 45.0
- 45.0 - 50.0
- 50.0 - 55.0
- 55.0 - 100.0

Map Data: Digital Topographic Mapping by the Nova Scotai Geomatics Center

Turbine Model: Enercon E-92
Hub Height: 98 m
Rotor Diameter: 92 m
Rated Power: 2,350 kW

Modeled Using:
DIN ISO 9613-2
Acoustics- Attenuation of sound during propogation outdoors.

AL-PRO Wind Energy Consulting Canada Inc.

July 6, 2016	UTM, NAD83, Zone20	Drawing 890.122

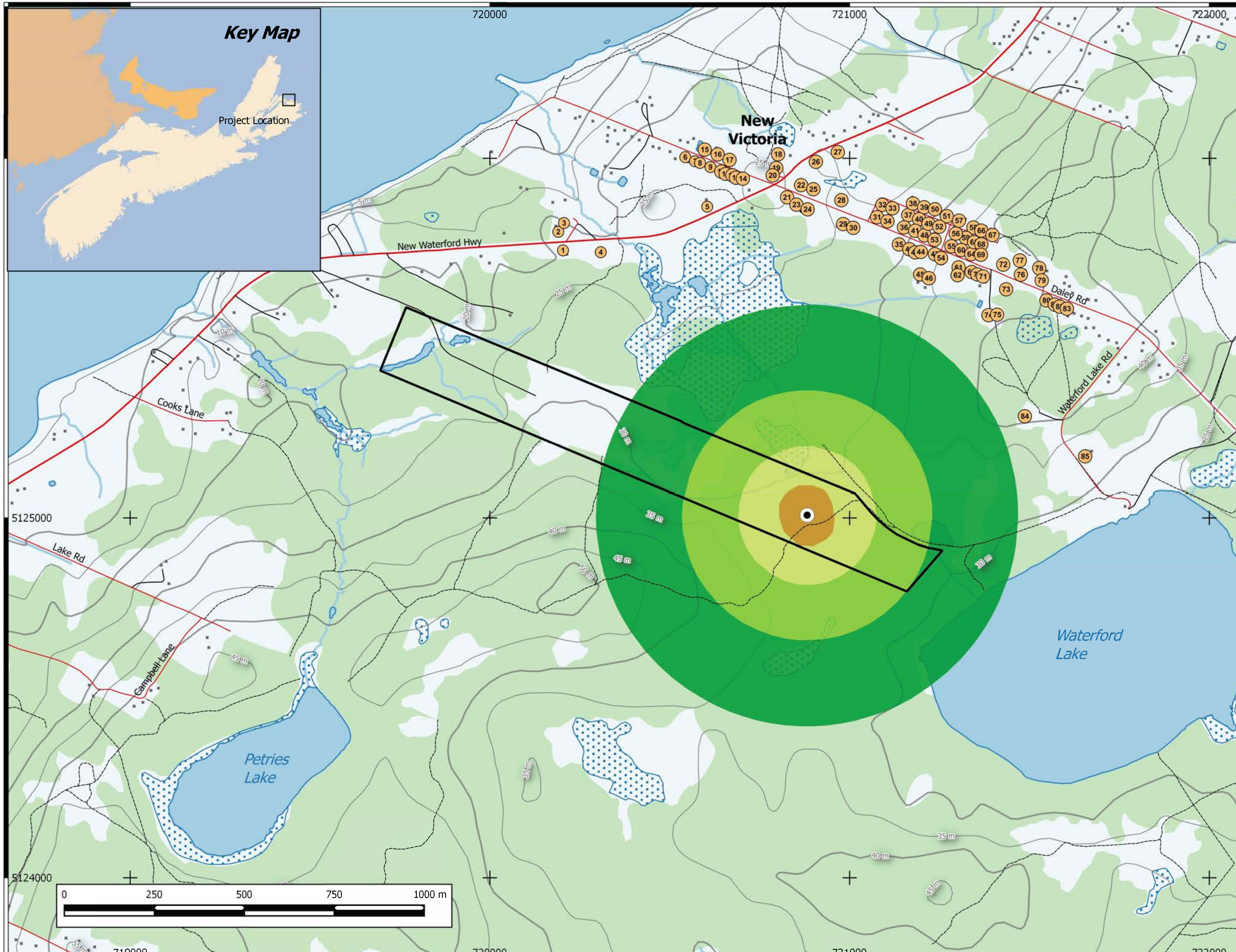

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Figure 10: Option 2 Sound Pressure Levels

7 m/s Wind Speed

Legend

- Modeled Dwelling
- Proposed Turbine
- Building
- Study Area

Predicted dBA Levels

- 40.0 - 45.0
- 45.0 - 50.0
- 50.0 - 55.0
- 55.0 - 100.0

Map Data: Digital Topographic Mapping by the Nova Scotai Geomatics Center

Turbine Model: Enercon E-92
Hub Height: 98 m
Rotor Diameter: 92 m
Rated Power: 2,350 kW

Modeled Using:
DIN ISO 9613-2
Acoustics- Attenuation of sound during propogation outdoors.

AL-PRO Wind Energy Consulting Canada Inc.

July 6, 2016	UTM, NAD83, Zone20	Drawing 890.122

8.2 Visual

Any loss of aesthetic value associated with the Project may be as a result of the physical presence of new turbines, trails, increased traffic, and changes in vegetation and wildlife communities. The greatest impact will be associated with the physical presence of the turbine.

Currently, no data is available which indicates how wind power project visual thresholds are defined or exceeded. Therefore, it is assumed that much of the aesthetic value is perceived by residents and visitors to the area. In order for the public and regulatory personnel to effectively estimate the visual effect of the Project, the following was completed:

1. A visual representation of the Project from vantage points surrounding the Project Area. The visual representations were provided in poster board format to the public during Open House events on June 09, 2016 at the New Waterford Community Centre and July 7, 2016 at the New Victoria Fire Hall located on Daley Road directly northeast from the Project Area. Visual representations were provided for both turbine option locations and are provided in Appendix IX.

2. Visual zone of influence analysis. This study uses line of site analysis and incorporates a Digital elevation Model (DEM) obtained from the Nova Scotia Topographic database (1:10,000), the Nova Scotia Forest Inventory database, turbine specific characteristics (hub height, rotor diameter) to create a model that defines the areas from which the tip and hub heights of the turbines can be seen. The incorporation of mean stand height from the forest database provides a realistic viewshed which assumes the observer has an eye height of 1.5 m agl. and that all forests above 1.5 m obscure the line of site (*i.e.*, in summer conditions). The resultant model identifies whether the turbine will be seen from a geographic area (within which a specific receptor may be located). Figures for both turbine options for turbine tip and hub are provided in Appendix IX.

In addition to visual impacts and aesthetics experienced by residents, the Project will affect the visual characteristics and, therefore, opinions of visitors to the region. Nova Scotia markets itself as a natural, coastal destination. From a tourism perspective, the question of how the Project will impact the visitor experience from the local scenic perspective is unknown, as that experience is highly subjective.

8.3 Shadow Flicker

The objectives of this analysis are to determine (*i.e.*, through computer modeling) the possible visual effects of the designed wind project on the surrounding, local residences.

There are no municipal, provincial, or federal regulations related to shadow flicker, but many jurisdictions (including NSE) have adopted the standard of no more than 30 hours of shadow flicker per year, or no more than 30 minutes of shadow flicker on the worst day of the year at receptor locations (e.g., dwellings, cottages/camps, hospitals, schools, and daycares). These guidelines were developed in Germany and are now included under that country's Federal Emission Control Act (as cited in Haugen 2011).

The shadow flicker assessment was completed by AL-PRO and is attached to this document as Appendix VIII. As discussed in Section 4.6, the modeling exercise was completed utilizing the turbine specifications for the New Victoria Community Wind Project to determine potential shadow flicker at both turbine option locations. The potential shadow flicker at multiple Points of Reception surrounding the Project Area was also calculated.

8.3.1 Turbine Option Location 1

Results of the modelling indicated that receptor 70 receives the highest amount of shadow flicker on an hour per year basis (26 hours and 52 minutes) and receptor 46 receives the highest amount of shadow flicker on a minutes per day basis (29 minutes per day).

The results for Turbine Option 1 indicate that the proposed turbine location is expected to comply with the shadow flicker thresholds of 30 minutes/day and 30 hours/year. Two figures illustrating the extent of shadow flicker from Turbine Option 1 (30 minutes/day and 30 hours/year) are shown in Figures 11 and 12.

8.3.2 Turbine Option Location 2

As discussed in detail in Section 4.6 an alternate turbine option location is included as part of the EA for the Project. The alternate turbine location (Turbine Option Location 2) is located approximately 180 meters east of Turbine Option Location 1.

The Shadow Flicker modelling procedure was initially completed for Turbine Option Location 2 via the same methodology as that used for Turbine Option Location 1 (*i.e.,* under a worst case scenario, bare ground method). Results of the modelling exercise indicated the following:

Results of the modelling indicated that receptor 75 receives the highest amount of shadow flicker on an hour per year basis (26 hours and 6 minutes) and receptor 84 receives the highest amount of shadow flicker on a minutes per day basis (32 minutes per day).

This result indicates that Turbine Option Location 2 exceeds the limit threshold of 30 minutes per day (at receptor 84) as required by NSE.

As previously discussed, the modelling is based on worst case scenario conditions and no obstructions between the turbine blades and the sun. Therefore, the modeling was repeated but vegetation height data from the NSDNR Forest Cover Database was included in order to create more realistic conditions. All other worst case scenario conditions previously discussed were included in the modelling methodology. In support of this method, and in consultation with Health Canada, MEL completed a ground truthing exercise within the Project Area, and within the undeveloped forested property abutting the northern Project Area boundary to confirm that the vegetation heights sourced from the forest cover database were accurate. The field truthing exercise confirmed that vegetation height was under-estimated in the forest cover database, and in reality, vegetation exceeded those values. Results of the modelling exercise via this technique indicated the following:

Receptor 85 receives the highest amount of shadow flicker using the forest canopy height modelling approach. This receptor is located northeast of the Project Area along Waterford Lake Road and is expected to received 10 hours and 45 minutes of flicker per year, and a daily maximum of 27 minutes using the worst case scenario.

Two figures illustrating the extent of shadow flicker from Turbine Option Location 2 (30 minutes/day and 30 hours/year) based on the above described methodology are shown in Figures 13 and 14.

The proponent recognizes that modelling for shadow flicker via this approach (*i.e.* using forest canopy height) is not "worst case" and should clearing of vegetation on neighboring lands occur in the future, it is possible shadow flicker could exceed the provincial threshold of 30 minutes per day/30 hours per year at receptor 84. Land to the north of the Project Area comprises a combination of multiple private, federal and CBRM owned properties, and future use of this land (including potential for vegetation removal is unknown). For this reason, shadow flicker for Turbine Option 2 has been considered as a VEC with identified potential residual effects (see Sections 10.2 and 10.3).

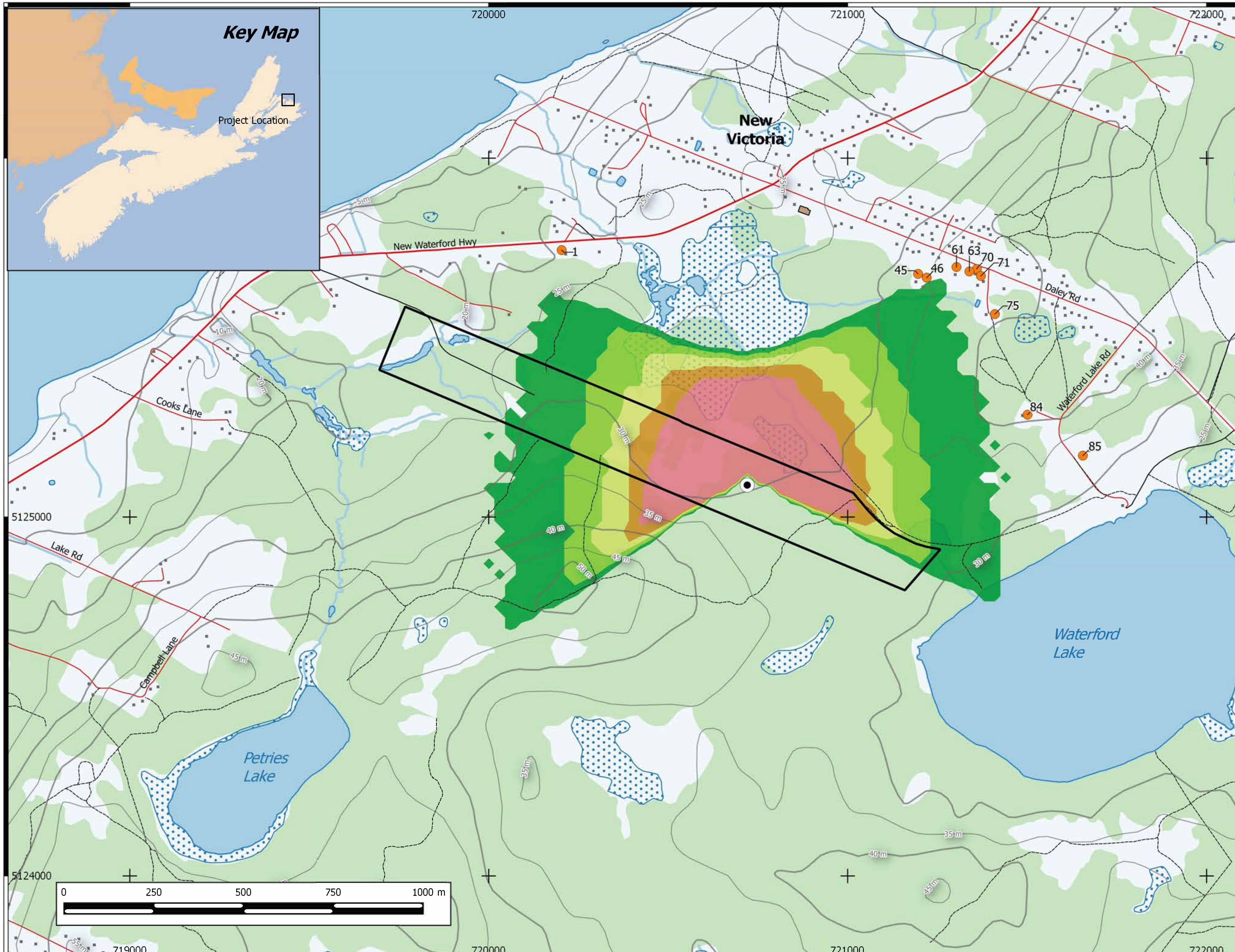

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Figure 11: Option 1 Shadow Flicker

Maximum Minutes Per Day

Legend

- Modeled Receptor
- Proposed Turbine
- Building
- Study Area

Option 1 max min per day

- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 +

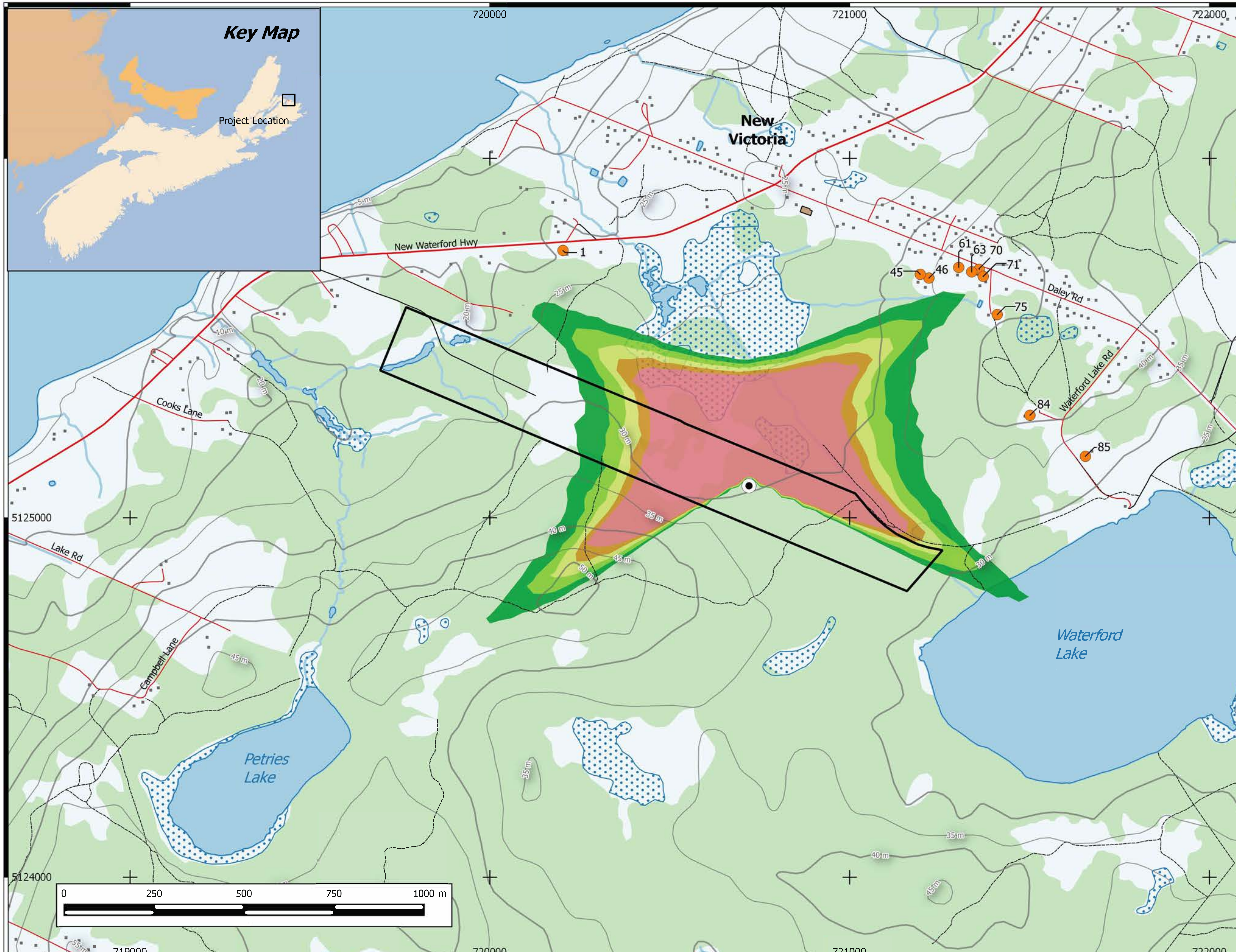
Map Data: Digital Topographic Mapping by the Nova Scotai Geomatics Center

Turbine Model: Enercon E-92
Hub Height: 98 m
Rotor Diameter: 92 m
Rated Power: 2,350 kW

Modeled Using:
Worst Case - 100% Sun
Rotor Always Perpendicular to the Sun
Eye Ht: 1.5 m
Bare Earth Model

AL-PRO Wind Energy Consulting Canada Inc.

July 6, 2016	UTM, NAD83, Zone20	Drawing 890.142



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COMMUNITY WIND DEVELOPMENT

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Figure 12: Option 1 Shadow Flicker

Hours Per Year

Legend

- Modeled Receptor
- Proposed Turbine
- Study Area

Option 1 Hrs per Year

- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 +

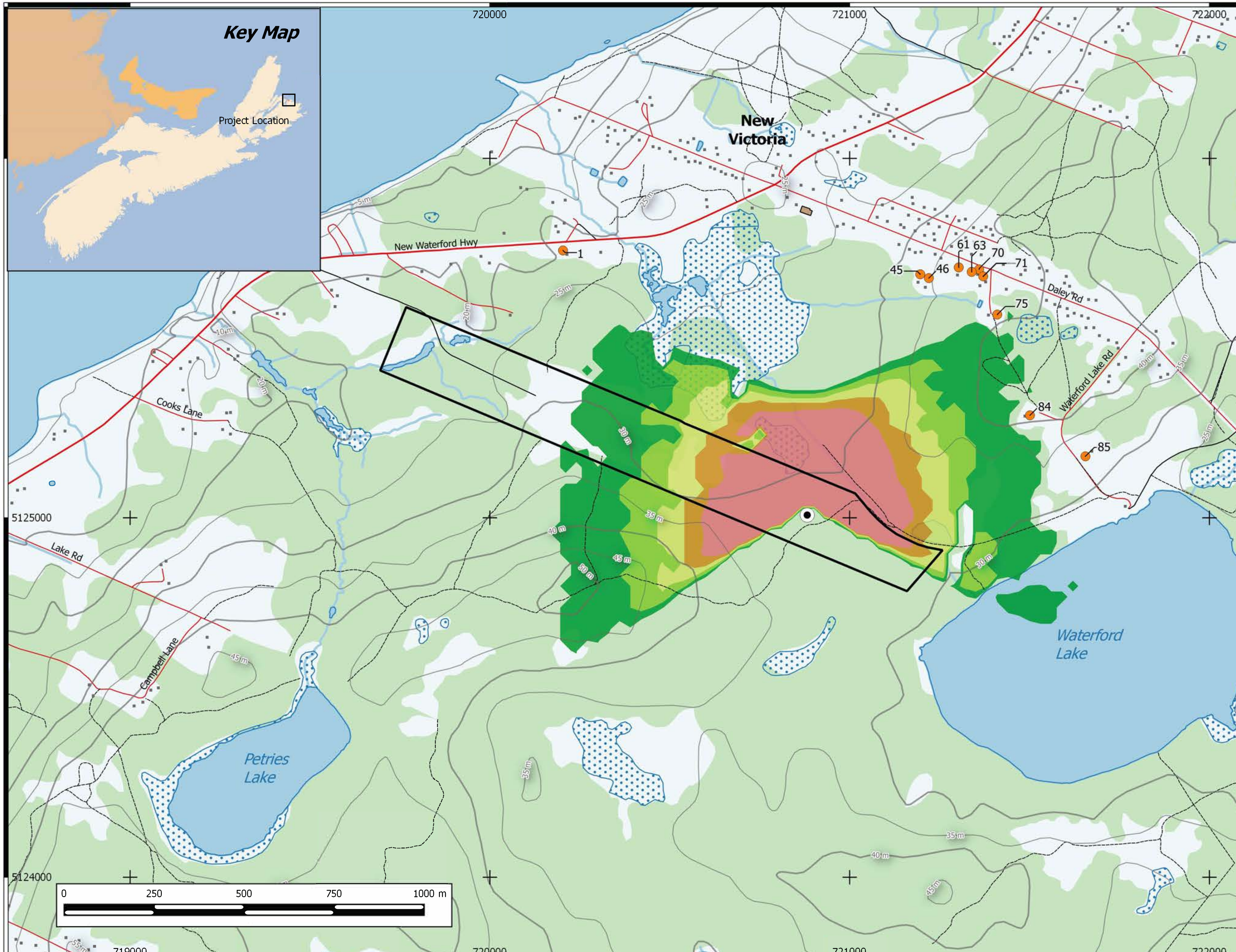
Map Data: Digital Topographic Mapping by the Nova Scotai Geomatics Center

Turbine Model: Enercon E-92
Hub Height: 98 m
Rotor Diameter: 92 m
Rated Power: 2,350 kW

Modeled Using:
Worst Case - 100% Sun
Rotor Always Perpendicular to the Sun
Eye Ht: 1.5 m
Bare Earth Model

AL-PRO Wind Energy Consulting Canada Inc.

July 6, 2016	UTM, NAD83, Zone20	Drawing 890.132



CELTIC CURRENT
COMMUNITY WIND DEVELOPMENT

New Victoria Community Wind Project

Figure 13: Option 2 Shadow Flicker

Maximum Minutes Per Day

Legend

- Modeled Receptor
- Proposed Turbine
- Building
- Study Area

Option 2 Max Hrs per Day

- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 +

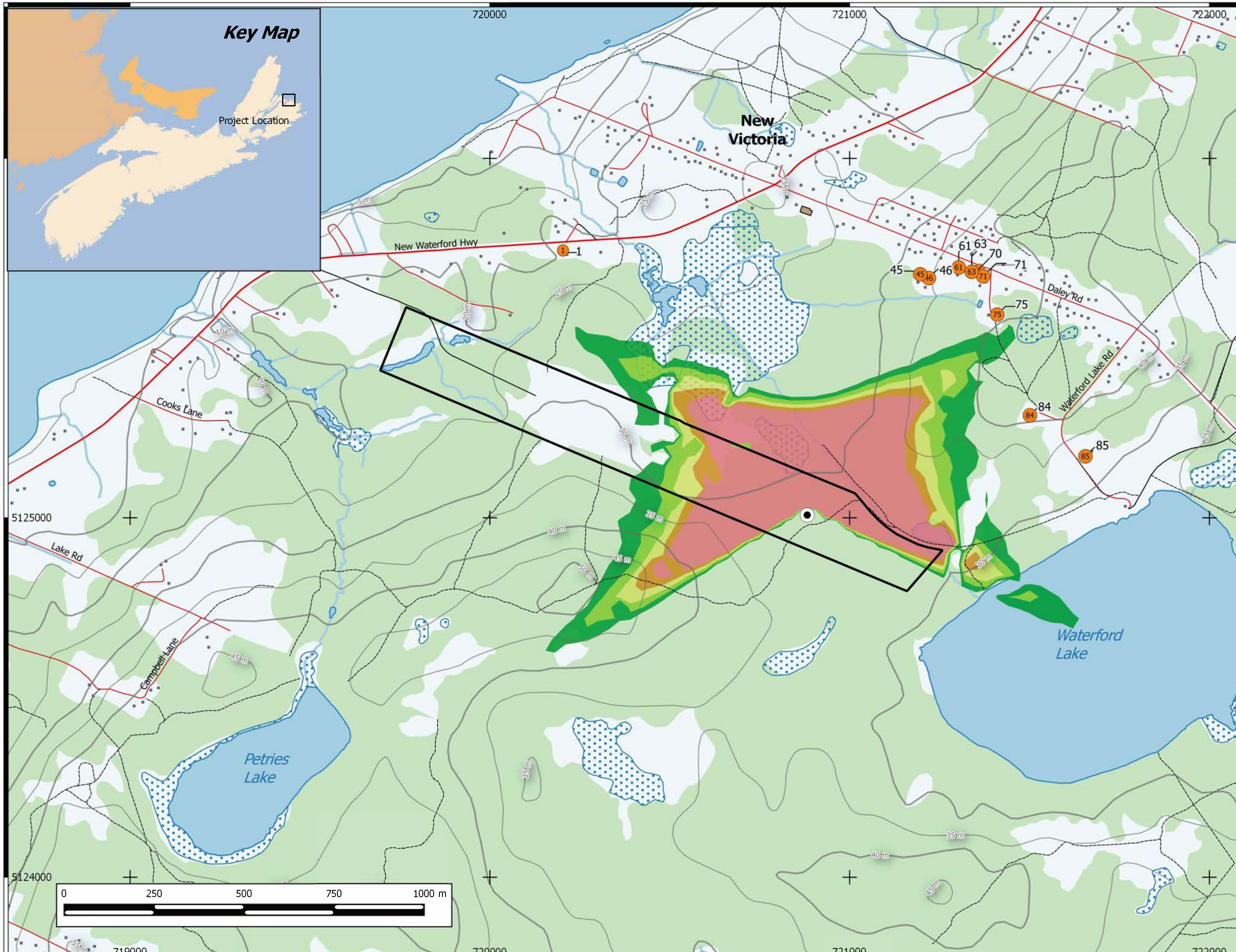
Map Data: Digital Topographic Mapping by the Nova Scotai Geomatics Center

Turbine Model: Enercon E-92
Hub Height: 98 m
Rotor Diameter: 92 m
Rated Power: 2,350 kW

Modeled Using:
Worst Case - 100% Sun
Rotor Always Perpendicular to the Sun
Eye Ht: 1.5 m
Forest Canopy Height

AL-PRO Wind Energy Consulting Canada Inc.

July 6, 2016	UTM, NAD83, Zone20	Drawing 890.142



CELTIC CURRENT
COMMUNITY WIND DEVELOPMENT

New Victoria Community Wind Project

Figure 14: Option 2 Shadow Flicker

Hours Per Year

Legend

- Modeled Receptor
- Proposed Turbine
- Building
- Study Area

Option 2 Hrs per Year

- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 +

Map Data: Digital Topographic Mapping by the Nova Scotai Geomatics Center

Turbine Model: Enercon E-92
Hub Height: 98 m
Rotor Diameter: 92 m
Rated Power: 2,350 kW

Modeled Using:
Worst Case - 100% Sun
Rotor Always Perpendicular to the Sun
Eye Ht: 1.5 m
Forest Canopy Height

AL-PRO Wind Energy Consulting Canada Inc.

July 6, 2016	UTM, NAD83, Zone20	Drawing 890.132

8.4 Electromagnetic Interference

Due to their large size, wind turbines can interfere with radio waves emitted from telecommunication and radar systems. In response to these potential conflicts, the Radio Advisory Board of Canada (RABC) and the Canadian Wind Energy Association (CanWEA) have issued a set of guidelines which describe the methodology for assessing magnetic interference (EMI).

EMI created by a wind turbine can be classified in two categories:

1. Obstruction - occurs when a wind turbine is placed between a receiver and a transmitter, creating an area where the signal is weakened and/or blocked; and,
2. Reflection - caused by the distortion between a signal and a reflection of the signal from an object. Included within reflection is a sub-category called Scatter. Scatter is a result of rotor blade movement.

The specific characteristics of a wind turbine will influence the type and magnitude of the interference. Furthermore, wind turbines affect different types of signals in various ways as some telecommunication signals are more robust to interference than others.

A preliminary investigation of the potential conflict between the proposed Project and communication systems has been completed. Potential stakeholders relating to the New Victoria Community Wind Power project and EMI have been contacted. The complete EMI report and consultation responses to date are included as Appendix X. The results of the investigation are summarized in Table 22:

Table 22. EMI Systems and Proximity to the Project Area

System	Result
Point-to-Point Systems above 890 MHz	There are no radio link transmitters or receivers that are within 1.0 km of the proposed wind farm. Additionally, there are no links that pass within the recommended consultation zone.
Broadcast Transmitters	No AM transmitters within the 5 km consultation zone. One transmitter within the 15 km consultation zone. Broadcaster has been contacted, no concerns. No FM Transmitters located within the 2 km consultation zone. No TV Transmitters within the 2 km consultation zone.

System	Result
Over-the-Air Reception	A number of potential receivers are located within the 15 km consultation zone recommended by the RABC for analogue Television transmitters. **Proponent to develop a reception mitigation policy and procedures.**
Cellular Type Networks	No cellular networks located within the 1.0 km consultation zone.
Land Mobile Radio Networks and Point-to-point Systems below 890 MHz	There is one Land Mobile Radio Network located within the 1.0 km consultation zone. Licensee has been contacted. There are no Point-to-point Systems below 890 MHz within the 1.0 km consultation zone.
Satellite Systems	No ground satellite stations located within 500 m of the proposed wind farm. No dwellings or buildings located within the projected consultation cone.
Air Defence Radars, Vessel Traffic Radars, Air Traffic Control Radars and Weather Radars	Department of National Defense (DND) Contacted – Analysis has been completed but no decisions to date. NAV Canada Contacted – No concerns. Vessel Traffic Systems – Canadian Coast Guard contacted - No Issues. Weather Radar – Environment Canada contacted – No concerns.
CBC Preliminary Report	CBC has been contacted in regard to the proposed wind project. No CBC AM Transmitters within 15 km of the project. No CCBC-TV Transmitters within 100 km of the proposed project. No CBC FM Transmitters located within 5 km of the project.
VOR (VHF Omnidirectional Range)	There is one VOR site located within the 15 km consultation zone. Nav Canada Consulted – No concerns

9.0 PUBLIC ENGAGMENT SUMMARY

9.1 Public Consultation

Celtic Current believes that open, honest and transparent relationships are essential to their success. Celtic Current also believes that communities have a right to know about its activities in those communities. To this end, Celtic Current attempts to structure its community involvement program to:

- Ensure all stakeholders have the opportunity to learn about operations, and Projects, and are able to provide input;
- Create a positive relationship with stakeholders through community involvement and community investment;
- Work within the Project timeline; and
- Resolve issues in a timely, friendly manner.

Community involvement at the New Victoria Community Wind Project was initiated in June 2016.

- In advance of the Open House completed for the New Victoria Community Wind Project, over 300 flyers were distributed by Canada Post to New Victoria postal code addresses. These flyers announced the Open House date and location, as well as opened the line of communication directly with the Celtic Current project team if people had questions, comments or concerns, by providing each household with local contact information for Celtic Current LP. A Notice providing the same information was advertised in the Cape Breton Post on June 04, 2016.

- There were multiple responses provided to individuals requiring additional information about the Project. Email correspondence, including responses to questions are provided in Appendix XI. Answers to questions from local residents were also provided during phone calls by Celtic Current Project manager Peter Archibald. A list of phone calls from residents and general theme of questions is provided in Appendix XI.

- On June 09, 2016, Celtic Current hosted an open house at the New Waterford Community Centre (6-8 pm). This provided residents and other interested parties an opportunity to view and discuss with Celtic Current representatives (2 in attendance) information on the Project and wind power in general. The Project was introduced to the community through a series of poster boards and consultants (two from McCallum Environmental and one from Nortek Resource Solutions) describing the Project, the environmental assessment process, and proposed and expected timelines for construction of the Project.

    - Twenty-eight people attended the Open House (according to signatures on the sign in sheet provided at the front door);

- Attendees were encouraged to fill out comment cards. Four comment cards were received.

The Sign in Sheet and Comment Cards are provided in Appendix XI. Poster Boards presented at the Open House are also presented in Appendix XI

- Subsequent to the June 9 Open House, additional questions and clarification regarding the Project was requested from the following:
  - New Waterford Source Water Protection Committee (NWSWPC): Specific questions related to potential impacts of the Project to the New Waterford Municipal Water Supply Area were asked of the Proponent. A review report was provided to the NWSWPC on June 17, 2016. The document is provided in Appendix IV.
  - The Community Press Newspaper (New Waterford): A series of questions were provided by Jeremy Fraser. Responses were provided by the Proponent to Jeremy Fraser and were published in the June 17 edition of the newspaper. Questions and responses are provided in Appendix XI.

- A second Open House was held on July 7, 2016, at the New Victoria Fire Hall on Daley Road in order to provide local residents an additional opportunity to ask questions and gather more information about the Project. One member of Celtic Current LP, and three consultants were present.

  - Twenty-seven people attended the Open House (according to signatures on the sign in sheet provided at the front door);
  - Attendees were encouraged to fill out comment cards. Seven comment cards were received.

The Sign in Sheet and Comment Cards for the second Open House are provided in Appendix XI.

During both Open House events, Celtic Current LP and consultants discussed the Project with local residents and members of the public. The following concerns were relayed the Project team regarding the Project. Information provided to the attendees in response is also provided below:

Proximity between proposed turbine locations and residential properties: The proximity of the proposed turbines to residential properties was a concern expressed by multiple attendees of the public at the Open House. Specifically, individuals questioned the location of the Project Area, and why it was not located in adjacent, undeveloped land further away from residential properties. The Project team explained the rational behind the site selection process (*i.e.* connectivity to power line infrastructure, access, environmental constraints, wind resource, location and siting on land previously disturbed by quarrying activity and tree harvesting etc.)

Additional discussion regarding the provincial and municipal setbacks was held, and specific concerns were communicated by members of the public to the Project team regarding the municipal setback which requires a 244m setback for the model of turbine being proposed for the Project.

Turbine Option 1 has a greater setback (740m) to residential properties than Turbine Option 2 (669m), and for this reason it was communicated to the public that Turbine Option 1 is the preferred turbine option location.

Sound levels at residential properties caused by the proposed turbine:
Residents expressed concern at potential sound levels created by the proposed turbine. The Project team explained the methodology used for sound modelling at receptors identified surrounding the Project Area. As well, the Project team explained the provincial threshold for sound as required by NSE (40dBA).

The sound modelling results presented at the Open House indicated sound pressure levels up to and including the provincial threshold of 40dBA (see poster presentations in Appendix XI), but did not visually present sound pressure levels below this threshold. Therefore, the Project team provided modelled sound levels on a receptor specific basis within 1km of the Project Area, for individuals that requested it.

The Project team noted to the public that should the Project receive EA approval, EA terms and conditions would be issued from NSE to ensure provincial requirements for sound levels are maintained throughout the lifetime of the Project.

Potential for shadow flicker at residential properties caused by the turbine:
Some residents were concerned that they would experience shadow flicker impacts as a result of the proposed turbine. The Project team outlined the methodology used for shadow flicker modelling at receptors identified surrounding the Project Area. As well, the Project team explained the provincial threshold for shadow flicker as required by NSE (30 mins per day/30 hours per year).

The Project team provided receptor specific shadow flicker results to individuals that requested it, and feedback from people suggested that this was a useful exercise in order for them to understand the potential impacts at their properties.

The Project team outlined to the public that should the Project receive EA approval, EA terms and conditions would be issued from NSE to ensure the provincial requirements for shadow flicker levels are maintained throughout the lifetime of the Project.

Potential use of adjacent properties in the future:
Concern related to future use of land existing adjacent to the Project Area was expressed by one neighbouring landowner, and other members of the public. Specifically, the provincial setback of 600m between the turbine and residential receptors would likely not be met, and sound and shadow flicker levels would likely be exceeded at portions of adjacent land, closest to the Project Area.

The Project team outlined that there are no provincial or municipal processes in place to account for future land use when planning a development project. In addition, the Project team advised the public that the proponent had engaged in the municipal development agreement process through CBRM.

Potential visual impacts:
The ability for residents to see the turbine from their home and/or the community of New Victoria was expressed as a concern by multiple members of the public. The Project team explained the methodology used for visual and zone of visual influence (ZVI) modelling at various locations surrounding the Project Area (see poster board presentations in Appendix XI).

Utilizing the ZVI map, the Project team provided receptor specific information to individuals that were interested in whether the turbine would be visible from their homes.

Proximity of the proposed turbine location to the New Waterford Municipal Water Supply Area:
Some residents were concerned about possible impacts to the NWMWSA. The Project team discussed the review report that was specifically compiled for the New Waterford Source Water Protection Committee and outlined the findings of the review (see Appendix IV) It was communicated to the public that among other reasons, as a result of the nature and size of the Project (*i.e.* one turbine and access road) and its location within a different tertiary watershed than the NWMWSA, potential impacts to water quality and supply are not expected as a result of the Project.

9.2 Mi’kmaq Consultation & Traditional Use

Project details were submitted to the Kwilmu’kw Maw-klusuaqn Negotiation Office and the NS Office of Aboriginal Affairs on June 22, 2016. In addition, an invite to the June 09, 2016 Open House was extended to Membertou First Nation. Details included a Project map, description of the work undertaken to date, and invitation to comment.

10.0 DISCUSSION OF IMPACTS

10.1 Valued Ecosystem Component Selection

The scope, methodology and baseline environmental conditions for the New Victoria Community Wind Project have been described in detail in Sections 3 through 9 in this registration document. Each Valued Ecosystem Component (VEC), as identified and defined in the NSE *Proponent’s Guide to Wind Power Projects: Guide for Preparing an Environmental Assessment Registration Document*, May 2007 (updated January 2012), has been described and baseline environmental work has been completed to evaluate each VEC based on the site specific conditions relating to the New Victoria Community Wind Project.

Based on the environmental baseline work completed for each VEC over the course of a twelve-month period, and the expertise of the various members of the EA Project Team, evaluation of each VEC has been completed to determine which VEC could have potential residual effects once planned mitigation has been completed. This evaluation is described in Table 23. A Project EPP (Appendix I) has been completed, and will support the mitigation strategies required for the Project. VECs with identified potential residual effects are carried forward (in Section 10.2) for further discussion.

Table 23. Valued Ecosystem Component (VEC) Evaluation

VEC Category	Valued Ecosystem Components (VECs)	Description of Impacts	Mitigation	Residual Effects (Section 10.2)	Applicable Section of Report
Atmospheric Environment	**Weather and Climate**	Potential impacts to localized air quality conditions: • Increase in air emissions due to increased usage of equipment and vehicles during construction and operation; and, • Generation of dust during construction activities.	Project-related air emissions and dust are expected to be temporary and localized in nature. Mitigation for these effects is provided in the Project EPP.	No	Description of VEC Section 5.2 Mitigation Recommendations Appendix I EPP
	Air Quality				
Geophysical Environment	**Physiography and Topography**	Potential impacts include localized disturbance of surficial soils and shallow bedrock; • Potential for Acid Rock Drainage (ARD); and, • Damage from blasting activities to potable groundwater supplies. The New Waterford Municipal Water Supply Area (NWMWSA) extends approximately 540m into the eastern extent of the Project Area.	Geotechnical investigations are necessary. Although the need for blasting in unlikely, the geotechnical assessment will confirm this expectation. The need for mitigative measures or monitoring programs relating to potable water resources will be determined post-geotechnical evaluation and determination of blasting needs. The likelihood of ARD occurring on site is considered low but will be fully determined once geotechnical assessment has been completed. Project-related effects to the geophysical environment are expected to be temporary and localized. Mitigation for effects is provided in the EPP.	No	Description of VEC Section 5.3 Mitigation Recommendations Appendix I EPP A review report presenting potential interactions between the Project and the NWMWSA is provided in Appendix IV
	Surficial Geology				
	Bedrock Geology				
	Hydrogeology and Groundwater				

VEC Category	Valued Ecosystem Components (VECs)	Description of Impacts	Mitigation	Residual Effects (Section 10.2)	Applicable Section of Report
Geophysical Environment			The closest turbine option (2) location to the NWMWSA is approximately 70 meters. Local groundwater, water quality and quantity are not expected to differ for the local area surrounding the Project Area as a result of the Project.		
Terrestrial Environment	**Vegetation** **Herpetofaunal species** **Mammals**	Potential terrestrial impacts to flora and fauna. Please note, species of conservation interest and species at risk, birds and bats have been considered as separate VECs for the purpose of this assessment. Impacts to flora and fauna include: • Temporary loss of vegetation due to clearing activities for project infrastructure; • Habitat fragmentation; • Introduction of invasive species; • Sensory disturbance to fauna; and • Mortality of fauna species due to clearing and construction activities.	Cleared areas will be re-vegetated and clearing will be limited to areas needed for construction of access roads and turbine pads. The project size is small (1 turbine) and therefore the effects associated with habitat fragmentation are considered to be minimal. Clearing and grubbing best management practices are described in the EPP. Mortality of fauna is considered to be minimal due to the small overall size of the project. Sensory disturbance related to the construction phase of the Project are temporary. Sensory disturbance as a result of the turbine are considered to be negligible.	No	Description of VEC Section 5.4.1, 5.4.2, and 5.4.3 Mitigation Recommendations Appendix I EPP

VEC Category	Valued Ecosystem Components (VECs)	Description of Impacts	Mitigation	Residual Effects (Section 10.2)	Applicable Section of Report
	Birds (Avifauna)	Potential concerns associated with birds include: • Mortality resulting from direct collision with turbine blades; • Habitat alteration; and, • Sensory disturbance. Potential effects are dependent on many variables such as: • Design of Project; • Habitat present; • Migration pathways and bird community present; and Topography	Due to the potential residual effects of wind turbines on birds once mitigation efforts are employed, this VEC has been considered for further assessment. Detailed effects and mitigation measures are discussed in Section 10.2.	Yes	Description of VEC Section 5.4.4 Effects Assessment and Mitigation Section 10.2
Terrestrial Environment	**Bats**	Potential concerns associated with bats include: • Mortality resulting from direct collision with turbine blades; • Mortality resulting from barotrauma; • Habitat alteration; and, • Sensory disturbance. Potential effects are dependent on variables such as: • Habitat present; • Bat community present and proximity to bat hibernacula; • Season; and • Weather factors	Due to the potential residual effects of wind turbines on bats once mitigation efforts are employed, this VEC has been considered for further assessment. Detailed effects and mitigation measures are discussed in Section 10.2.	Yes	Description of VEC Section 5.4.5 Effects Assessment and Mitigation Section 10.2

VEC Category	Valued Ecosystem Components (VECs)	Description of Impacts	Mitigation	Residual Effects (Section 10.2)	Applicable Section of Report
Terrestrial Environment	**Wetlands**	Potential concerns associated with wetlands include: • Direct impact of roads, the turbine or other project infrastructure with wetland habitat; and, • Indirect impact of wetland habitat through construction in upland buffer area, or impacts to surface water systems that indirectly could affect wetland habitat.	Wetland habitat has been delineated and a 30 meter upland buffer has been identified across the Project Area. Both turbine option locations and related infrastructure (*i.e.* laydown area and turbine pad) avoid wetland habitat. The proposed access road intersects a portion of one wetland to access Turbine Option Location 1. A small portion of an additional wetland is intersected to access Turbine Option Location 2. A provincial approval to alter wetland habitat will be obtained by NSE prior to alteration of wetland habitat.	No	Description of VEC Section 5.4.8 Mitigation Recommendations Appendix I EPP
Terrestrial Environment	**Species of Conservation Interest (SOCI) and Species at Risk (SAR)**	With the exception of bird species SOCI/SAR (assessed separately in this assessment), one fauna species SAR (Canada Lynx) and three fauna SOCI (Fisher, Long-tailed Shrew and Rock Vole) has the potential to be found within or immediately surrounding the Project Area. Potential concerns these species include: • Sensory disturbance resulting in area avoidance or behaviour changes; and, • Alteration or loss of habitat/habitat fragmentation.	Due to the potential residual effects of wind turbines on SAR/SOCI once mitigation efforts are employed, this VEC has been considered for further assessment. Detailed effects and mitigation measures are discussed in Section 10.2.	Yes	Description of VEC Section 5.4 Effects Assessment and Mitigation Section 10.2

VEC Category	Valued Ecosystem Components (VECs)	Description of Impacts	Mitigation	Residual Effects (Section 10.2)	Applicable Section of Report
Freshwater Environment	**Watercourses**	No areas of open water were identified within the Project Area during field surveys. Two watercourses were identified in WL4 (eastern extent of Project Area), once of which is considered fish bearing. None of the watercourses or WL4 are subject to alteration as a result of the Project.	No mitigation required at this time.	No	Description of VEC Section 5.4.7 Mitigation Recommendations Appendix I EPP
	Fish Habitat				
Socio-Economic Environment	**Land Use/Property Values**	The New Victoria Community Wind Project is a small project proposed on a privately owned single parcel of land. Therefore, impacts to the tourism in the surrounding community are expected to be low. Available literature did not find significant evidence in determining the effect of wind projects on surrounding property values. The project lands are privately owned and do not support public recreation areas. The Project will likely create more local jobs and increase tax revenues within Cape Breton County, and provide a community dividend, resulting in a positive change for the local economy.	Celtic Current have met provincial and municipal setback requirements from both turbine option locations to all residential properties surrounding the Project Area. Celtic Current will employ, whenever possible, local contractors to complete Project tasks.	No	Description of VEC Section 6.1-6.5
	Recreation				
	Tourism				
	Local Economy				

VEC Category	Valued Ecosystem Components (VECs)	Description of Impacts	Mitigation	Residual Effects (Section 10.2)	Applicable Section of Report
Additional Considerations	**Sound**	Sound during construction and decommissioning phases will be temporary and localized. As directed by Nova Scotia Environment and its associated Proponent Guide to Wind Power Projects (NSE 2007), operational sound has been modelled to meet 40 dBA at all receptors.	Celtic Current will complete post construction sound monitoring, at the request of NSE to confirm model predictions.	No	Description of VEC Section 8.1
	Electromagnetic Interference (EMI)	Wind turbines can interfere with various types of electromagnetic signals that are emitted from radar and telecommunication systems. An EMI study was completed by the Project Team and consultation with relevant stakeholders has determined that there are no objections regarding EMI effects associated with the Project. provided to date.	No mitigation required at this time.	No	Description of VEC Section 8.4

VEC Category	Valued Ecosystem Components (VECs)	Description of Impacts	Mitigation	Residual Effects (Section 10.2)	Applicable Section of Report
Additional Considerations	**Shadow Flicker**	Shadow flicker can occur when rotating blades cast flickering light and shadows during times of direct sunlight. As directed by Nova Scotia Environment and its associated Proponent Guide to Wind Power Projects (NSE 2007), shadow flicker has been modelled to meet 30 min/day and 30 hours/year at all receptors for Turbine Option Location 1. The provincial thresholds have been met for Turbine Option Location 2, however vegetation canopy was included in the modelling process.	Celtic Current will complete post construction shadow flicker monitoring, at the request of NSE to confirm model predictions. Should vegetation on adjacent lands be removed during the lifetime of the Project, potential residual effects of shadow flicker could occur in relation to Turbine Option Location 2. Therefore, this VEC has been considered for further assessment. Detailed effects and mitigation measures for Turbine Options Location 2 are discussed in Section 10.2.	Turbine Option >Location 1: No Turbine Option >Location 2: Yes	Description of VEC Section 8.3 Effects Assessment and Mitigation Section 10.2
	Electromagnetic Interference (EMI)	Wind turbines can interfere with various types of electromagnetic signals that are emitted from radar and telecommunication systems. An EMI study was completed by the Project Team and consultation with relevant stakeholders has determined that there are no objections regarding EMI effects associated with the Project. provided to date.	No mitigation required at this time.	No	Description of VEC Section 8.4

VEC Category	Valued Ecosystem Components (VECs)	Description of Impacts	Mitigation	Residual Effects (Section 10.2)	Applicable Section of Report
	Visual	Wind Projects produce a change in the visual landscape. Predicted view plans from four vantage points have been provided in this registration document and were provided to the public during the public consultation process.	Turbine colors and marking schemes will comply with provincial or municipal requirements.	No	Description of VEC Section 8.2

As indicated in Table 24, the following three VECs have been carried forward to the detailed effects assessment:

- SOCI/SAR;
- Birds; and,
- Bats.

10.2 Effects Assessment

Effects assessment involves the following steps:

1. Identification of potential negative effects of the Project on selected VEC;
2. Description of recommended mitigation;
3. Identification of expected residual effects (post mitigation);
4. Evaluation of significance of residual effects; and,
5. Description of recommended follow up and monitoring.

The level of potential impact after mitigation measures are applied (e.g. residual effects) was ascertained based on the criteria identified in the *Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms under the Canadian Environmental Assessment Act (CEAA)* (NRCan, 2003). Significance of residual effects is determined using four levels of significance as indicated in Table 24.

Table 24. Significance of Residual Effects

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

Potential effects to each identified VEC are discussed and evaluated in the following sections to determine specific mitigation requirements, expected significance of residual effects, and any monitoring and follow up requirements.

10.2.1 Avifauna (Birds)

Potential concerns associated with birds at the New Victoria Community Wind Project include:

- Mortality resulting from direct collision with turbine blades or during construction of project infrastructure and decommissioning;
- Habitat alteration; and,
- Sensory disturbance.

Table 25 provides a summary of the potential environmental effects resulting from the Project-VEC interactions. The table is divided according to each of the Project phases assessed (Construction, Operation and Maintenance, Decommissioning as well as Accidents, Malfunctions, and Unplanned Events). The discussion following the table provides an analysis of key Project-VEC interactions, by Project phase.

Most potential interactions associated with the construction phase will be limited, based on the current level of disturbance (e.g. quarry, existing access road and previous clear cutting) and the small size of the overall project.

Table 25. Project- VEC Interactions by Project Phase on Avifauna

Project Activities and Physical Works	Potential Environmental Effect		
	Habitat Alteration	Sensory Disturbance	Direct Mortality
Construction			
Site preparation	X	X	X
Roadbed construction	X	X	X
Turbine pad- levelling and grading	X	X	X
Temporary storage pads/areas	X	X	X
Operation and Maintenance			
Project presence			X
Infrastructure maintenance		X	
Winter maintenance		X	
Vegetation management	X		X
Decommissioning			
Turbine dismantling and removal		X	
Turbine pad and road reclamation	X	X	
Accidents, Malfunctions and Unplanned Events			
Erosion and sediment control failure	X		
Fire	X	X	X

10.2.1.1 Construction

Wildlife habitat directly within the footprint of proposed new access roads and turbine pad area construction will be eliminated. Clearing and grubbing for site preparation will remove vegetation, reducing the quantity of terrestrial habitat, and will affect the quality of already marginal habitat. The Project will result in a slight increase in edge area, which may act as a barrier for some animal movements, and could increase predation on birds and small mammals, but also has potential benefits related to habitat creation (edge nesting birds), suitable bat habitat, and food availability (near edge and ditches).

Very little clearing is necessary for this Project, as the majority of the access road already exists, and the proposed turbine only requires approximately 1 hectare of additional clearing.

Wildlife that currently utilize the habitat within the direct area of the turbine pad, access road or laydown area, will be permanently displaced during the initial stages of construction. This could potentially cause direct mortality of bird species that are unable to relocate to alternate suitable habitat. During construction, birds may be affected by disturbance and noise related to construction activities (*i.e.,* blasting, and forest removal). Birds affected may temporarily move out of the range of disturbance throughout the construction period. Similar, and more intact habitat (due to recent harvesting within the Project Area) to that identified within the Project footprint is present in surrounding lands (notably the south and north). This provides an alternate habitat resource for wildlife and birds during the construction phase.

Construction, in particular site preparation, during the breeding season for birds has the potential to cause direct mortality, abandonment of nests, the destruction of nest contents, which could include species designated as SAR or SOCI. If adjacent suitable habitat is not available, birds that have been displaced will not likely nest until nearby habitat becomes available, as most birds return to the same general area from year to year. This may result in a higher non-breeding population. Nesting habitat has not been confirmed within the footprint of construction, however the construction phase of the Project is planned to take place outside of the nesting season for most birds (May-August).

Construction of temporary areas associated with the construction phase has the potential to interact with birds and/or bird habitat in a similar fashion to those of site preparation activities, though on a smaller scale.

The additional area required for clearing is expected to be minimal. As there is no unique habitat within the Project Area and the area has been historically harvested, displaced birds should be able, and are expected, to move to similar habitat patches within and adjacent to the Project Area.

The environmental effects of clearing and grubbing are most severe when these activities are conducted during the period when most bird species are breeding (May to end of August). Clearing and grubbing at this time could result in the direct mortality of eggs and unfledged nestlings. The killing of birds or the destruction of their nests, eggs, or young is an offence under the Migratory Birds Convention Act.

Change in wildlife habitat quality includes the potential fragmentation of habitat during construction. Habitat fragmentation can adversely affect local populations of wildlife living adjacent to the Project Area. This would be a result of specific species not willing to leave their habitat which is currently provided by contiguous forest cover. As such, the species won't enter cleared areas, which results in a reduction in available habitat to a specific species. Habitat fragmentation may adversely affect local populations of birds living adjacent to the access road and project infrastructure. However, the size of this project (one access road and a single turbine) suggests that the significance of this impact would be low.

Wildlife, including birds may be temporarily displaced from areas adjacent to the Project as a result of Construction-related noise. This potential environmental effect would be temporary, and for a short duration (*i.e.*, during active Construction).

Based on consideration of the potential environmental effects of the activities required for Construction, the proposed mitigation (e.g., avoidance, and limiting area of disturbance), and the residual environmental effects significance ratings criteria, the environmental effects of Construction on birds and bird habitat are rated minimal and not significant.

10.2.1.2 Operation and Maintenance

The most likely potential effect of the Project on birds is direct mortality resulting from collision with project infrastructure, namely turbine blades, during the operational phase.

A recent study (Zimmerling et al., 2013) estimated collision mortality using data from carcass searches for 43 wind farms, incorporating correction factors for scavenger removal, searcher efficiency, and carcasses that fell beyond the area searched. On average, 8.2 ± 1.4 birds (95% C.I.) were killed per turbine per year at these sites, although the numbers at individual wind farms varied from 0 - 26.9 birds per turbine per year (Zimmerling et al, 2013).

Despite concerns about the impacts of biased correction factors on the accuracy of mortality estimates, these values are likely much lower than those from collisions with some other anthropogenic sources such as windows, vehicles, or towers, or habitat loss due to many other forms of development. Species composition data suggest that < 0.2% of the population of any species is currently affected by mortality or displacement from wind turbine development (Zimmerling et al, 2013).

Flying areas used by large numbers of foraging or roosting birds are at risk from collision with turbines, or those areas considered as important migratory flyways (Drewitt and Langston 2006). According to a recent evaluation of operational wind projects in Canada, bird fatalities are dominated by passerines with relatively low numbers of raptors and waterbirds. (EC et al. 2012).

No significant migratory flyways or features that attract large numbers of migrant passerines were detected during pre-construction avian surveys at the Project Area, and very few waterfowl and raptors were observed passing over the site during key migratory periods. Although isolated collisions will occur, it is very unlikely that collision mortality resulting from Project operations will have an effect at the population level given the low level of use by birds in this area.

The proposed turbine option locations are both within habitat types that are relatively common locally and at the landscape level. Both options have been sited to maintain a buffer from all identified wetlands which can offer suitable habitat for some species, including SOCI (although none were identified within wetlands during surveys).

Based on consideration of the potential environmental effects of the activities during the Operation Phase, the proposed mitigation, and the residual environmental effects significance ratings criteria, the environmental effects of Operation on birds and bird habitat are rated low and not significant.

10.2.1.3 Decommissioning

Decommissioning of turbine components, the turbine pad and access road will result in a positive effect on the Project, involving the reclamation of land and re-establishment of vegetation across the Project Area.

10.2.1.4 Accidents, Malfunctions and Unplanned Events

Accidents, Malfunctions and Unplanned Events that may occur in association with the Project and could have adverse environmental effects on bird and bird habitat are listed below with a discussion of the potential environmental effects.

Erosion and sediment control measures could fail during precipitation events and release sediment, potentially affecting wetland or stream habitat specifically used by birds. This type of effect is temporary and short-term, and is highly localized to the affected area. There were no areas of wetland identified within the Project Area that provide suitable bird habitat (e.g. mudflats, shallow open water) so this effect is rated low and not significant.

Fire events during any phase of the Project could remove significant amounts of vegetation, thereby having an environmental effect on habitat for wildlife, and potentially result in their displacement or mortality, particularly during breeding season when the young are less mobile. The Project EPP discusses mitigation and precaution measures related to the potential for fire to occur.

10.2.2 Species of Conservation Interest and Species at Risk

With the exception of bird species discussed separately in this report, as discussed in Section 10.1, four SOCI or SAR may be present within or near the Project Area;

- Canada Lynx (SAR)
- Fisher (SOCI)
- Long-tailed Shrew (SOCI) and
- Rock Vole (SOCI)

Potential effects on the above mentioned species from the New Victoria Community Wind Project include:

- Sensory disturbance resulting in area avoidance or behaviour changes; and,
- Alteration or loss of habitat/habitat fragmentation.

Table 26 provides a summary of the potential environmental effects resulting from the Project-VEC interactions on all four species. The table is divided according to each of the Project phases assessed (Construction, Operation and Maintenance, Decommissioning as well as Accidents, Malfunctions, and Unplanned Events). The discussion following the table provides an analysis of key Project-VEC interactions, by Project phase.

The majority of potential interactions associated with the construction phase are limited due to the historical disturbances that have already occurred (i.e. quarry, existing access road and tree harvesting), and the small size of the overall Project.

Table 26. Project- VEC Interactions by Project Phase on SAR/SOCI

Project Activities and Physical Works	Potential Environmental Effect	
	Habitat Alteration	Sensory Disturbance
Construction		
Site preparation	X	X
Roadbed construction	X	X
Watercourse crossing structures		
Turbine pad- levelling and grading	X	X
Temporary storage pads/areas	X	X
Operation and Maintenance		
Project presence		X
Infrastructure maintenance		X
Winter maintenance		X
Vegetation management	X	
Decommissioning		
Turbine dismantling and removal		X
Turbine pad and road reclamation	X	X
Accidents, Malfunctions and Unplanned Events		
Erosion and sediment control failure		
Fire		X

<u>*10.2.2.1 Construction*</u>

Project construction is not expected to significantly impact the SOCI and SAR that may be present in the area. Construction will be limited to the extension of the existing access road, construction of the turbine pad, and erection of the turbine itself. If present, the species may be displaced due to noise and activity. However, this impact is temporary and of short duration.

<u>*10.2.2.2 Operation and Maintenance*</u>

There is limited research available relating to the potential effect of wind projects on mammals during the operations phase of the project. Some research has identified short term impacts and avoidance of wind projects during the construction phases for species such as elk and wolves

(Walter et. al 2006). However, the potential effect from wind project operations has not been extensively researched and is not well understood.

The study of the response of elk to wind-power development in Oklahoma conducted by Walter et al. (2006) referenced above did determine that elk in the area were not adversely affected by the wind-power development, either through negative effects on diet or through changes in home range. The elk remained in the area throughout the construction and operation phases of the wind farm, and the access roads were no barrier to elk movement.

Based on consideration of the potential environmental effects of the activities required for Operation, the small size of this project and the proposed mitigation (e.g. limiting area of disturbance and only a single access road), and the residual environmental effects significance ratings criteria, the environmental effects of Operation on the SOCI and SAR identified are expected to be low and therefore not significant.

10.2.2.3 Decommissioning

Decommissioning of turbine components, the turbine pad and access road will result in a positive effect on the Project, involving the reclamation of land and vegetation across the Project Area, and reduction in overall habitat fragmentation associated with the access road.

10.2.2.4 Accidents, Malfunctions and Unplanned Events

Accidents, Malfunctions and Unplanned Events that may occur in association with the Project and could have adverse environmental effects on the SAR/SOCI are listed below with a discussion of the potential environmental effects.

Fire events during any phase of the Project could remove significant amounts of vegetation, thereby having an environmental effect on habitat for wildlife, and potentially result in their displacement or mortality, particularly during breeding season. The Project EPP discusses mitigation and precaution measures related to the potential for fire to occur.

10.2.3 Bats

Potential concerns associated with bats at the New Victoria Community Wind Project include:

- Mortality resulting from direct collision with turbine blades;
- Mortality resulting from barotrauma;
- Habitat alteration; and,
- Sensory disturbance.

Table 27 provides a summary of the potential environmental effects resulting from the Project-VEC interactions. The table is divided according to each of the Project phases assessed (Construction, Operation and Maintenance, Decommissioning as well as Accidents, Malfunctions, and Unplanned Events). The discussion following the table provides an analysis of key Project-VEC interactions, by Project phase.

The majority of potential interactions associated with the construction phase are limited due to the historical disturbances that have already occurred (*i.e.* quarry, existing access road and tree harvesting), and the small size of the overall Project.

Table 27. Project- VEC Interactions by Project Phase on Bats

Project Activities and Physical Works	Potential Environmental Effect			
	Habitat Alteration	Sensory Disturbance	Direct Mortality	Indirect Mortality
Construction				
Site preparation	X	X		
Roadbed construction	X	X		
Watercourse crossing structures				
Turbine pad- levelling and grading	X	X		
Temporary storage pads/areas	X	X		
Operation and Maintenance				
Project presence			X	X
Infrastructure maintenance		X		
Winter maintenance		X		
Vegetation management	X			
Decommissioning				
Turbine dismantling and removal		X		
Turbine pad and road reclamation	X	X		
Accidents, Malfunctions and Unplanned Events				
Erosion and sediment control failure	X			
Fire		X		

10.2.3.1 Construction

Project construction is not expected to significantly impact bats that may be present in the area. Construction will be limited to extension of the existing access road, and erection of the turbine itself. Furthermore, construction will occur during normal working (daylight) hours. Bats that are present in the area fly at night during hunting or migration and would therefore not be affected by construction operations. Finally, no hibernacula are going to be disturbed during the construction phase.

10.2.3.2 Operation and Maintenance

Mortality of bats is a known potential effect during the operational phase of wind energy projects throughout North America. The first large scale wind developments were located in western North America, typically in agricultural and open prairie landscapes (reviewed in Johnson, 2005). Fatalities of these non-migratory species were largely absent from these sites. It is likely that this reflects the location of these wind development sites in open non-forested landscapes.

These species may be under represented in the bat communities in open areas due to an association with forested landscapes. More recently however, evidence of Myotis fatalities from wind turbines have been noted at sites in eastern North America (reviewed in Arnett et al., 2008; Jain et al., 2007b; Johnson, 2005). Therefore, although documented fatalities of Myotis are fewer than for migratory species, there is still risk.

The prominent causes of bat deaths at wind turbines are direct collision (*i.e.*, blunt-force trauma) and barotrauma (indirect). It is difficult to attribute individual fatalities exclusively to either direct collision or barotrauma (Grodsky et al. 2011). Barotrauma involves tissue damage to air containing structures (*i.e.*, lungs) caused by rapid or excessive air pressure change. In this case, it is believed that air pressure change at turbine blades (in movement) causes expansion of air in the lungs not accommodated by exhalation, therefore resulting in lung damage and internal hemorrhaging. Grodsky et al. (2011) used radiology to investigate causes of mortality and found that a majority of the bats (74%; 29 of 39) examined had bone fractures that are likely to have occurred during direct collision with turbines. Approximately one-half (52%; 12 of 23) of bats whose ears were examined had mild to severe hemorrhaging in the middle or inner ears (or both). The true nature of mortality resulting from turbine collision remains poorly understood.

Overall bat activity at the Project Area was low during the traditional peak period in bat movements across the landscape. This may suggest that the Project site is not situated within an area of importance to local/regional bats moving to swarming/hibernation sites. Bats may also avoid the Project Area due to historical harvesting of the forest or unsuitable habitat provision. However, white-nosed syndrome must also be considered which is resulting in generally low reported numbers of bats during all monitoring activities across Nova Scotia.

Based on consideration of the potential environmental effects of the activities required for Construction and Operation, the proposed mitigation (e.g., limiting area of disturbance and size of project [small]), and the residual environmental effects significance ratings criteria, the environmental effects of Operation on bats and bat habitat are rated low and not significant.

10.2.3.3 Decommissioning

Decommissioning of turbine components, the turbine pad and access road will result in a positive effect on the Project, involving the reclamation of land and vegetation across the Project Area, and reduction in overall habitat fragmentation.

10.2.3.4 Accidents, Malfunctions and Unplanned Events

Accidents, Malfunctions and Unplanned Events that may occur in association with the Project and could have adverse environmental effects on bats and bat habitat are listed below with a discussion of the potential environmental effects.

Erosion and sediment control measures could fail during precipitation events and release sediment, potentially affecting wetland or stream habitat used by wildlife species such as bats. This type of effect is temporary and short-term, and is highly localized to the affected area.

Fire events during any phase of the Project could remove significant amounts of vegetation, thereby having an environmental effect on habitat for wildlife, and potentially result in their displacement or mortality, particularly during breeding season when the young are less mobile. The Project EPP discusses mitigation and precaution measures related to the potential for fire to occur.

10.2.4 Shadow Flicker

Potential concerns associated with shadow flicker is specifically related to Turbine Option Location 2. As discussed in Section 8.3.2, one receptor (84) exceeded the provincial threshold for minutes of shadow flicker per day using a worst case modeling scenario. Subsequently, modelling was re-run utilizing forest canopy height inputs which resulted in provincial maximum thresholds of 30 minutes per day/30 hours per year being met.

In the eventuality that vegetation is removed from land to the north of the Project Area during the lifetime of the Project, shadow flicker at Turbine Option Location 2 has been identified as having potential residual effects. The interaction would occur only during the operational phase of the Project and its associated human health effects include annoyance and/or stress.

10.3 Mitigation

10.3.1 Birds

To avoid destroying nesting or breeding species during breeding timeframes, clearing of remaining vegetation and routine vegetation management will occur outside of the breeding and nesting season for most bird species (May-August).

A follow-up monitoring program will be implemented after construction and will be designed in accordance with Canadian Wildlife Service and/or NSDNR requirements. The purpose of the follow-up monitoring is to determine rates of mortalities occurring and, if so, to identify any possible mitigation measures.

If it appears that a high number of direct fatalities are occurring, attempts will be made to determine the nature of the fatalities, specific timing or seasonality, weather related effects at the time, so that mitigation such as modifications to turbine operations may be designed (*i.e.,* change to cut-in wind speeds for turbine operation; change to lighting; other).

The Project is committed to use of limited lighting during construction and on turbines while still meeting all lighting requirements of Transport Canada. Furthermore, there will be no general lighting at the Project Area (restricted to during times when technicians are on site only).

10.3.2 Bats

The following mitigation is provided for minimizing bat effects at the New Victoria Community Wind Project.

Potential effects to bats have been minimized by avoiding placement of Project infrastructure in suitable bat habitat resources (i.e. wetlands, riparian areas, mature deciduous-dominated forest stands.

A post-construction monitoring program to quantify bat fatality rates is of utmost importance. These surveys need to be appropriately designed to account for searcher efficiency and scavenger rates and need to be conducted over an entire season (April to October), but especially during the fall migration season from mid-August to late-September. Should fatalities be found, these should be investigated with respect to spatial distribution of fatalities, turbine lighting, weather conditions and other site specific factors which can then be analyzed and operations adjusted in an adaptive management framework.

Celtic Current has the ability to alter the cut-in wind speeds of the Enercon turbine if bat mortality is shown to change during post construction monitoring.

10.3.3 Species At Risk and Species of Conservation Interest

Celtic Current is committed to limiting the area of disturbance associated with the Project and construction to a single access road and turbine in order to minimize potential impacts of potential SAR/SOCI habitat within the Project Area.

Other related mitigation methods include;

- Complete the construction phase within the shortest possible timeframe;
- Minimize periods of time spent on site;
- Avoidance of sensitive habitats;
- No herbicide use for vegetation management;
- Identify and communicate information related to SAR and SOCI to Project personnel, and ensure sightings are reported to the Celtic Current so additional mitigation strategies can be developed.

10.3.4 Shadow Flicker

In the eventuality that the Project proceeds with Turbine Option Location 2, the following mitigation is provided for minimizing the potential effects of shadow flicker at Receptor 84.

The Proponent will contact the owner of Receptor 84 and outline the potential for shadow flicker levels to increase at their property should vegetation be removed in lands between the turbine and their property during the operational phase of the Project. The property owner will be made aware that should they notice vegetation being removed from adjacent land between the turbine and their home during the operational phase, they should contact the Proponent. At such point, the Proponent commits to determining whether potential shadow flicker levels at the receptor are being affected by the loss of vegetation.

Should it be reported, or determined by the Proponent that shadow flicker levels are exceeding provincial thresholds at receptor locations adjacent to the Project Area, in consultation with NSE, one/both of the following mitigation methods will be implemented:

- A post-construction monitoring program will be completed at Receptor 84 to quantify the extent of shadow flicker;
- The Proponent commits to creating a natural barrier (*i.e.* vegetated or other acceptable method) to reduce shadow flicker extent at affected receptors (should it be necessary);
- Curtail operation of the Enercon turbine at times of the year/day where shadow flicker exceeds provincial thresholds.

11.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Environmental factors that have the potential to have damaging effects on wind turbines include:

- Ice throw
- Hurricane
- Heavy snow
- Lightening
- Fire

11.1 Ice Throw

Wind turbines can accumulate ice under certain atmospheric conditions, such as temperatures near freezing (0°C) combined with humidity, freezing rain, or sleet. Since changing weather conditions may then cause this ice to be shed, there are safety concerns that must be considered during Project development and operation. However, the Enercon turbine blades are equipped with blade de-icing equipment which is engineering to remove any build up of ice prior to the ice being at risk of shedding.

Any ice that is accumulated may be shed from the turbine due to warmer temperatures, gravity and the mechanical forces of the rotating blades.

In the unlikely event of ice throw the motion of the fragment is governed by specific forces. The ice fragment has an initial velocity due to rotation, while in flight the motion is constrained by gravity and aerodynamic forces.

Due to certification requirements which outline load cases which must be used in the design of wind turbines (including iced blades) manufacturers incorporate ice build up on the blades as a load resulting in additional vibration caused by both mass and aerodynamic imbalance. (LeBlanc, 2007)

Leblanc (2007) used defined methodologies and analyses to determine the probability that an ice fragment will land on a certain target or in a particular area in the range of the turbines. The probability of impact is then multiplied by the probability of ice throw. The final result is the probability that a target fixed at a certain range from the turbine will be hit in one year. If targets are not fixed, such as cars on a roadway, then the probability must be multiplied again by the probability that the target will be in position. Mobile targets are discussed in the analyses.

The calculated probabilities result of this risk analysis are provided in terms of Individual Risk (IR), which is defined as the probability of being struck by ice fragment per year. (LeBlanc, 2007). The results of the Leblanc's (2007) are as follows:

1. Scenario A – Fixed Dwelling: Based upon a location of 300 metres from an individual turbine, calculated risk is 1 strike per 500,000 years;
2. Scenario B – Road: Based upon a road location 200 metres from a turbine, with a 100 vehicles travelling 60 km/h along a 600 metre section of road, during 5 days of icing events, calculated risk is 1 strike per 260,000 years;
3. Scenario C – Individuals: Based upon one ever-present individual within 300 metres of a turbine, who does not impinge within 50 metres of the turbine base, calculated risk is 1 strike per 137,500,000 years.

The calculated strike risk does not factor in the following characteristics at the New Victoria Community Wind Project:

1. The presence of forest vegetation providing additional shelter; and,
2. Topographic variations.

All commercial wind turbines include vibration monitors, which will automatically shut the turbine down when vibrations exceed a pre-set level. This vibration safety shutdown feature is also effective when excessive ice builds up on the turbine blades thus further limiting the risk of ice throw. In addition, Celtic Current is committed to the installation of signs at a central access point warning of the potential for ice throw. Operation and maintenance staff and contractors will be made aware of the risk of ice accumulation, throw, or falling as a function of Celtic Current Safety Guidelines.

11.2 Hurricane, Heavy Snow, and Hail

All commercial wind turbines include vibration monitors, which will automatically shut the turbine down when vibrations exceed a pre-set level. This shut down will occur in inclement weather including high winds/hurricane, heavy snow or hail. In addition, Celtic Current is committed to the installation of signs at a central public access point identifying the presence of wind turbines.

11.3 Lightning

There is the potential for a lightning strike causing fire. Or, damage to the electrical systems within a turbine could also cause a localized fire. All commercial turbines are equipped with built-in grounding systems to avoid fire during a lightning strike.

12.0 CONCLUSIONS

Celtic Current LP (Celtic Current) intends to construct a 2.35 MW (nameplate capacity) single turbine on private land [PID 15262371] within the community of New Victoria, Nova Scotia. This Project consists of a single access road and turbine pad, a system of above ground distribution lines and an Enercon E-92 2.35 MW turbine. The proposed schedule involves construction during Fall 2016 with a tentative operation date of late Spring to early Summer 2017.

The field data, regulatory consultation, and subsequent conclusions of this assessment indicate there are no expected significant residual environmental effects resulting from the New Victoria Community Wind Power Project once all appropriate mitigation and monitoring has been implemented and completed.

Standard construction mitigation methods will be implemented to ensure there are no significant impacts of the Project on VECs. These methods were included in the development of the EPP which is included as part of this assessment.

Two Turbine Option Locations are being considered as part of the Project. **Turbine Option Location 1 is the preferred location** for the following reasons:

- The proposed access road alters a small, narrow portion of one wetland (WL3), whereas an access road to Turbine Option Location 2 would involve alteration of an additional wetland (WL4) for the purposes of an extended access road. This wetland alteration would be avoided entirely should Turbine Option Location 1 be the final turbine siting location;
- Turbine Option Location 1 has a greater setback (740m) from the closest residential receptor than Turbine Option Location 2 (669m).
- Turbine Option Location 1 has a greater setback from the NWMWSA (238m) than Turbine Option Location 2 (76m);
- The extended road required to access Turbine Option Location 2 would require additional vegetation clearing, and increased fragmentation of habitat.
- Turbine Option Location 2 has elevated Shadow Flicker modelling result using the standard bare earth methodology, compared to Turbine Option Location 1 which meets provincial maximum thresholds when modelling using “worst case” scenario (see Section 8.3 and Appendix VIII).

Turbine Option Location 1 is located within a mature mixed forest and Turbine Option Location 2 is located in a similar habitat type as Option 1, though the canopy coverage is dominated by different hardwood species. Both turbine option locations exist in-between, and adjacent to areas that have been historically harvested. An active quarry exists in the western third of the Project Area which comprises an existing access road. As part of the proposed Project, the existing access road will be upgraded, subsequently limiting potential effects to habitat and wildlife fragmentation.

Natural areas remaining following Project construction will continue to include disturbed and undisturbed tracts of forests, wetlands, or stands of trees or other vegetation within the Project Area. These forested natural areas are continuous, and provide suitable habitat, travelling corridors, thermal and security cover for wildlife, and are representative of forest systems throughout the Project Area. Habitat fragmentation will be minimal, based on the size of the Project.

Species at risk inventories within the Project revealed that no flora species at risk were identified.

Due to the Project location (Cape Breton) and on-site habitat suitability, it is possible that Canada Lynx (a SAR) could utilize the Project Area. However, the Project Area is not located near the primary areas in Cape Breton where the lynx has been known to reside, and the Project Area is situated adjacent to residential areas which would deter Canada Lynx presence. The small size of the Project, and the construction of only a single access road results in low residual impact to the Canada Lynx should it exist at this location.

Avian SOCI were identified within or near the Project Area and bat monitoring confirmed bat presence within the Project Area. The environmental assessment process has determined that residual environmental effects on birds and bats is low, post-mitigation, and Celtic Current is committed to completing follow up monitoring as recommended by CWS and NSDNR.

There are no areas of cultural significance identified during assessments of historical resources. As well there are no adverse effects anticipated on health and socio-economic conditions, physical and cultural heritage areas, traditional land use, and traditional structures or sites as a result of environmental changes from the Project.

Celtic Current has exceeded residential setbacks with the closest residence or other sensitive receptor being located approximately 740 meters from the Turbine Option Location 1, and 669 meters from Turbine Option Location 2. Sound models indicate that the regulatory criterion of 40 dBA for sound output from either turbine option location, at any identified receptors within 1000m is not expected to be exceeded.

Shadow flicker modelling has been completed for both turbine option locations. Results of the modeling indicate that when using worst case scenario (including bare earth) modelling inputs, Turbine Option Location 1 is expected to comply with the shadow flicker thresholds of 30 minutes/day and 30 hours/year. Modelling results using the bare earth (worst case scenario) for Turbine Option Location 2 however, indicates that one receptor (84) exceeds the daily threshold of 30 minutes per day as required by NSE. Modelling was re-run for Turbine Option Location 2 but included relevant and current vegetation height data from the NSDNR Forest Cover Database. Results of the modelling using this methodology indicates that Turbine Option Location 2 is expected to comply with the shadow flicker thresholds of 30 minutes/day and 30 hours/year at all receptor locations. Due to the potential for vegetation to be removed in lands between Turbine Option Location 2 and receptor 84 in the future, Turbine Option Location 2 has been considered as a VEC with identified potential residual effects. In the eventuality that vegetation is removed during the operational lifetime of the Project, the Proponent in consultation with NSE has committed to completing follow up monitoring and mitigation.

The magnitude of disturbance and risk associated with the Project are all considered minimal given the size of the Project, abundance of similar VEC's within the Project Area and the mitigation techniques and technologies currently available. Furthermore, this assessment concludes there are no significant environmental concerns and no significant impacts expected that cannot be effectively mitigated through well established and acceptable practices, or ongoing monitoring and response. Residual environmental effects have been determined to be minimal or low for identified VECs.

The EA process has determined that Turbine Option Location 1 has reduced potential impact in comparison to Turbine Option Location 2, and as such, is the preferred turbine siting location for this Project.

13.0 LIMITATIONS

<u>Constraints Analysis</u>

- On some maps, land use or land cover is defined everywhere to form a complete mosaic of polygons. On topographic maps landuse/landcover is depicted only in certain areas. The source data in some cases may need to be conditioned to allow the second type of depiction if it is a mosaic, and certain constraints will operate differently in each case (Agent Consortium, 2001); and,
- Conflicts that might exist between objects in a database are typically of a logical nature, such as topological inconsistencies or duplicate identifiers. We attempted to ensure that our database has addressed any potential inconsistencies, however inconsistencies may still occur. In map generalization, the vast majority of conflicts are physical, spatial consequences of reducing map scale. The greater the degree of scale change, the more cluttered an un-generalized map will be, and this signals the extents of potential conflicts in presentation of the data.

Limitations incurred at the time of the assessment include:

- McCallum Environmental Ltd. has relied in good faith upon the evaluation and conclusions in all third party assessments. McCallum Environmental Ltd. relies upon these representations and information provided but can make no warranty as to accuracy of information provided;
- There are a potentially infinite number of methods in which human activity can influence wildlife behaviors and populations and merely demonstrating that one factor is not operative does not negate the influence of the remainder of possible factors;
- The environmental assessment provides an inventory based on acceptable industry methodologies. A single assessment may not define the absolute status of site conditions;
- Effects of impacts separated in time and space that may affect the areas in question, have not been not been included in this assessment.
- Regulatory standards and requirements for property value analysis have not been established or recommended by Nova Scotia Environment. Therefore, site and regional effects assessment of this VEC has not been completed as part of this environmental assessment.
- Regulatory standards and requirements for assessment of infrasound have not been established or recommended by Nova Scotia Environment. Therefore, effects assessment relating to this potential VEC has not been completed as part of this environmental assessment.

General Limitations incurred include:

- Classification and identification of soils, vegetation, wildlife, and general environmental characteristics (*i.e.,* vegetation concentrations, and wildlife usage) have been based upon commonly accepted practices in environmental consulting. Classification and identification of these factors are judgmental and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may not identify all factors;
- All reasonable assessment programs will involve an inherent risk that some conditions will not be detected and all reports summarizing such investigations will be based on assumptions of what characteristics may exist between the sample points.

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15 CERTIFICATION

This Report has considered relevant factors and influences pertinent within the scope of the assessment and has completed and provided relevant information in accordance with the methodologies described.

The undersigned has considered relevant factors and influences pertinent within the scope of the assessment and written, and combined and referenced the report accordingly.

Andy Walter,
Senior Project Manager
McCallum Environmental Ltd.

I have reviewed the information as submitted and completed this report in conformity with the Code of Ethics and the Duties of Professional Biologists and good industry practice.

Respectfully submitted,

Meghan Milloy,
Vice President
McCallum Environmental Ltd.