Sable Wind Project

June 27

2012

Environmental Assessment Registration Document

Municipality of the District of Guysborough

With

Nova Scotia Power Incorporated

EXECUTIVE SUMMARY

The Municipality of the District of Guysborough have partnered with Nova Scotia Power Inc. to submit a proposal for approximately 13.8 MW wind generating facility, entitled the Sable Wind Project (the Project). The Project will be constructed on privately owned lands in Guysborough County, which are surrounded by the communities of Canso, Hazel Hill and Little Dover.

The Project is being developed in response to the Government of Nova Scotia's Request For Proposal (RFP) for the procurement of 300GWh per year of renewable electricity. The submission date for the RFP is expected to be June 27, 2012, with the intended commissioning of the Project before 2015. The Project is considered a Class 1 undertaking under the Nova Scotia Environmental Assessment Regulations and as such, requires a registered Environmental Assessment as identified under Schedule A of the Regulations.

The component assessments and the registration document have been completed according to the methodologies and requirements outlined in the "Proponent's Guide to Wind Power Projects: Guide for Preparing an Environmental Assessment Registration Document" (Nova Scotia Environment 2007, updated 2012) and accepted best practices for conducting Environmental Assessments (EA).

The goal for completing the EA is to identify potential Valued Ecosystem Components (VECs), determine what effects the Project may have on each VEC and develop mitigation techniques that will eliminate, reduce or control any adverse environmental effects. To assist in this evaluation, a project sensitivity designation is assigned, which provides guidance to the level of complexity regarding the individual studies which will need to be taken to evaluate the residual effects or the determination of potential additional studies. The Project has been designated a Category 4, which indicates that a very high level of evaluation will be required during the assessment process.

The VECs that have been considered during this assessment process are:

- Air quality;
- Surficial geology (soil);
- Bedrock geology;
- Groundwater;
- Aquatic habitats;
- Fish and fish habitat;
- Terrestrial habitat;
- Wetlands;
- Rare plants;
- Avifauna;
- Bats;

- Acoustics;
- Visual aesthetic;
- Radar/telecommunication;
- Land use/recreation;
- Archaeological resources;
- First Nations resources;
- Local communities and economy; and
- Human health and safety.
- Special focus component studies were completed for the following:
- Wetlands;
- Habitat and flora;
- Terrestrial fauna;
- Archaeological resources;
- Avifauna;
- Acoustics;
- Shadow flicker; and
- Visual impact.

Based on the data collected during the component studies and the research conducted for each of the respective VECs, the proponent used the data to develop constraints mapping to ensure, to the extent possible, that avoidance was the first consideration. This data was further used to determine reasonable mitigation strategies to further lower the potential impacts to VECs.

The Proponents have utilized best management techniques to optimize the size of the Property Boundary, focusing on protection of higher valued ecosystems. The vast majority of the potential effects on the VECs evaluated were determined to have very low to no residual effects based on the activities surrounding the construction, operations and maintenance and decommissioning of the project. Potential impacts on VECs that may result in residual effects will be lowered to an acceptable level with the deployment of appropriate mitigation, best management practices and follow up programs.

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1. PROJECT INFORMATION

This section of the Environmental Assessment (EA) Report provides a description of the project proponents, a brief overview of the Project, and a description of the regulatory requirements. The structure of the overall document is also provided.

1.1. Proponent Description

The District of Guysborough is one of four municipal units in Guysborough County, Nova Scotia. Occupying the eastern half of Guysborough County and the northeast corner of mainland Nova Scotia, the District's administrative centre is located in the Shiretown of Guysborough. The Municipality is in the process of absorbing the Town of Canso, and it completely surrounds the Town of Mulgrave. It borders the St. Mary's municipal district to the West, Antigonish County to the North and the Strait of Canso and Atlantic Ocean to the East and Southeast.

The Municipality owns and operates a 2^{nd} Generation landfill operation, serving 17 rural municipalities in Northeastern Nova Scotia and Cape Breton and recently became the first municipality in Nova Scotia to receive approval to apply for the installation of five Small Wind turbines through the Nova Scotia Small Wind (<50 kWh) ComFIT program.

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Nova Scotia Power Incorporated (NSPI) has been the main electricity provider for Nova Scotians for more than 80 years, supplying 95% of the electrical generation, transmission and distribution in the province. NSPI provides safe, dependable sources of energy to its 490,000 customers. NSPI is making strides in reducing emissions and adding renewable energy sources. It is focusing on new technologies to enhance customer service and reliability. NSPI is the principal operating subsidiary of Emera, with 1,900 employees, $4.0 billion in assets and a fleet that includes thermal, tidal and hydro plants, as well as combustion and wind turbines.

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1.2. Project Overview

The Sable Wind Project (the "Project") is a proposed wind generating facility located in close proximity to the Town of Canso in Guysborough County, Nova Scotia. The Project will have a maximum nameplate capacity of 13.8 MW. The Project is approximately 81 km away from Antigonish, 42 km away from Port Hawkesbury and 40 km from the Town of Guysborough. Project lands are centered at 657148.796 E and 5020195.129 N (20T; NAD 83) and comprise approximately 137 ha of municipal land.

1.3 Regulatory Framework

The Project is subject to a Class I EA as defined by the Environmental Assessment Regulations under the *Nova Scotia Environment Act* (1994-95). As such, the proponents are required to register the Project with Nova Scotia Environment (NSE) and subsequently comply with the Class I registration process as defined by the "Proponent's Guide to Environmental Assessment" (NSE, 2009a).

A federal EA is required when one or more triggers occur as defined under the *Canadian Environmental Assessment Act* (CEAA):

- A federal department or agency carries out a project;
- A federal department or agency provides financial assistance to enable a project to be carried out;
- A federal department or agency sells, leases or transfers control of land to enable a project to be carried out; and/or
- A federal department or agency issues an authorization to enable a project to be carried out.

No federal triggers are expected to apply to the Project; lands are privately owned, and no federal funding is proposed to support the Project. Certain federal authorizations under the *Fisheries Act* and *Navigable Waters Protection Act* may be applicable but are not expected to be required. Sufficient best practices and mitigation measures will be applied to Project activities that have the potential to trigger federal legislation. A federal EA is, therefore, not anticipated.

A Land Use By-Law exists in the Municipality of the District of Guysborough; large scale wind developments are permitted within the Industrial Heavy (I-2) and Industrial Resource (I-3) zones and must receive a development permit prior to construction (MODG, 2011). Applications must be accompanied by site plans showing lot dimensions, auxiliary structures or buildings, location of watercourses, setbacks from dwelling and property lines, warning lights and signage and turbine specifications (MODG, 2011). The Land Use By-Law also describes minimum setback distances from various constraints:

- Minimum setback from any dwelling except a dwelling on the same lot shall be two times (2.0 x) the maximum height of the turbine;
- Minimum setback from a public road shall be two times (2 x) the maximum height of the turbine;
- Minimum setback from institutional uses, such as hospitals, daycares, schools, libraries, residential care facilities, etc., on an adjoining or adjacent lot, shall be the greater of four times (4 x) the maximum height of the turbine; and
- The minimum separation distance between turbines shall be equal to the maximum height of the tallest turbine (MODG, 2011).

The Project is currently located in an area designated as "Schedule B", which was approved during a Council Meeting on June 8th, 2011; therefore it is within the permitted lands for large scale wind development. A map of Schedule B lands can be found at: http://www.municipality.guysborough.ns.ca/sites/default/files/Permits-and-Zoning/Schedule_B_Wind_Map.pdf

1.4. Structure of Document

Table 1.1 outlines the content of each section of the EA report.

Table 1.1: EA Report Structure

Section	Content
Section 2	Project description, including an overview of Project location, activities and schedule
Section 3	Scope and methodologies used during the EA process
Section 4	Existing biophysical environmental conditions, potential impacts and mitigation
Section 5	Existing socio-economic and cultural conditions, potential impacts and mitigation
Section 6	Other considerations, including visual impacts and sound
Section 7	Public, First Nations and municipal consultation
Section 8	Effects of the Project on the environment
Section 9	Effects of the environment on the Project
Section 10	Analysis of cumulative effects
Section 11	Follow up measures and future studies
Section 12	Other approvals required
Section 13	Concluding remarks
Section 14	References
Section 15	Appendices

1.5. Investigators and Authors

Table 1.2 presents consultants and investigators for the Project and authors of the EA report. Credentials are provided in Appendix A.

Table 1.2: List of Consultants/Investigators, Main Contacts and Work Completed

Company	Main Contacts	Work Completed
Nova Scotia Power Incorporated	Jennifer Pratt, Melissa Haley, Stephanie Fuller	EA Report
Strum Environmental	Bruce Strum, Melanie Smith, Andy Walters	Wetland, Habitat, Rare Species, Bird Desktop Analysis; Wetland Assessment; Acoustic Assessment; Visual Impact Assessment
Membertou Geomatics Consulting	Jason Googoo	MEKS Proposal
Genivar	Barry Turner	Radar and Radio Interference Study Proposal
Davis Archaeological Consultants Ltd.	Stephen A. Davis and April MacIntyre	Archaeological Resource Impact Assessment
Clarence Stevens	Clarence Stevens	Avian Studies

2. PROJECT DESCRIPTION

2.1. Purpose of Project

Nova Scotia, through both the Renewable Energy Plan and the legislated (2010) amendments to the *Electricity Act*, has committed to supplying 25% of all consumed energy as renewable energy to Nova Scotian homes by 2015. This commitment is expected to be achieved through developments in hydro, biomass, wind and tidal energy; wind is expected to play the primary role in reaching these targets.

The Government of Nova Scotia has appointed a Renewable Energy Administrator (REA) for the purpose of overseeing a competitive bid process for renewable electricity projects. In December 2011, a Request For Proposal (RFP) *for 300GWh of Renewable Energy from Independent Power Producer (IPP)* was issued. While Nova Scotia Power Inc. (NSPI) retains responsibility for the purchase of energy, the REA will evaluate the bids and select a winner based on a detailed review of all submissions. The extent of an EA's completion is a consideration as part of the evaluation process for the proposal. The EA is being registered to illustrate its completion for this project.

The proposed Project is intended to generate electricity for sale to NSPI and serves the purpose of contributing to NSPI's greenhouse gas emissions targets, while at the same time addressing the province's legislated renewable energy commitments.

2.2. Geographical Location

The Property Boundaries are located in Guysborough County, with the Project centre located at 657148.796 E and 5020195.129 N (20T; NAD 83). The closest communities to the Property Boundary, other than the Town of Canso (1.9 km), are Hazel Hill to the west (1.9 km) and the community of Little Dover to the south (4.8

km). Canso is located at the end of Highway 16, which runs in an east-west direction from Monastery (80 km by road). Chapel Gully walking trail is located on the northeastern Property Boundary, less that 1 km from the nearest turbine. A map of the location of the Project is provided in Drawing 2.1.

A list of all PIDs involved in the Project can be found in Table 2.1

Table 2.1: List of PIDs Involved in the Project

PID	Owner
35096700	Town of Canso
35204031	Owner Unknown
35204023	Town of Canso
35204049	Town of Canso
35124312	Owner Unknown

Lands designated as Significant Habitat by the Department of Natural Resources (DNR) are located in close proximity to the Property Boundaries; specifically, coastal areas are protected for Harlequin Duck.

The closest provincial park is Black Duck Cove Provincial Park, located to the south of the Property Boundary (4.5 km), in Little Dover. Two other parks exist to the west: Tor Bay Provincial Park (southwest) and Port Shoreham Beach Provincial Park (northwest), both located 30 km away.

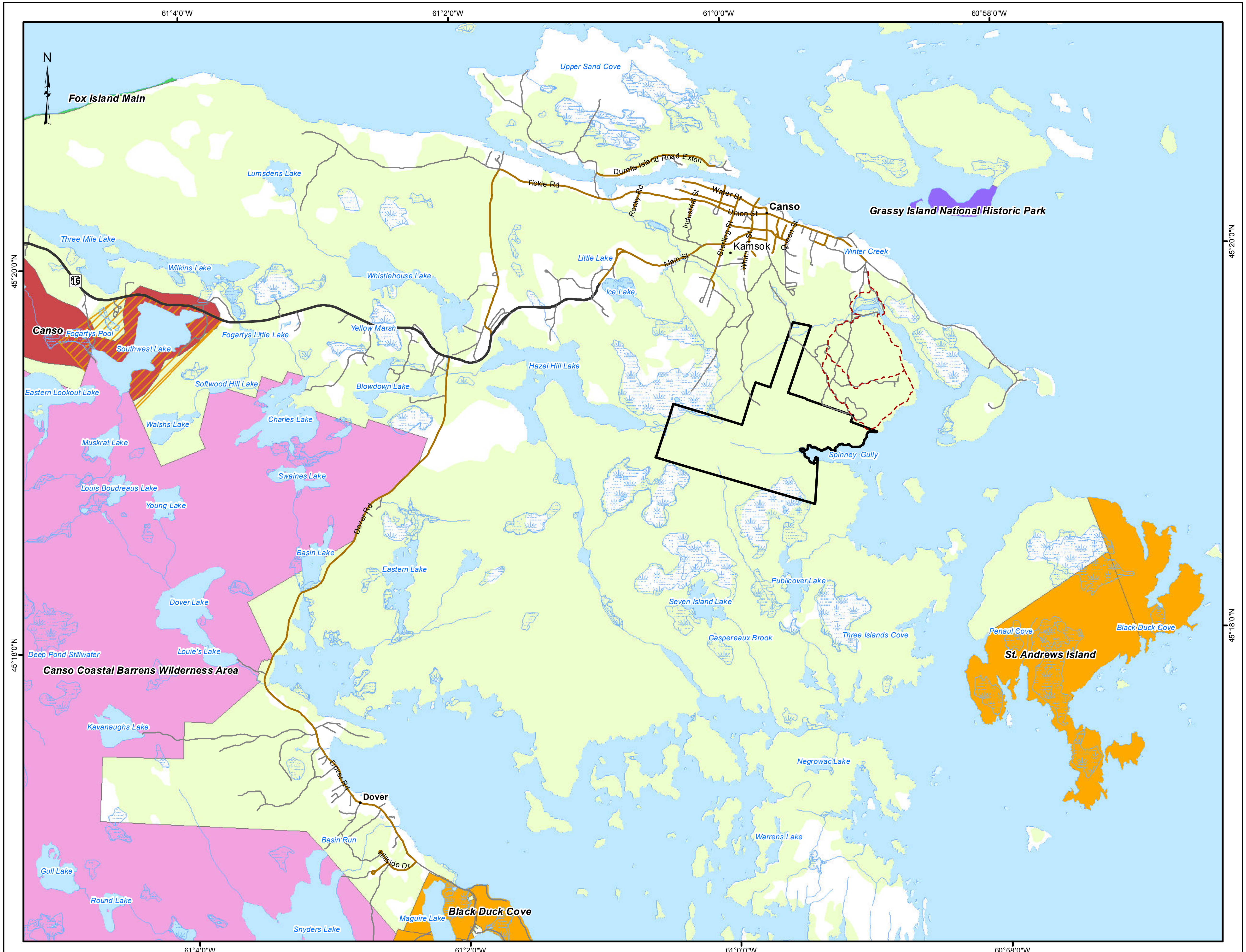
The Canso Island National Historic Site (Grassy Island) is located to the north of the Property Boundaries approximately 2 km away and is only reachable by boat. An interpretive centre and boat dock are located within the Town of Canso, where visitors can learn historic information and gain access to the island itself.

Canso Coastal and Bonnet Lake Barrens Wilderness Areas are located approximately 2.3 km and 14 km (respectively) to the west of the Property Boundary; these areas are protected under the *Special Places Protection Act* (1981).

There are designated Indian Reserve Lands within 100 km of the proposed Project: the Paq'tnkek Indian Reserve is located northwest, near the community of Afton.

The closest Important Bird Area (IBA) is the Country Island Complex IBA, located 18 km to the northwest. This complex extends from Sheep Island in Tor bay to Darkin Island.

Drawing 2.1 shows the Property Boundaries in relation to Restricted and Limited Land Use Areas. As a turbine size has not yet been selected, the location and layout of turbines is still under consideration. A representative layout of potential turbine locations is found in Drawing 2.2.



SableWind

Sable Wind Project

Restricted Use Areas

Project Components

- Project Boundary

Provincial Layers

- Track/Trail
- Local Roads
- Collector
- Arterial
- Chapel Gully Trail
- Watercourse
- Waterbody
- Wetland
- Designated Water Supply Areas
- Natural Watershed Municipal Surface Water Su
- National Historic Sites and Parks
- Operational Non-Designated Parks and Reserve
- Protected Beaches under the Beaches Protecti
- Wilderness Areas

Notes:

Kilometers
0 0.25 0.5 1 1.5

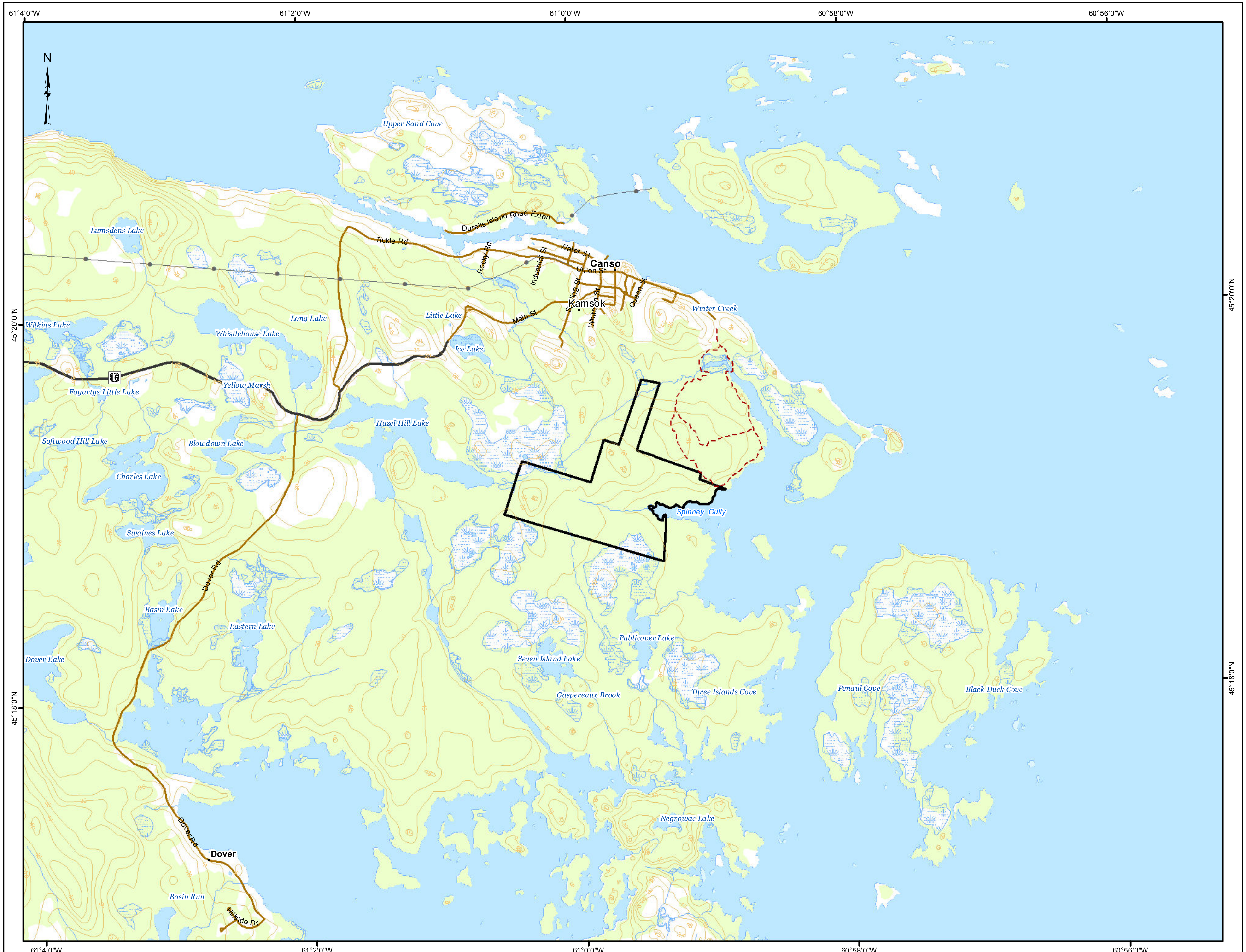
Date: June, 2012

Scale: 1:35,000
Projection: UTM Zone20 NAD83
Sources: DNR, GeoBase, NSTDB 1:10,000, Restricted and Limited Land Use

No guarantee is given as to the accuracy or currency of any of the data. The cadastral information portrayed has no legal value and should only be used as a guide.

Sheet:

2.1



Sable Wind

Sable Wind Project

Project Area

Project Components

- Project Boundary

Provincial Layers

- Contour - 5m Interval
- Local Roads
- Collector
- Arterial
- Chapel Gully Trail
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Wooded Areas

Notes:

0 250 500 1,000 1,500 Meters

Sheet: 2.2

Date: June, 2012

Scale: 1:35,000
Projection: UTM Zone20 NAD83
Sources: DNR, NSTDB 1:10,000

2.3. Project Activities

2.3.1 General

The use of Provincial roads during the construction, operation, and decommissioning phases of the Project will be in compliance with the *Nova Scotia Temporary Workplace Traffic Control Manual* (2009). All required permits and approvals will be obtained prior to construction.

Site services required prior to and during construction include, but are not limited to:

- Staging and storage facilities, including designated areas for re-fueling;
- Temporary offices;
- Laydown areas for construction and maintenance equipment;
- Temporary sanitary facilities;
- Water and rinsing facilities;
- Utilities and communications;
- Garbage collection and off-site disposal; and
- Concrete batch plants (unlikely, but to be determined).

Weather constraints may affect the proposed schedules and activities that are weather dependent (e.g. turbine delivery and construction) have been scheduled to occur during optimal time frames to minimize delay. For example, the delivery of the turbine pieces will occur outside of the spring weight restrictions, which are pursuant to Subsection 20(1) of Chapter 371 of the Revised Status of Nova Scotia, *The Public Highways Act* and published by Transportation and Infrastructural Renewal (http://gov.ns.ca/trans/trucking/springweight.asp). The timing and duration can change annually based on weather conditions; as such, delivery will be scheduled between May and December, and the spring restrictions will be reviewed prior to transporting the pieces if it's occurring close to typical spring closure months.

General activities required for construction of the Project are:

- Vegetation clearing and site preparation;
- Access road construction, including potential watercourse crossings;
- Lay down and storage area(s);
- Foundation construction;
- Tower erection;
- Installation of collection systems;
- Substation construction;
- Interconnection with Canso substation; and
- Commissioning.

2.3.2 Site Preparation

In order to prepare for construction, several activities must be completed, including:

- Land surveys for placement of road, turbines, and associated works;
- Geotechnical investigations;
- Placement of erosion and sedimentation control measures;
- Installation of any temporary bridges, stream crossings, or other mitigation controls; and
- Clearing of trees and shrubs followed by grubbing areas for construction.

Trees and shrubs will be removed outside the bird nesting season, unless an approved mitigation plan has been agreed to by NSE, DNR and the Canadian Wildlife Service (CWS). The proponents are aware of the Migratory Bird Regulations (MBR) under the *Migratory Birds Convention Act* (MBCA) 1994 and that CWS cannot authorize incidental take of migratory birds, nests or eggs for activities such as the construction of a wind farm and associated infrastructure. Any clearing activities will avoid nesting season where possible; otherwise, such activities will not take place until the Proponents, DNR and CWS have agreed to an appropriate mitigation plan.

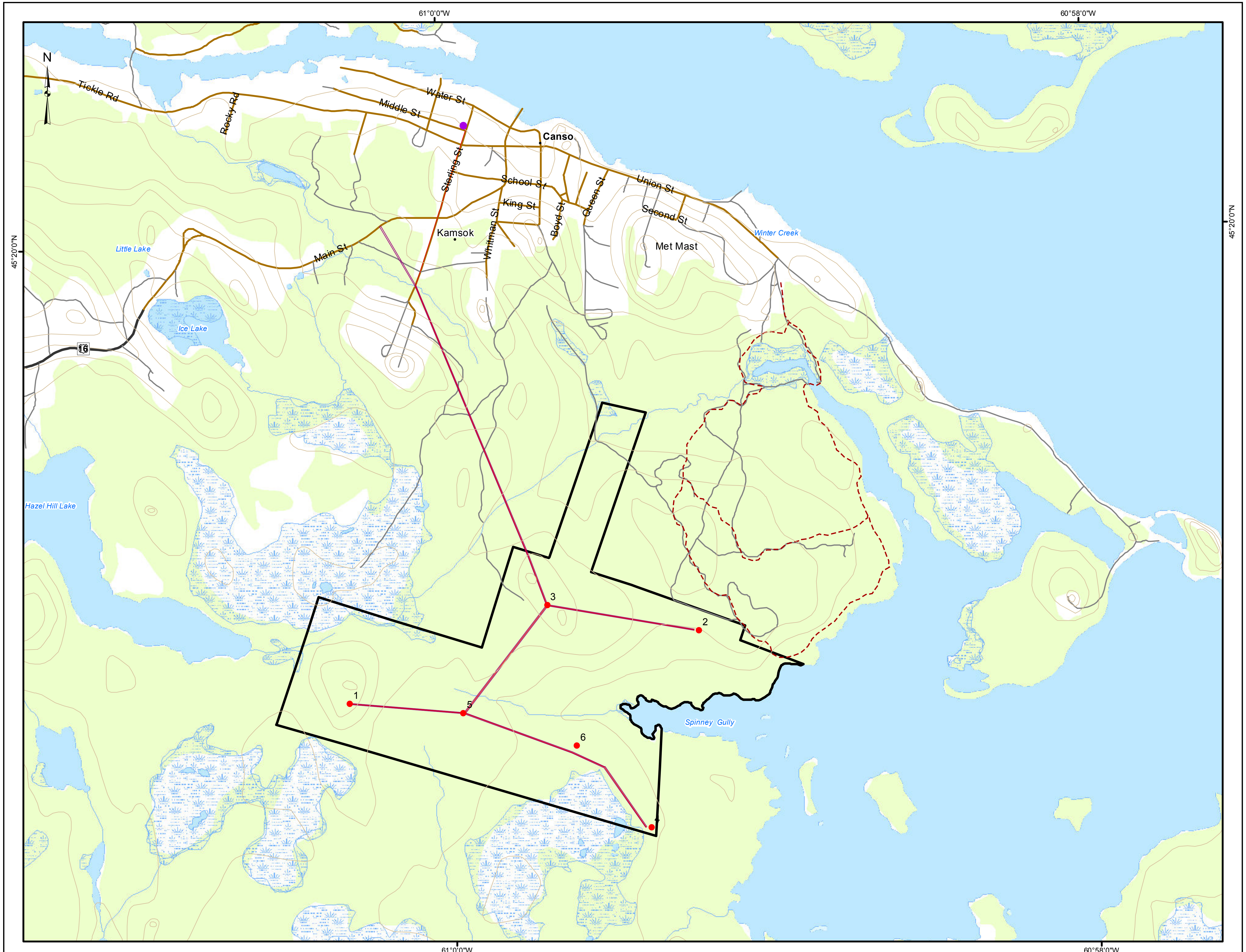
Equipment needs will likely include:

- Light trucks;
- Drilling rigs;
- Backhoes (or similar equipment for temporary bridge placement); and
- Forestry harvesting equipment.

2.3.3 Construction

On-site Roads

Roads will be graded to a standard width of 5 m, not including shoulders sloped at a ratio of 1:2. There will be areas where the width could be as much as 7 to 8 m to accommodate flow of vehicles and laydown areas. The total length of on-site access roads will be based on the total number of turbines for the Project. Currently, approximately 4 km of roads is estimated to be required. Roads based on the optimized layout, are shown on Drawing 2.3.



Sable Wind Project

Proposed Road Layout

Project Components

- Turbine Location
- Proposed Substation
- Proposed Road
- Proposed Collector
- Project Boundary

Provincial Layers

- Other Road
- Local Roads
- Collector
- Arterial
- Chapel Gully Trail
- Watercourse
- Waterbody
- Wetland

Notes:

Meters 0 50 100 200 300

Date: June, 2012

Scale: 1:9,000
Projection: UTM Zone20 NAD83
Sources: DNR, GeoBase, NSTDB 1:10,000,
NS Mineral Resources Well Log Database

No guarantee is given as to the accuracy or currency of any of the data. The cadastral information portrayed has no legal value and should only be used as a guide.

Sheet: **2.3**

Roads will need to be constructed to accommodate wide turning radii, with a minimum inside horizontal radius based on the length of the turbine blades and other components. Roads may need to be widened up to 11 m to accommodate the turning radius of the vehicles. Road inclines typically will range from 4% to 7%, depending on whether the incline includes a curve or not (respectively). Access roads will need to be capable of withstanding loads up to a maximum axle load of 12 tonnes and a maximum overall weight of 130 tonnes.

Upgrades to the existing roads may consist of:

- Widening;
- Overhead conflicts (i.e. wires, tree branches, signs, etc.);
- Ditching (or other storm water management installations);
- Stream crossings (i.e. bridges, large culverts);
- Additional lifts of gravel;
- Compaction of lifts; and
- Use of uni-axial geo-textile membrane to reduce the amount of gravel quantities and placement.

The construction of new roads will involve the removal of vegetation and grubbing. The soil will be removed to a depth of 0.5 to 1 m (depending on the ground conditions determined during geotechnical assessment). Roads will be constructed to the NS Standard Specifications for Municipal Services as best practices for gravel based roads, as well as to accommodate heavy loads from delivery trucks. As a rule of thumb, every 1 m of access road would use approximately 3.7 m^3 of gravel. However, 25% of this gravel volume can be eliminated by using a geo-textile membrane system. This method of road construction is commonly used in the wind turbine industry.

During the construction phase, the Project roads will be maintained with additional stone or periodic grading.

Any material removed for road construction will be stored, re-used on-site or disposed of in accordance with regulations and best practices for road construction. Any material stored on-site will be accompanied with appropriate erosion and sedimentation control measures.

The following equipment could be used during the road construction phase:

- Excavators;
- Dump trucks;
- Bull dozers;
- Rollers;
- Graders;
- Crusher; and

- Light trucks;

Wind Turbine Pads

Each tower location will have a geotechnical borehole drilled to determine the final design for turbine foundations, to establish bedrock and overburden depths, and to complete bedrock/soil material sampling.

General activities during turbine pad construction may include:

- Removal of trees and shrubs;
- Installation of erosion and sedimentation control measures;
- Removal of overburden;
- Blasting of bedrock (to be determined);
- Excavating of soils;
- Pouring and curing of concrete pads (complete with reinforcing steel);
- Placement of competent soils to bring area to grade;
- Compaction of soils; and
- Excavation for electrical conduits and fibre optic communication trenches.

The foundations will typically be 20.5 m diameter and will be octagon shaped, with a depth of approximately 2.5 m for the concrete foundation, which will ultimately lie under the graded surface.

Depending on the availability of concrete during construction, there may be a requirement to have a concrete batch plant on-site. The construction of the turbine pads can be very time dependent, and curing between pours can impact the final strength of the concrete. If a concrete batch plant is required, appropriate permits will be obtained by the plant operators. Best management practices for setbacks from watercourses, wetlands and other sensitive areas will be followed.

Any wash water from the cleaning of the concrete trucks will be disposed of on-site, using standard industry practices and following environmental regulations/guidelines for the protection of watercourses and wetlands.

The crane assembly pad is typically 37 m x 40 m, dependent upon the height of the turbine tower selected. The exact arrangement of the turbine pads and crane pads will be designed to suit the specific requirements of each turbine and the surrounding topography. As such, the final design will be completed after the geotechnical assessments and turbine selection. The turbine pad itself will be larger to accommodate laydown and assembly areas, typically 75 m x 75 m.

All soils removed during the excavation phase will be stored according to provincial regulations and best practice guidelines. Any soil needed for backfilling after the foundation has been poured will be stored temporarily adjacent to the excavations until needed. Any remaining excavated material will be used on-site or removed and sent to an approved facility. Prior to excavation activities, erosion and sedimentation control measures will be deployed and assessed on a regular basis. All control measures will be maintained to ensure protection of watercourses and wetlands.

The construction of the typical turbine pad (from clearing to erecting the turbines) can take between 1 to 4 months, depending on weather, soil, and construction vehicle access.

The following equipment may be used during this phase:

- Excavators;
- Dump trucks;
- Bull dozers;
- Rollers;
- Graders;
- Crusher (not required if a local quarry can supply gravel sizes);
- Concrete trucks (not required if a concrete batch plant is established on-site);
- Light cranes; and
- Light trucks.

Wind Turbines

The wind turbine assembly typically includes multiple sections: tower, nacelle, hub and a three-blade rotor. All units will be delivered by several flatbed trucks, and the pieces will require a crane for removal from the vehicle at each of the prepared turbine pads.

The tower sections will be erected in sequence on the turbine foundation, followed by the nacelle, hub, and rotors (typically, rotors are attached to the hub on the ground prior to lifting). This assembly will occur with the use of both light cranes and a heavier crane. Erection will depend on weather, specifically wind and lightning conditions. Typical assembly timing should be between 2-5 days.

The following equipment is expected to be used during this phase:

- Main crane unit (up to 400' high in some cases);
- Main crane unit - assembly cranes; and
- Manufacturer's support vehicles.

Electrical Transmission

The electricity will be transmitted via distribution poles to a proposed interconnection substation adjacent to NSPI's Canso substation (19C). The interconnection substation will step up the voltage to 69kV before transmitting it a short distance to the high side of the transformer at NSPI's Canso substation (19C). All substation equipment and engineering will be approved and/or designed by NSPI staff.

Due to the interconnection substation being located adjacent to the existing Canso substation, any additional transmission line requirements are minimal and will not require a new Right-Of-Way (ROW). If a permit or approval is required, it will be sought out and received prior to the start of any work.

The conductor connecting the turbines will likely be above ground with a design similar to that found in residential areas throughout the province. Grounding cables (bare copper earthing cable) will be laid within the turbine pad for lightning protection.

The following equipment is expected to be used during this phase:

- Excavator and/or back hoe;
- Bucket trucks;
- Light cranes; and
- Light trucks.

Removal of Temporary Works and Site Restoration

Once construction of all phases has been completed, all temporary works will be removed and appropriate long term mitigation employed. Excess soil and gravel will be used on-site, as required, or disposed of at an appropriate facility. All areas will be appropriately graded and long term erosion and sedimentation control measures installed; once stabilized, temporary erosion and sedimentation controls are removed. Attention will be paid during site reinstatement to ensure areas will promote wildlife return to the area, to the extent possible.

The following is expected to be used during this phase:

- Excavator and/or back hoe;
- Grader;
- Hydroseeder; and
- Light trucks.

Commissioning

The turbines will undergo a series of tests for mechanical, electrical and controls prior to unit start-up sequence. Once the start-up sequence has been initiated, another series of performance checks for safety systems will be completed. When the turbines have cleared all tests, the commissioning of each unit can begin. This will need to be coordinated with NSPI, as electrical energy will need to be managed both within the substation and on the electrical collector line. These performance tests will be completed by qualified wind power technicians and electrical utility employees. Additional testing may also be required for transformers, electrical lines, and substation components, all of which will be performed by qualified engineers and technical personnel.

2.3.4 Operations and Maintenance

During the life span of the Project (estimated to be over 20 years), roads will be used to access the turbines by on-site and field staff, as well as maintenance personnel. The roads will be maintained with additional gravel and grading, as required. During the winter months, roads will be plowed, sanded, and/or salted, as required for safe driving.

Because of the potential for public access to the wind farm, signage will be affixed to all access roads to provide essential safety information such as emergency contacts and telephone numbers, speed limits, and the hazards associated with being within close proximity to the turbines (i.e. ice throw). These signs will be maintained during the life of the Project.

Scheduled maintenance work will be carried out on a periodic basis. Maintenance work may require the use of a variety of cranes for brief periods of time for replacement of turbine components. The most common vehicle during maintenance work will be light/medium pickup trucks.

Waste materials will be picked up by a qualified waste hauler and disposed of per Nova Scotia's *Solid Waste-Resource Management Regulations.* All applicable materials will be transported per the *Transportation of Dangerous Goods Act* (1992) requirements and stored per the Workplace Hazardous Information Management System (WHMIS) requirements. Waste materials, such as lubricating oils, will be removed from the Property Boundaries and will be recycled or disposed of following provincial and federal waste management regulations.

During the operational phase, Valued Ecosystem Components (VECs) may be monitored, as required by NSE. The VECs to be monitored will be specified within the EA approval, and plans will be developed per the terms and conditions.

2.3.5 Decommissioning

The Project currently has a projected life span exceeding 20 years. If the Project is among the RFP reward group, it will be granted a Power Purchase Agreement (PPA) that will span a 20 year period. Beyond that 20 year period, there may be merchant generation opportunities that might be available depending on electricity markets and estimated remaining turbine lifetime.

Decommissioning will commence shortly after the retirement of the turbine units. A decommissioning plan will be completed and submitted to NSE in an appropriate time frame to ensure removal of all structures within the EA approval terms and conditions.

Generally, decommissioning will follow the same steps as construction:

- Wind turbines will be dismantled and removed from the site;
- Turbine bases will be removed to below grade and top soil will be reinstated to ensure stabilization of the land;
- Internal roads and site entrance, if not required for any other purposes of interest to the Town of Canso or the Municipality of District of Guysborough, will be removed. If removed, land will be reinstated and stabilized;
- Collection system conductor and poles will be removed, recycled where possible, and disposed of otherwise to an approved facility; and
- All other buildings and equipment will be removed. Foundations will be removed to below grade, and all land will be reinstated and stabilized.

2.4. Project Construction Schedule

Table 2.2 presents the Project schedule from EA approval to Project decommissioning.

Table 2.2: Project Schedule

Project Activity	Scheduled Start	Duration
Environmental Assessment Approval	Summer 2012	N/A
Follow-up Environmental Studies	2012-2013 (post RFP results)	12 months
Geotechnical Assessment	Fall 2012	2 months
Engineering Design	Fall 2012	2 – 3 months
Power Purchase Agreement	Summer 2012	N/A
Turbine Agreement	Fall 2012	N/A
Clearing	Fall 2013 Winter 2014	Up to 4 months because of potential impacts from weather
Construction	Spring 2014 (spring weight restrictions will be taken into account prior to detailed construction schedule)	6 months
Commissioning	Fall 2014	2 months
Operations	Fall 2014	20 years
Decommissioning	No earlier than 2034	N/A

3. ASSESSMENT METHODOLOGY

3.1 Assessment Scope

An EA is a planning tool used to predict the environmental effects of a proposed project, identify measures to mitigate adverse environmental effects, and to predict whether there will be significant adverse environmental effects after mitigation is implemented. The purpose of EA is threefold:

- Minimize or avoid adverse environmental effects before they occur;
- Promote sustainable development by protecting and conserving the environment; and
- Incorporate environmental factors into decision making.

To ensure the registration document complies with all requirements under Section 9(1A) of the NS *Environment Act*, the following information has been considered:

- Name, location and identification of proponent;
- Nature of the undertaking;
- Purpose and need of the undertaking;
- Proposed construction and operation schedules;
- Description of the undertaking;
- Environmental baseline information;
- All steps taken by the proponent to identify and address concerns of the public and Aboriginal people;
- A list of all concerns regarding the undertaking expressed by the public and Aboriginal people;
- A list of approvals which will be required and other forms of authorization; and
- Sources of any public funding.

In addition to the requirements of Section 9 (1A), the registration document has been prepared using the following provincial guidelines:

- "A Proponent's Guide to Environmental Assessment", published by the Environmental Assessment Branch of NSE and revised in 2009 (NSE, 2009a); and
- "A Proponent's Guide to Wind Power Projects: Guide for preparing an Environmental Assessment", published by the Environmental Assessment Branch of NSE and revised in 2012 (NSE, 2012a)

3.2 Assessment Boundaries

The boundaries for the EA include those areas assessed for potential environmental interactions with activities during the construction, operation and decommissioning phases of the Project. As all interactions may have varying degrees of spatial extent, three separate boundaries have been established to best represent all assessments conducted for the purpose of the EA. Using different spatial boundaries also allowed for some flexibility in assessing environmental interactions.

- Property Boundary: refers to lands of interest to the Project owned by the Municipality of the District of Guysborough and the Town of Canso. Post-July 1, 2012 all of these lands will be conveyed to MODG.
- Project Site: refers to the actual footprint of the Project to be approved or the boundary specific to the final turbine layout, access roads and associated buffers. Interactions with VECs, including watercourses, wetlands, rare species, geology, hydrogeology and archaeology, were assessed in reference to the Project Site.
- Project Area: refers to the area within 50 km of the Property Boundaries. The Project Area was used to capture potential interactions that extended beyond the Project Site itself, such as receptors for acoustic and visual impacts, consultation with local residents and communities, economic affects, First Nations resources and habitat considerations relating to wildlife and flora.

3.3 Site Sensitivity

Potential wind farms are assigned a category level according to a matrix provided in the “Proponent’s Guide to Wind Power Projects” (NSE, 2012a). This matrix considers the overall Project size and the sensitivity of the site to determine the category level. The category level then outlines guidance with respect to the collection of baseline data for the EA, as well as post-construction monitoring requirements.

Table 3.1: Project Size

Size	Definition
Very Large	Total local area projected to contain more than 100 turbines
Large	Total local area projected to contain 41-100 turbines
Medium	Total local area projected to contain 11-40 turbines
Small	Total local area projected to contain 1-10 turbines

Source: NSE, 2012a

Table 3.2: Site Sensitivity Table

Potential Sensitivity	Determining Factor
Very High	Species identified are: • probability of a species listed as “at risk” federally or provincially (NS *Endangered Species Act*, SARA, COSEWIC, or NS General Status as “Red”) occurring within, or being negatively affected by the development. Site identified as: • habitat for a large or important bird colony, such as herons, gulls, terns, common eider, and seabirds • a known bat hibernacula (25 km radius) • a significant migration staging or wintering area for bats, waterfowl, or

Potential Sensitivity	Determining Factor
	shorebirds • an area recognized as internationally, nationally, or provincially important for bird (e.g., by being located in or adjacent to a provincial Wildlife Management Area or Wildlife Sanctuary, National Wildlife Area, Migratory Bird Sanctuary, Important Bird Area, National Park, Western Hemisphere Shorebird Reserve Network (WHSRN) and/or Ramsar sites, or similar area specifically designated to protect birds) • providing habitat for large concentrations of raptors (e.g., wintering, migration) • a known, or reasonably inferred migration corridor • having potential to reduce functional quality/quantity of habitat and/or cause significant land fragmentation with loss of connectivity
High	Site identified as: • 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) • containing species of high conservation concern (e.g., Species listed as “Yellow” under NS General Status of Wild Species)
Medium	• Site is recognized as regionally or locally important to birds, or contains provincially significant habitat types
Low	• Site does not contain any of the elements listed above

Source: NSE, 2012a

As the Project is expected to involve a maximum of 6 turbines, it is considered a “Small” project. Based on previously collected data and the identification of birds ranked as “Red” per Nova Scotia Department of Natural Resources (NSDNR) 2011 General Species List, the Project is classified as having a “Very High” potential sensitivity. According to the matrix in Table 3.3, the Project is determined to be a Category 4.

Table 3.3: Project Category

	Site Sensitivity			
Facility Size	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

Source: NSE, 2012a

Projects considered a Category 4 present the highest level of potential risk to wildlife, and/or their habitat(s) and will require the highest level of effort with comprehensive baseline surveys being required. The proponent must apply standards and protocols for bird monitoring specified for Category 4 projects as defined by Environment Canada (EC) and CWS. If the Project is approved, detailed follow-up will normally be required as a condition of the approval. Post-construction follow-up surveys, spread over at least two years and sometimes more, are required to determine changes in wildlife use of the area associated with construction of the turbines.

3.4 Assessment Methodology

The EA process involves:

- Identification of VECs that may potentially be affected, either negatively or positively, by the proposed Project;
- Determination of activities associated with the Project that may interact with identified VECs;
- Determination of mitigation measures that may reduce or eliminate potential negative effects;
- Evaluation of potential residual effects; and
- Development of follow-up measures to monitor residual effects.

The process by which VECs are identified is a stepwise approach that begins with a high-level, small scale examination of the Project using various data sources, such as preliminary mapping for site habitat types, wetlands and species at risk (SAR), and the creation of a preliminary report to present results and propose a field schedule. Once a general representation of the area is known, a list of preliminary VECs is generated. Individual component assessments, or studies, are then based on the identified VECs.

Table 3.4 lists potential VECs and the corresponding assessment. In some cases, the VEC warranted a specific individual impact assessment, while others only required desktop research and data compilation. Some studies have not yet been executed and are scheduled to take place during the 2012 field season. A number of studies were conducted as part of the previous EA in 2006. For complete methodologies used for the individual assessments, please refer to corresponding sections.

Table 3.4: List of Component Assessments and Corresponding Section

Potential VEC	Method of Analysis/Assessment	Date completed	Reference
Air Quality	Research and data collection	N/A	Section 4.1

Potential VEC	Method of Analysis/Assessment	Date completed	Reference
Surficial geology	Research and data collection	N/A	Section 4.2
Bedrock geology	Research and data collection	N/A	Section 4.2
Groundwater	Research and data collection	N/A	Section 4.2
Freshwater Habitats	Research and data collection	N/A	Section 4.3
Fish and Fish Habitat	Project specific fish habitat assessment	September, 2005	Section 4.3
	Research and Data Collection	N/A	Section 4.3
Terrestrial Habitats	Habitat mapping (desktop study)	May, 2012	Section 4.4
	Project specific flora and habitat assessment	June, 2004	Section 4.4
	Project specific species at risk assessment	September, 2004	Section 4.4
Wetlands	Wetland assessment (desktop study and field survey);	May, 2012	Section 4.4
	Project specific flora and habitat assessment	June, 2004	Section 4.4
Terrestrial Vegetation	Project specific flora and habitat assessment	June, 2004	Section 4.5
	Project specific species at risk assessment	September, 2004;	Section 4.5
	Lichen survey	September, 2004	Section 4.5
	Supplementary rare plant survey	June/August 2005	Section 4.5
	Desktop flora assessment and incidental field survey	May, 2012	Section 4.5
General Wildlife	Desktop Fauna assessment and incidental field survey	May, 2012	Section 4.6
	Project specific species at risk assessment	September, 2004	Section 4.6
Birds	Desktop assessment	May, 2012	Section 4.7
	Project specific avian assessment	2004-2005	Section 4.7
	Breeding Bird Survey	2004, 2005	Section 4.7
Bats	Research and desktop analysis	N/A	Section 4.7
Local community	Research and data collection	N/A	Section 5.1
Land use/recreation	Research and data collection	N/A	Section 5.2,5.3
Human Health and safety	Research and data collection	N/A	Section 5.4

Potential VEC	Method of Analysis/Assessment	Date completed	Reference
Radar and telecommunication	Project specific electromagnetic interference assessment	Fall, 2012; proposal received June,2 012	Section 5.5
Transportation	Research and data collection	N/A	Section 5.6
Archaeological and cultural resources	Project specific desktop archaeological review	June, 2004	Section 5.7
Mi'kmaq Ecological Knowledge Study (MEKS)	Project specific Mi'kmaq Ecological Knowledge Study	Fall 2012; Proposal received June, 2012	Section 5.8
Visual impact	Project specific acoustic assessment	May, 2012	Section 6.1
Sound	Project specific visual impact assessment	June, 2012	Section 6.2

The results of the individual component assessments supplement the existing baseline conditions of the site as described in Sections 4 and 5 of the report and also facilitated the development of constraints layers to evaluate potential turbine layouts. For instance, several VECs, specifically wetlands, surface water resources, fauna and terrestrial vegetation, and archaeology, are used as constraints to which buffers and setback distances are applied. More detail on-site selection, turbine layout and constraints mapping is provided in Section 3.5 and 3.6.

A preliminary list of potential VECs was developed once possible effects were examined, and the appropriate mitigation measures applied. Some preliminary VECs examined in Section 4 and 5 were then subsequently eliminated as sufficient mitigation was considered in place to minimize potential impacts.

Potential Project/VEC interactions are discussed and analyzed as part of the effects assessment. Interactions are associated with specific activities that generally take place during the site preparation/construction, operation/maintenance and decommissioning phases of the Project.

Potential effects from Project activities that may result in residual effects were further evaluated based on a standard methodology presented in Section 8. The majority of residual effects are as a result of operational and maintenance activities that span the lifetime of the wind farm.

3.5 Constraints Analysis

A constraints analysis was completed based on the land available per the Municipal By-Law (details in Section 3.6, Drawing 2.2). The purpose of the constraints analysis was to determine available lands on which to place turbines, access roads and other required infrastructure so as to avoid or minimize impacts to identified VECs to the extent possible. Data used for the constraints analysis were from a number of sources, including publicly available data sets and the results of individual component studies detailed in Section 3.4.

Once constraints were applied to the Property Boundaries, the land unsuitable for development could be determined. The product of this exercise was used during the turbine layout optimization process as turbines were ideally moved to areas outside the buffered constraints.

The following parameters were mapped to create an overall constraints layer that was applied during turbine layout optimization:

- Provincial data sets including:
    - Provincial wetland mapping;
    - Provincial wet areas mapping; areas were considered “high potential” for wetlands if they had a depth to groundwater of less than 0.5 m or a depth to groundwater of between 0.5 m-2.0 m and located adjacent to “mapped” wetlands;
    - Provincial 1:50,000 for watercourses and waterbodies;
    - Topography, including slope; slopes greater than 15% are not conducive to road or turbine construction;
    - Restricted land areas, including provincial parks, wildlife reserves, First Nations reserves and historic sites; and
    - Nova Scotia Wind Atlas.
- Other “social” considerations, including:
    - Occupied dwellings or residences;
    - Existing and proposed roads; and
    - Property lines.

The wind resource within the Property Boundary was also a constraint, as turbines’ placement (after all other constraints were considered) were optimized in areas with sufficient wind strength to make the Project economically viable. These areas tend to have higher elevations (such as ridges), so topography and provincial wind mapping were added as layers during the constraint exercise to determine the ideal placement of turbines. Setbacks between turbines were also considered to minimize wake losses and turbulence from the blades.

Once the constraints were mapped, the appropriate buffers and setbacks were applied and areas designated for development were identified. The following buffers were applied:

- 30 buffer around wetlands, waterbodies and watercourses;
- 140 m from shorelines;
- 30 m buffer around rare plant species;
- 155 m setback from property lines;
- 155 m setback from public roads;

- Minimum 1000 m setback from occupied dwellings, or residences; and
- Minimum 400 m setback between turbines to minimize wake loss and turbulence.

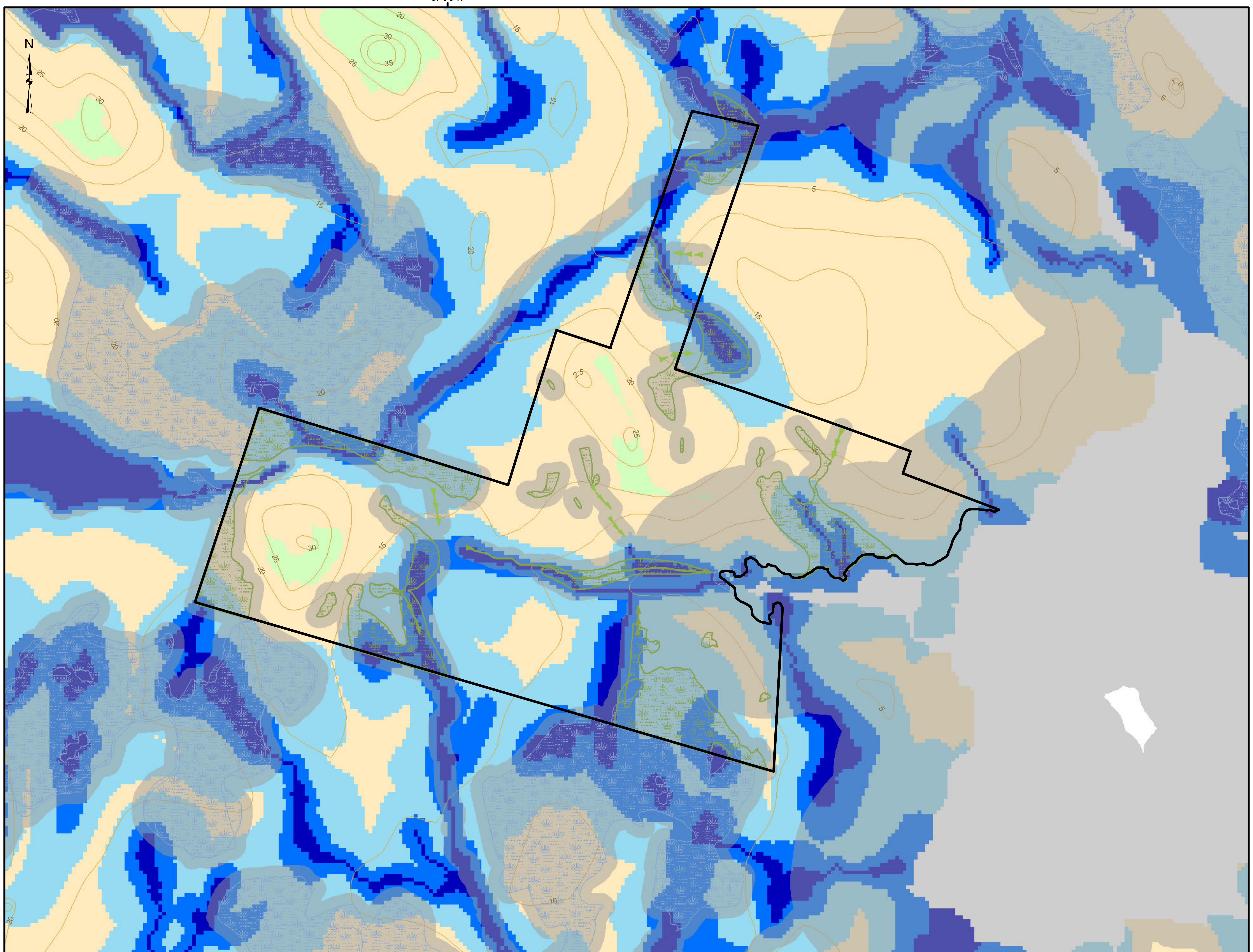
Drawings 3.1, 3.2, 3.3 and 3.4 provide constraints mapping applied to the Property Boundaries:

- Drawing 3.1 contains environmental constraints including wetlands, watercourses and waterbodies as well as the wet areas mapping and rare species;
- Drawing 3.2 provides social constraints including setbacks from residences, public roads and property lines;
- Drawing 3.3 provides topography and slope to demonstrate areas of high wind potential; and
- Drawing 3.4 provides a map of all constraints combined to demonstrate all areas that were either avoided or not conducive for turbine development.

In considering the size of the area within the Property Boundary after constraints are applied, only 55% of the area is suitable for development (62 ha).

Additional sound, visual, habitat and wetland studies were conducted in May and June, 2012. The results of these studies were also incorporated as constraints into the optimization process.

61°0'0"W



61°0'0"W

SableWind

Sable Wind Project

Environmental Constraints

Project Components
- Project Boundary

Provincial Layers
- Contour - 5m Interval
- Wetland

Strum Layers
- Watercourse
- Drainage
- Wetland

Constraints
- Coastline - 250m
- Prov. Waterbody Buffer - 30m
- Prov. Watercourse Buffer - 30m
- Prov. Wetland Buffer - 30m
- Strum Watercourse Buffer - 30m
- Strum Wetland Buffer - 30m

NSDNR Water Table

Depth (metres)
- 0 - 0.10 m
- 0.11 - 0.50 m
- 0.51 - 2 m
- 2.01 - 10 m
- > 10 m

Notes:

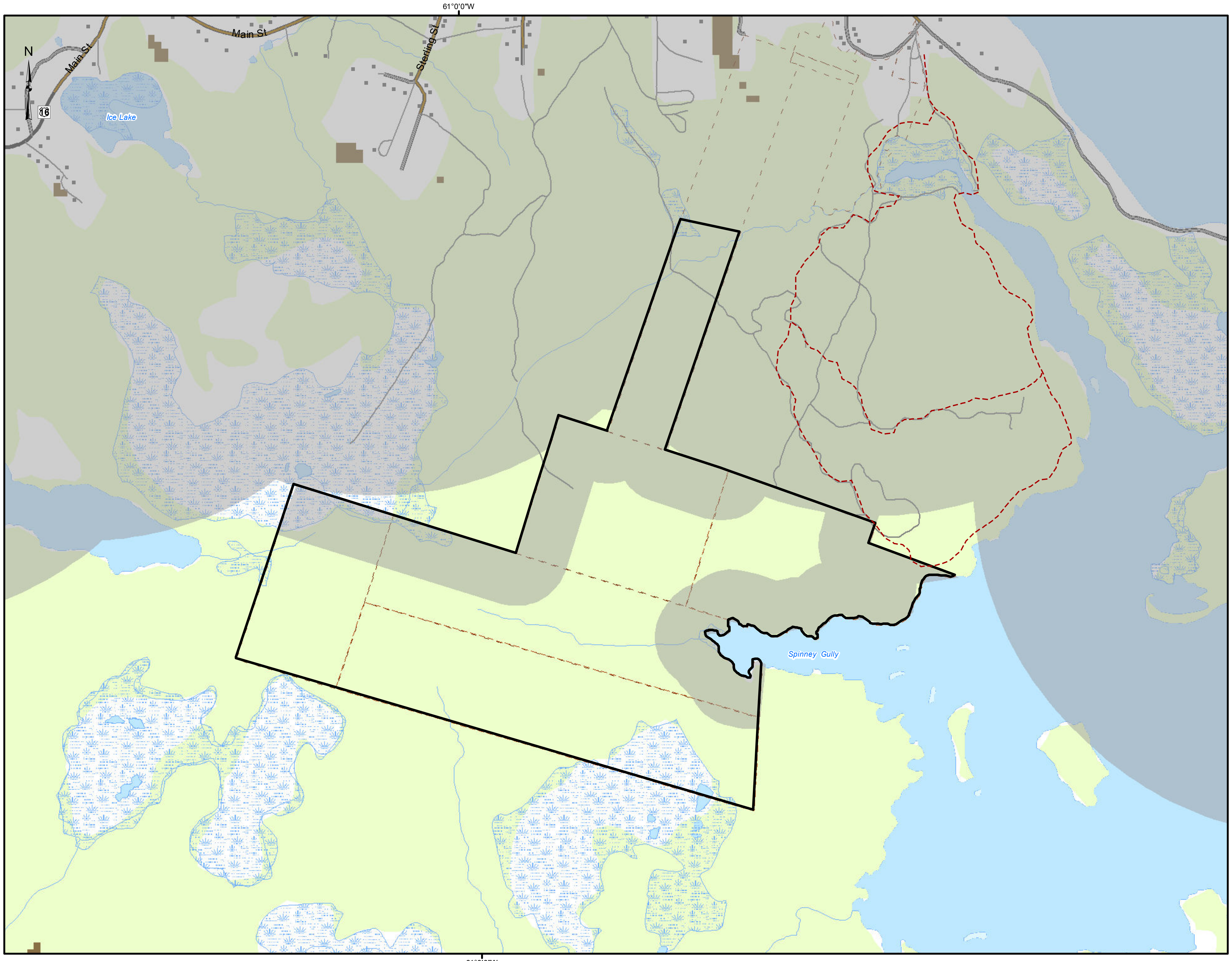
0 75 150 300 450 Meters

Sheet: 3.1

Date: June, 2012

Scale: 1:10,000
Projection: UTM Zone20 NAD83
Sources: NSDNR Wet Areas Mapping, NSTDB 1:10,000, Strum

No guarantee is given as to the accuracy or currency of any of the data. The cadastral information portrayed has no legal value and should only be used as a guide.



Sable Wind Project

Social Constraints

Project Components
- Project Boundary
- Lands of Interest

Provincial Layers
- Building
- Other Road
- Local Roads
- Collector
- Arterial
- Public Road
- Chapel Gully Trail

Constraints
- Internal Lot Line - 155m
- Public Road Buffer - 155m
- Building Buffer - 1km
- Slope > 15%

Notes:

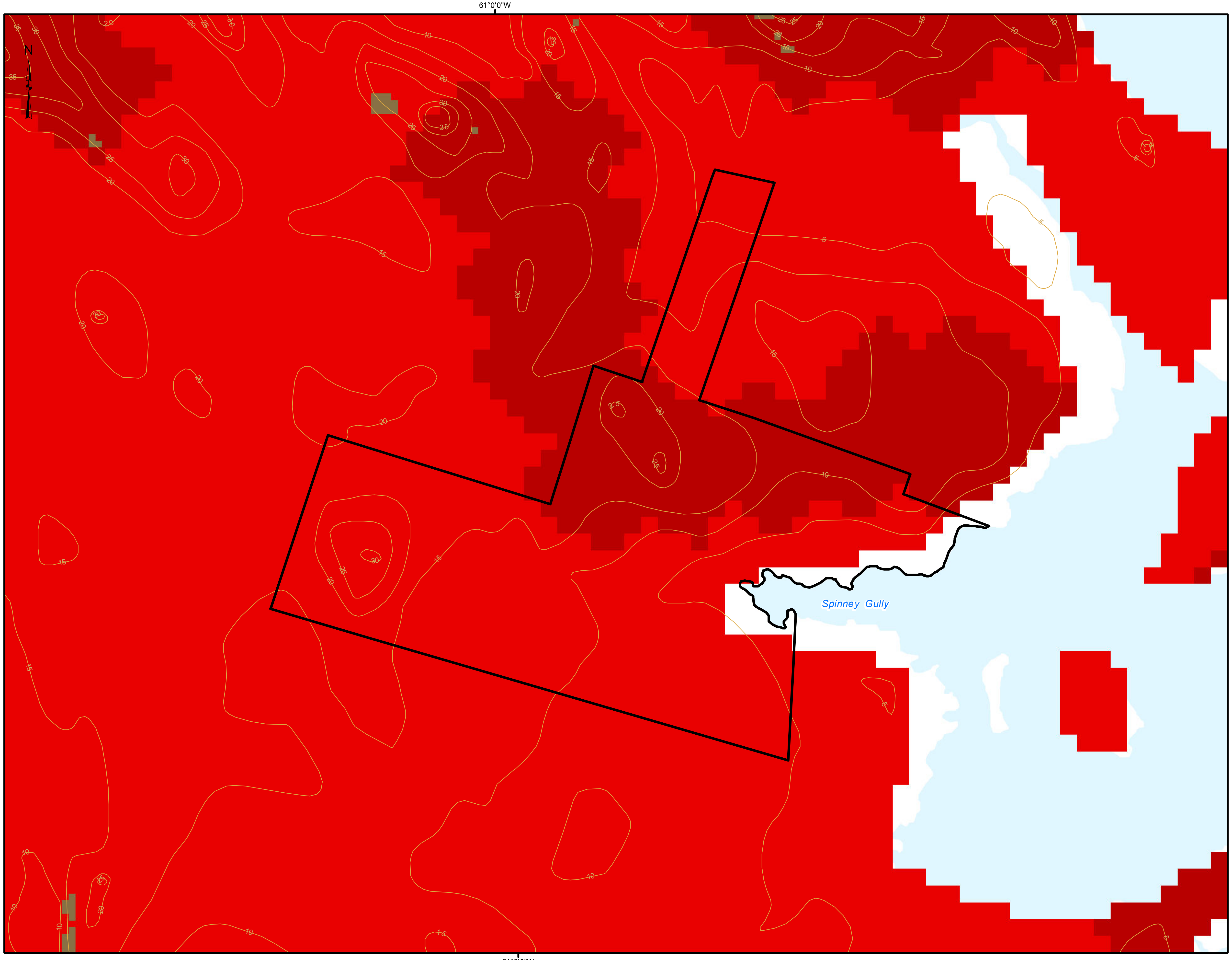
0 75 150 300 450 Meters

Sheet:

3.2

Date: June, 2012

Scale: 1:11,000
Projection: UTM Zone20 NAD83
Sources: DNR, NSTDB 1:10,000, GeoBase



SableWind

Sable Wind Project

Wind Constraints

Project Components
Project Boundary
Provincial Layers
Contour - 5m Interval
Constraints
Slope > 15%

Wind Speed (m/s)
9.51+
9.01 - 9.5
8.51 - 9.0
8.01 - 8.5
7.51 - 8.0
7.01 - 7.5
6.51 - 7.0
6.01 - 6.5
5.51 - 6.0
5.01 - 5.5
4.51 - 5.0
0.0 - 4.5

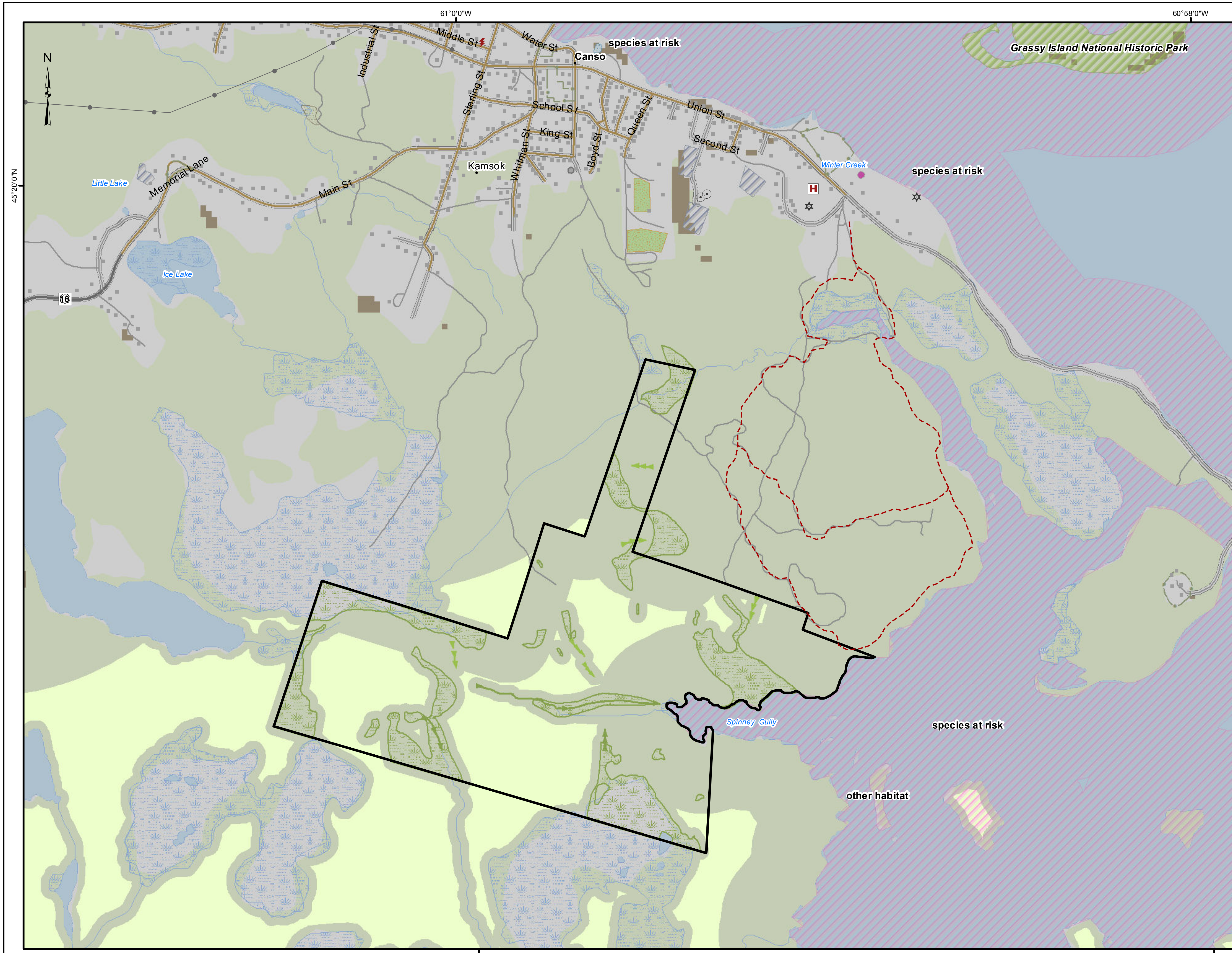
Notes:
1. NS Wind Atlas 80m AGL

Meters
0 75 150 300 450

Date: June, 2012

Scale: 1:11,000
Projection: UTM Zone20 NAD83
Sources: NS Wind Atlas, NSTDB 1:10,000

Sheet:
3.3



Sable Wind Project

Constraints

Project Components
- Project Boundary

Strum Layers
- Watercourse
- Drainage
- Wetland

Constraints
- Internal Lot Line - 155m
- Restricted Land Use - 60m
- Public Rd. - 155m
- Hydrology - 30m
- Cemetery/Field - 200m
- Building - 1km
- Campground - 200m
- Coastline - 140m
- Significant Habitat - 60m
- Slope > 15%

Provincial Layers
- Building
- Substation
- Tower
- Lighthouse
- Track/Trail
- Local
- Arterial
- Public Road
- Chapel Gully Trail
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Restricted Use Lands
- Significant Habitat
- Sewage Settling Pond
- Tank
- Campground/Park
- Cemetery
- Heliport
- Pit
- Sports Field

Notes:

0 100 200 400 600 Meters

Date: June, 2012

Scale: 1:13,000
Projection: UTM Zone20 NAD83
Sources: DNR, GeoBase, NSTDB 1:10,000, Restricted and Limited Land Use, Significant Habitat, Enercon, Strum

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Sheet:

3.4

3.6 Site Optimization

Wind data has been collected in the Project Area over a 47 month monitoring period from February 2004 to January 2008; thus, the area within the Property Boundary is known to have sufficient wind for the Project to be economically viable. As mentioned in Section 3.5, there are limited areas that are suitable for turbine placement. Generally, the higher the elevation the faster the wind speed; therefore, locations with higher elevations were selected to optimize wind yields.

Wake losses are found within the space behind a wind turbine. Wake loss is marked by decreased wind power capacity due to the turbine itself causing turbulence downwind of the rotors. The wake is less effective at generating energy for a distance from the machine. Thus, when siting a wind farm development, it is important to space turbines to minimize the impact that each one has on the others' power production capacity. Typically, the prediction of wake impacts vary due to wind speed at hub height, wind speed over the site area, topography and the wake interactions between the wind turbines themselves. This is a complicated and very site-specific calculation completed via computer models, which are specifically engineered to accurately model a wind farm's energy production.

The Project, as part of its predictions to show that the development is economical, has completed this modeling. The optimized layout presented within the EA registration document shows the closest two turbines to be approximately 400 m apart. Reduction of this spacing between any turbines could cause detrimental economic impacts to the development due to wake loss impacts.

During site optimization the Project had the following goals with respect to the wind farm layout:

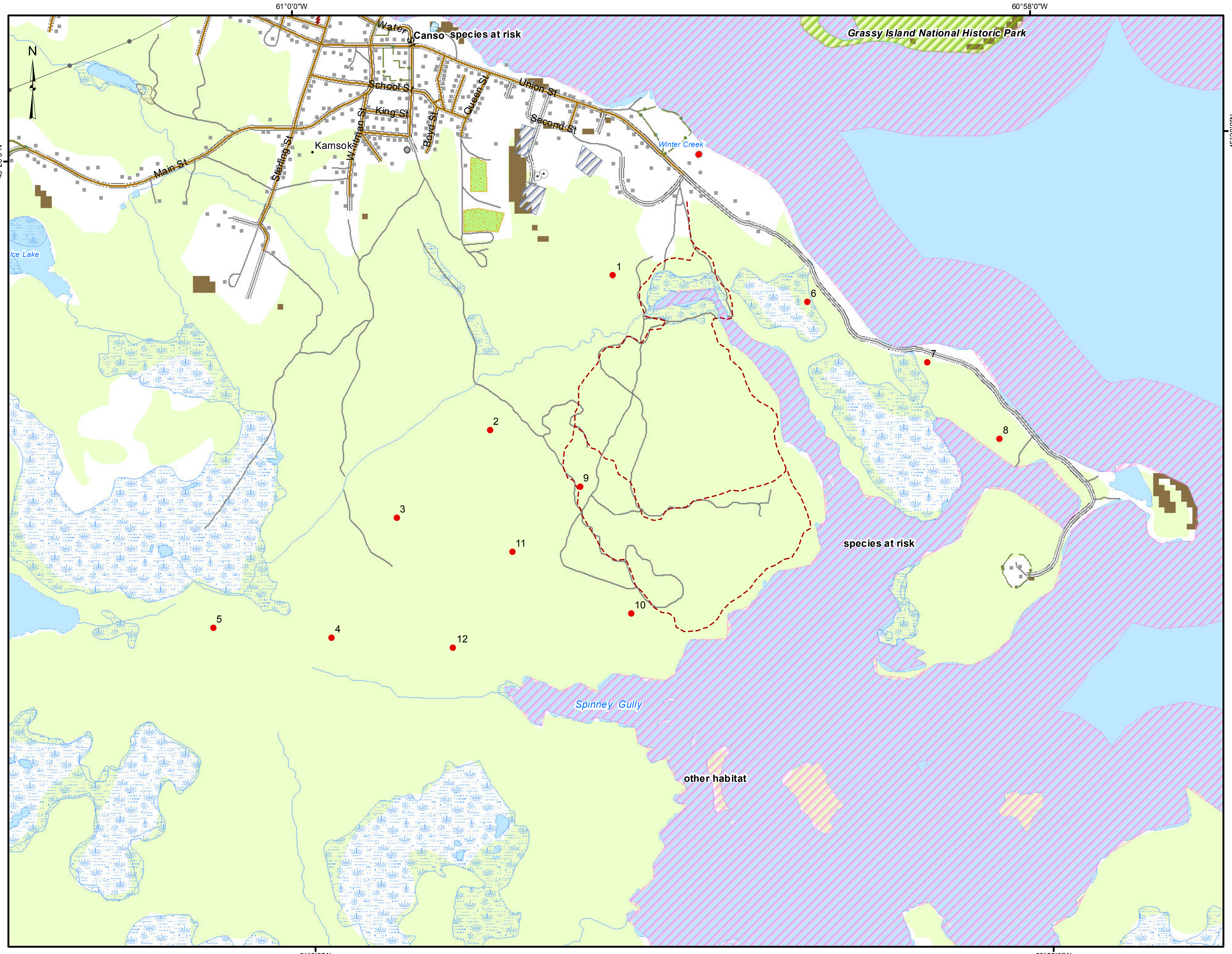
- An installed capacity of up to a maximum 13.8 MW nameplate capacity and six (6) turbine locations;
- Maximization of the net energy yield;
- Optimization of distances between turbines taking into account construction considerations as well as wake-related energy losses while maximizing wind speeds (minimum distance between turbines of 400 m); and
- Physical, environmental and social constraints specifically but not limited to:
  - Sound levels;
  - Visual impact;
  - Ice throw; and
  - Minimizing footprint and habitat fragmentation.

The previous turbine layout from the 2006 EA considered three turbines on the peninsula leading out to Glasgow Head as well as one turbine north of the Property Boundaries in close proximity to the Town of Canso (Drawing 3.5) (AMEC, 2006). During the 2006 EA process, DNR and EC raised concerns regarding the three turbines on the peninsula due to potential impacts to birds. The northernmost turbine was in close proximity to residences (approximately 290 m) and, as a result, sound levels based on modeling conducted for the 2006 report exceeded the current accepted levels (AMEC, 2006). As a result of subsequent wind zoning work done by MODG, these locations were never considered as part of lands within the Property Boundary for the By-Law, as such these lands were eliminated for the preliminary layout used for the purpose of this EA report. A map of the preliminary layout can be found in Drawing 3.6.

The process of optimizing the preliminary turbine layout was based on 6 possible locations, which represents the maximum number of turbines being considered. Turbines will be selected within the range of 2.3 to 3 MW; as nameplate capacity increases, the number of turbines required to render the Project economically viable decreases. Using the preliminary layout, turbine locations were optimized based on energy yield and wake loss. The optimized turbine layout can be found in Drawing 3.7.

In June 2012 the Proponent requested a meeting with NSE and DNR regarding the optimized layout to address potential issues prior to the submission of the final EA report and registration. The Proponent presented the revised Project footprint, showing optimization from the original 2006 layout and preliminary layout. While comments on most VECs were generally positive, DNR expressed concerns regarding the extent of wetlands located within the Property Boundaries in relation to their potential use by migrating bird species. As three turbines (2, 4 and 6) are in proximity to delineated wetlands (<30 m) and the shoreline (< 500 m), there exists the potential for interactions with migrating birds seeking refuge during inclement weather.

The Proponent will continue to consult with DNR and NSE regarding concerns with turbine placement and potential impacts to VECs. The layout in Drawing 3.7 is considered the final Project footprint for the purpose of this EA report. The total number of potential turbine locations will not exceed 6; the final number of turbines will be determined if the proponent is awarded the RFP. The final Project footprint has been used for further evaluation of potential environmental effects throughout the remainder of the EA report.



SableWind

Sable Wind Project

2006 Layout

Project Components

- Turbine Location

Provincial Layers

- Building
- Hospital
- Substation
- Tower
- Lighthouse
- Track/Trail
- Local
- Arterial
- Chapel Gully Trail
- Public Road
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Restricted Use Lands
- Significant Habitat
- Sewage Settling Pond
- Tank
- Campground/Park
- Cemetery
- Heliport
- Pit
- Sports Field

Notes:

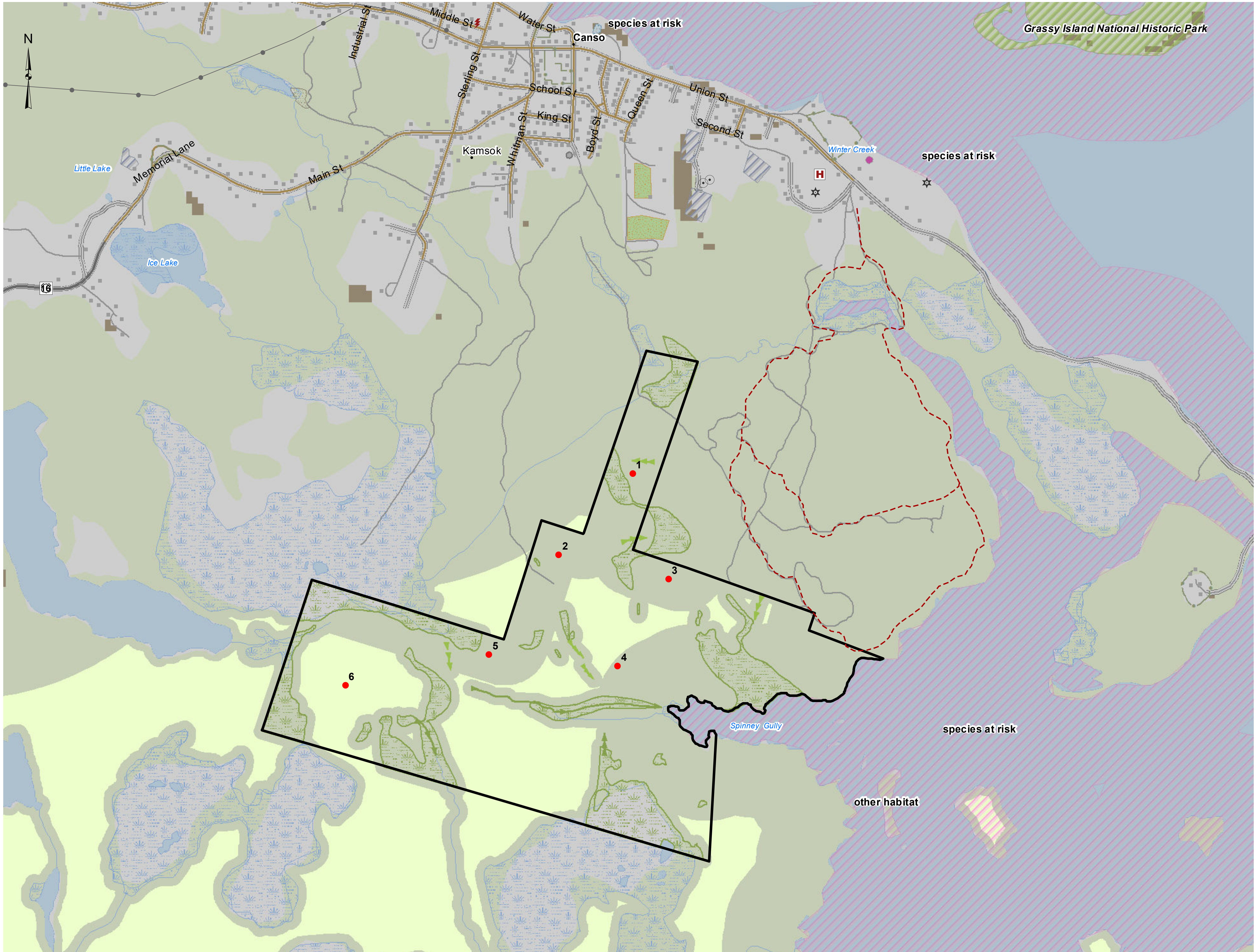
1. Turbine Location point symbol ~ 60m in diameter

0 100 200 400 600 Meters

Date: June, 2012

Scale: 1:13,000
Projection: UTM Zone20 NAD83
Sources: DNR, GeoBase, NSTDB 1:10,000, Restricted and Limited Land Use, Significant Habitat, Canso Wind Farm EIS 2006

Sheet: **3.5**



SableWind

Sable Wind Project

Optimized Layout

Project Components

- Turbine Location
- Project Boundary

Strum Layers

- Watercourse
- Drainage
- Wetland

Constraints

- Internal Lot Line - 155m
- Restricted Land Use - 60m
- Public Rd. - 155m
- Hydrology - 30m
- Cemetery/Field - 200m
- Building - 1km
- Campground - 200m
- Coastline - 140m
- Significant Habitat - 60m
- Slope > 15%

Provincial Layers

- Building
- Substation
- Tower
- Lighthouse
- Track/Trail
- Local
- Arterial
- Public Road
- Chapel Gully Trail
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Restricted Use Lands
- Significant Habitat
- Sewage Settling Pond
- Tank
- Campground/Park
- Cemetery
- Heliport
- Pit
- Sports Field

Notes:

1. Turbine Location point symbol ~ 22m in diameter

0 100 200 400 600 Meters

Date: June, 2012

Scale: 1:13,000
Projection: UTM Zone20 NAD83
Sources: DNR, GeoBase, NSTDB 1:10,000, Restricted and Limited Land Use, Significant Habitat, Enercon, Strum

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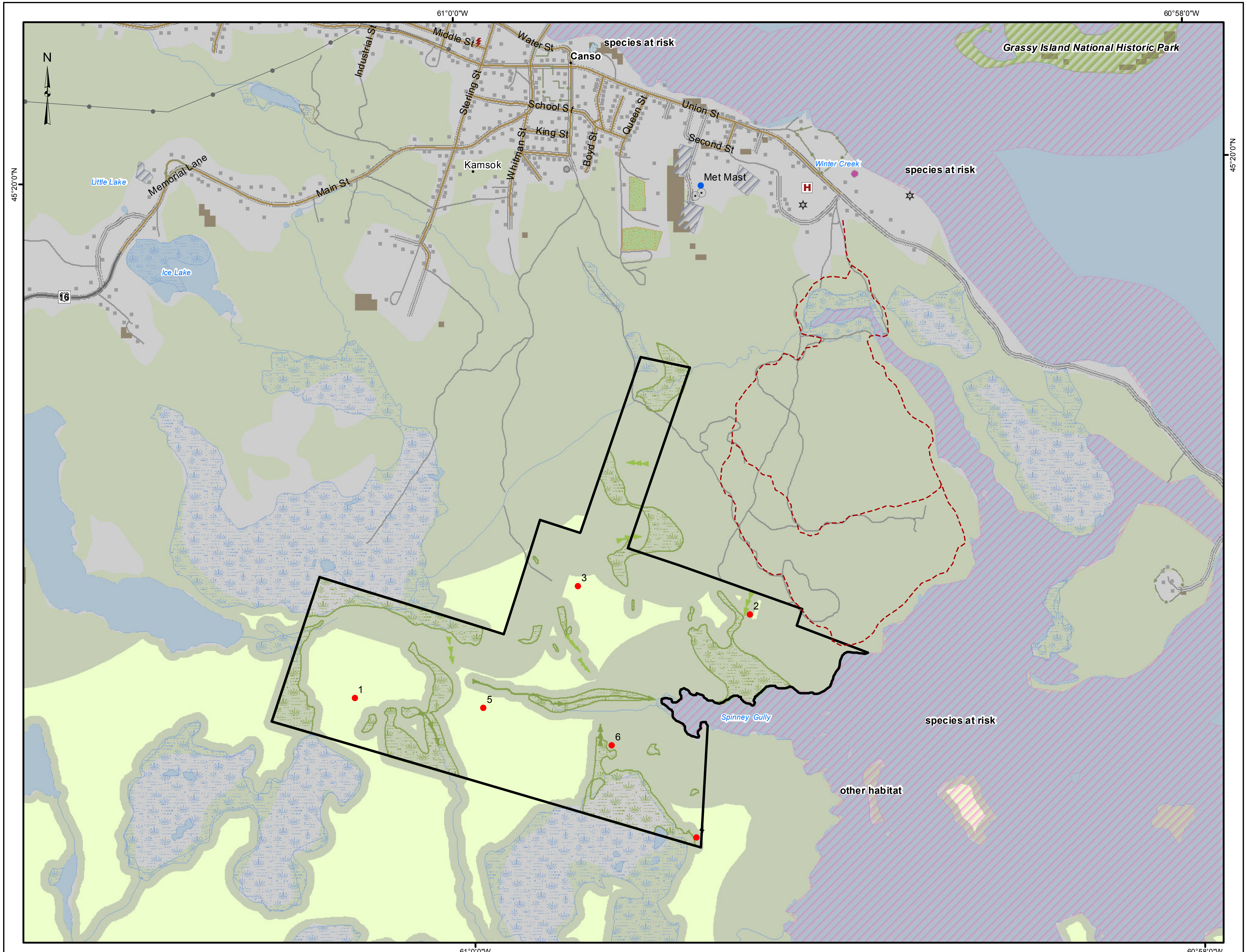
Sheet: **3.6**



SableWind

Sable Wind Project

Final Layout

Project Components	Provincial Layers
Turbine Location	Building
Met Mast	Substation
Project Boundary	Tower
Strum Layers	Lighthouse
Watercourse	Track/Trail
Drainage	Local
Wetland	Arterial
Constraints	Public Road
Internal Lot Line - 155m	Chapel Gully Trail
Restricted Land Use - 60m	Transmission Line
Public Rd. - 155m	Watercourse
Hydrology - 30m	Waterbody
Cemetery/Field - 200m	Wetland
Building - 1km	Restricted Use Lands
Campground - 200m	Significant Habitat
Coastline - 140m	Sewage Settling Pond
Significant Habitat - 60m	Tank
Slope > 15%	Campground/Park
	Cemetery
	Heliport
	Pit
	Sports Field

Notes:

1. Turbine Location point symbol ~ 22m in diameter

0 100 200 400 600 Meters

Sheet: 3.7

Date: June, 2012

Scale: 1:13,000
Projection: UTM Zone20 NAD83
Sources: DNR, GeoBase, NSTDB 1:10,000, Restricted and Limited Land Use, Significant Habitat, Enercon, Strum

3.7 VEC Selection

Based on preliminary investigations, provincial guidance, constraints analysis and the collective knowledge and expertise of the Project team, the following list of potential VECs will be used for analysis of potential impacts and mitigation:

- Air quality;
- Surficial geology (soil);
- Bedrock geology;
- Groundwater;
- Aquatic habitats;
- Fish and fish habitat;
- Terrestrial habitat;
- Wetlands;
- Fauna;
- Flora;
- Avifauna;
- Bats;
- Acoustics;
- Visual aesthetic;
- Radar/telecommunication;
- Transportation;
- Land use/recreation;
- Archaeological resources;
- First Nations resources;
- Local communities; and
- Human health and safety.

4. BIOPHYSICAL ENVIRONMENT AND EFFECTS MANAGEMENT

4.1 Atmospheric Environment

4.1.1 Weather and Climate

Nova Scotia's climate is quite varied and is largely governed by coastal influences and elevation (Davis and Browne, 1996). The Property Boundary (centered at 657148.796 E, 5020195.129 N) lies within the Atlantic Coast Ecoregion of Nova Scotia, which extends from Digby to Scatarie Island off the coast of Cape Breton Island (Webb et al., 1999; Neily et al., 2003). This region is characterized by short, cool summers and relatively mild, wet winters (Neily et al., 2003). The typical growing season in the area of the Property Boundary is 202 days (Webb and Marshall, 1999).

The closest weather station to Canso is Hart Island (45°12'N, 60°59'W, 2.3 km); it has been recording temperatures and wind gusts since 1995. Based on the historical results from this station, the temperature typically varies from -7^{o}C to 21^{o}C and is rarely below -12^{o}C on a yearly basis (Weather Spark, 2012). The warmest weather typically occurs from mid-June to mid-September with average highs of 21^{o}C and average lows of 15^{o}C (Weather Spark, 2012). The coldest weather typically occurs from mid-December to mid-March with average lows of -7^{o}C and average highs of 0^{o}C (Weather Spark, 2012). On average, a typical year will have wind speeds that vary from between 1m/s to 13 m/s, rarely exceeding 17 m/s. The highest average wind speed of 9 m/s occurs during the winter months. The lowest average wind speed of 5 m/s occurs during the summer months. The wind gusts most often from the southwest, northwest and west (18%, 16% and 15% of the time respectively). The wind gusts least often from the north east and south east (5% and 6% of the time respectively) (Weather Spark, 2012).

Hart Island does not record precipitation data; therefore, the Deming weather station was also analysed. Based on its proximity to Canso and its location at the coast, Deming is most likely to have very similar climate conditions to Canso. Local temperature data was obtained from the Deming meteorological station (44 ^{o} 12'N, 63°10'W) located approximately 18 km to the northwest of the Property Boundary. For the period from 1971-2000, the temperature typically varies from -4^{o}C to 17^{o}C and is rarely below -8^{o}C on a yearly basis (Environment Canada, 2012a). January and February were the coldest months (-4.1 and -4.5°C, respectively), while the warmest months were August and September (17.1 and 14.7°C, respectively) (Environment Canada, 2012a).

From 1971-2000, mean annual snowfall and rainfall were 109 and 132 cm respectively (Environment Canada, 2012a). Mean snowfall amounts are spread out across the months of December (21.5 cm), January (25.2 cm), February (26.0 cm) and March (20.4 cm), while the rainiest months are May, October, November and December (115.9, 145.4, 141.5 and 120.5 mm, respectively) (Environment Canada, 2012a).

Not all stations within Nova Scotia collect data for fog, ice fog or freezing fog. Table 4.1 shows the data available from Environment Canada's current weather stations.

Table 4.1: Fog, Ice Fog or Freezing Fog Data for Nova Scotia Weather Stations

Location	Distance from Canso	Average number of fog days per year	Average foggiest month	Average least foggiest month
Sydney (46^{o}N, 60^{o}W)	108 km north east	76	May (12 days)	October (3 days)
Halifax Airport (44.9^{o}N, 63.5^{o}W)	200 km south west	119	July (16 days)	February (6 days)
Shearwater (44.6^{o}N, 63.5^{o}W)	211 km south west	101	July (16 days)	December (4 days)
Greenwood	308 km north	34	July (5 days)	January,

(45°N,64.9°W)	west			February, April, May, November, & December (2 days each)
Yarmouth (43.8°N, 66.1°W)	438 km south west	117	July (20 days)	December (4 days)

Source: The Weather Network, 2012a-e

Historical data for Canso from 1964 – 1971 was reviewed for fog; based on this review, the data presented above in Table 4.1 is representative of the conditions recorded. The data for Canso was recorded on a 3-hr basis and may actually be considered more accurate than data recorded above because it was completed by direct observation.

Based on the above information and the reviewed 1964-1971 data, it is possible that Canso could be expected to average 100 days of fog annually, however data from 1964, 1968 and 1971 indicated that fog-days during those years were 79, 69, and 89 days, respectively. Based on the 5 locations around the province, it would be expected that the foggiest months will be May through July (this trend was also evident in the 1964-1971 data), coinciding with the least windy timeframe.

Lighting of the turbines is known to have an impact on bird behaviour in heavy fog; this has also been considered, and all lights (except for the navigation beacon lights) will be "on-demand".

Fog can impact the behaviour of avifauna. Please refer to Section 4.7 for more information on interactions with fog and birds.

4.1.2 Air Quality

Nova Scotia monitors air quality at six stations throughout the province. Measured parameters include ground-level ozone (O_3), particulate matter (PM2.5), and nitrogen dioxide (NO_2), and these values are used to calculate a score on the Air Quality Health Index (AQHI) (Environment Canada, 2011b). The AQHI is a scale from 1-10+, in which scores represent the following health risk categories: Low (1-3), Moderate (4-6), High (7-10), and Very High (10+) (Environment Canada, 2011b).

The AQHI monitoring station closest to the Property Boundaries is located in Port Hawkesbury, approximately 42 km (geographically) northeast of the Property Boundaries. The AQHI at this site is usually low at all times of the year (Environment Canada, 2011c).

4.1.3 Effects and Mitigation

The potential impact of wind facilities on the atmospheric environment occur primarily during the construction phase, with the longer term impacts during Operations and Maintenance primarily from on-site vehicle emissions and fog.

Wind turbines are a source of green energy production as the conversion process from the kinetic energy from the wind to mechanical energy created by the turbine does not involve combustion of fuels. However, some emissions will be realized during both the construction and operational phases of the project from both on-site vehicles and heavy equipment. Potential effects to the atmospheric environment during the different phases of the Project are identified in Table 4.2.

Table 4.2: Potential Effects on the Atmospheric Environment

Potential Effect	Source of Effect	Project Phase*		
		C	**M/O**	**D**
Airborne particulates and dust	Dust and particulates occurring as a result of ground work (i.e. excavation, grading and exposed surfaces).	✔		✔
	Dust and particulates sourced from transportation of materials (i.e. mud on truck loads and collection of mud on wheels).	✔		✔
	Particulates and dust as a result of blasting activities (if required).	✔		
	Stockpiled material becoming airborne	✔		✔
Increased vehicle emissions	Release of CO_2, nitrous and sulphur oxides from trucks, on-site machinery, service vehicles and maintenance equipment	✔	✔	✔
Interact of avifauna with turbines during fog events	Avifauna mortality due to inhibited ability to navigate safely in the fog		✔	

**C – Construction phase M/O Maintenance/Operational Phase D – Decommissioning Phase*

The following measures will be implemented to minimize or eliminate impacts to the atmospheric environment and its potential interaction with avifauna:

- Development and implementation of an Environmental Protection Plan (EPP) for the Project, which will include provisions for erosion and sediment control, emission controls, and dust control;
- Contractor requirements that address all applicable air quality criteria during construction;
- Monitoring of complaints and implementation of appropriate actions, as required;
- Installation of stropping navigational lighting (as required by Transport Canada); and

- Installation of all other lights as "on-demand", with a process in place to ensure that lighting is minimized during heavy and/or prolonged fog events.

Mitigation measures described above are considered to be standard best practices and are expected to address potential impacts. Therefore, atmospheric environment is not assessed further. The interaction between avifauna and fog is further addressed in Section 4.7.

4.2 Geophysical Environment

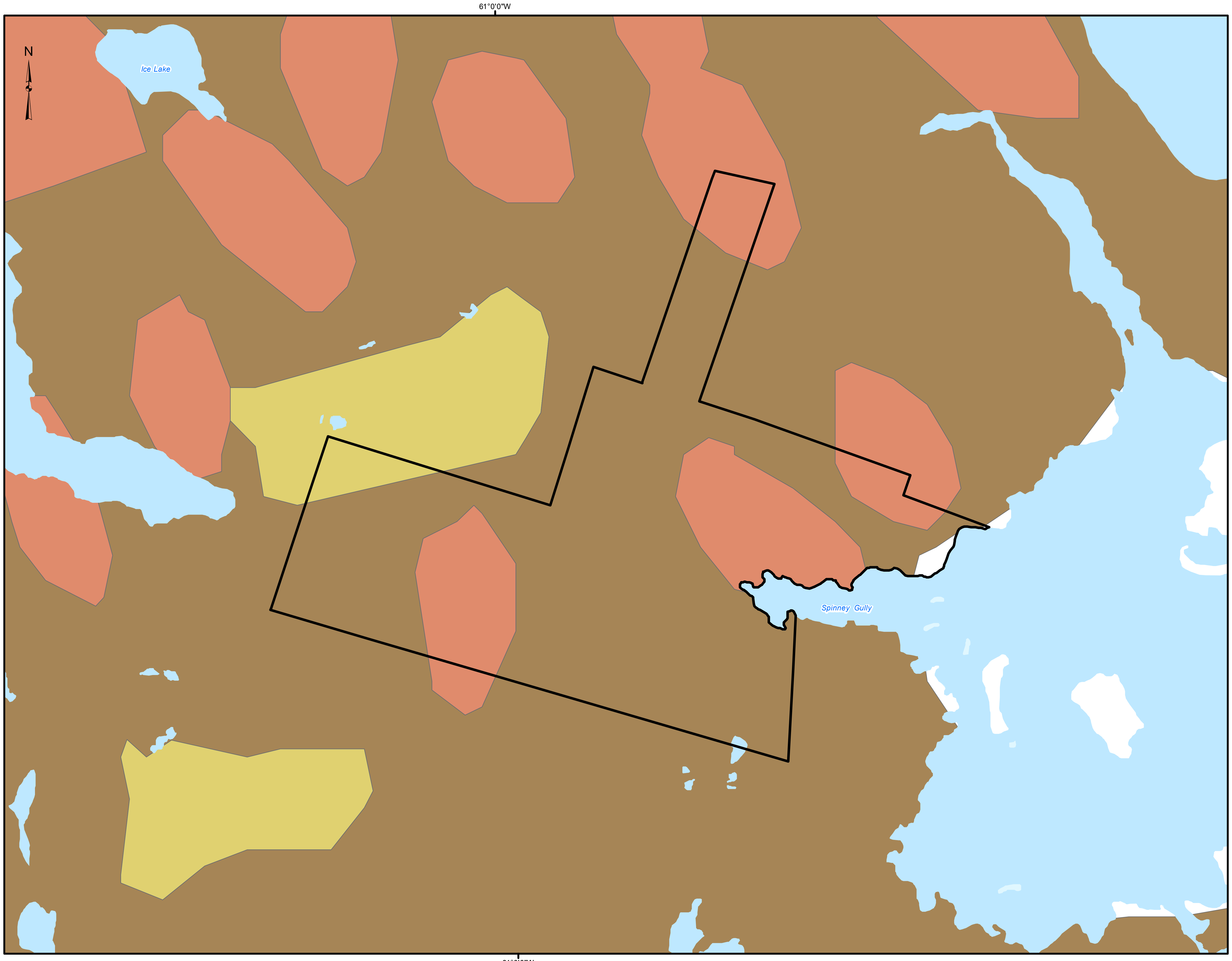
4.2.1 Physiography and Topography

The Property Boundaries are located within the Atlantic Coast Ecoregion, which consists of a narrow strip along the southeastern coastline of Nova Scotia from Digby to Scatarie Island off the east coast of Cape Breton (Webb et al., 1999; Neily et al., 2003). Topography is characterized by undulating to rolling coastal landscape; the coastline is irregular with estuaries and headlands, resulting in an indented coast with fringed islands (Webb et al., 1999; Neily et al., 2003). Elevation of the site ranges from 5 m to upwards of 30 m above sea level; overall, the site generally slopes downwards to the south and east, towards the Atlantic Ocean (Webb et al., 1999; Neily et al., 2003).

4.2.2 Surficial Geology

The Property Boundaries are located within the physiographic subdivision of the Atlantic Uplands (Stea et al., 1992). The surficial geology of the site is characterized by two different units: bedrock and silty till plain drumlins (Drawing 4.1) (Stea et al., 1992). The bedrock is overlain by a silty material which is derived from both local and distant sources (Stea et al., 1992). This material creates a rolling topography with thicker till masking bedrock undulations. Drumlins appear throughout the site ranging from 4 – 30 m in depth (Stea et al., 1992). The bog located south of the Property Boundary is classified as an organic deposit composted of sphagnum moss, peat and clay (Stea et al., 1992). These organic deposits can range in depth from 1 m at the edge to 5 m in the centre (Stea et al., 1992).

Soils in the area are predominately very thin or non-existent. Over the granitic bedrock, where soil cover is evident, the majority of the soils feature a well-drained sandy loam, interspersed with many boggy areas (Stea et al., 1992).



Sable Wind Project

Surficial Geology

Project Components

Project Boundary

Provincial Layers

Other Road

Local Roads

Collector

Arterial

Waterbody

Geology By Unit

Bedrock

Organic Deposits

Silty Drumlin

Notes:

0 75 150 300 450 Meters

Date: June, 2012

Scale: 1:11,000
Projection: UTM Zone20 NAD83
Sources: NSDNR Minerals & Energy Map ME 1992-3, NSTDB 1:10,000

No guarantee is given as to the accuracy or currency of any of the data. The cadastral information portrayed has no legal value and should only be used as a guide.

Sheet:

4.1

4.2.3 Bedrock Geology

Bedrock geology across the site consists of two types: Early Cambrian aged slate of the Goldenville Formation and Middle to Late Devonian aged granite of the Liscomb Complex (Keppie, 2000) (Drawing 4.2).

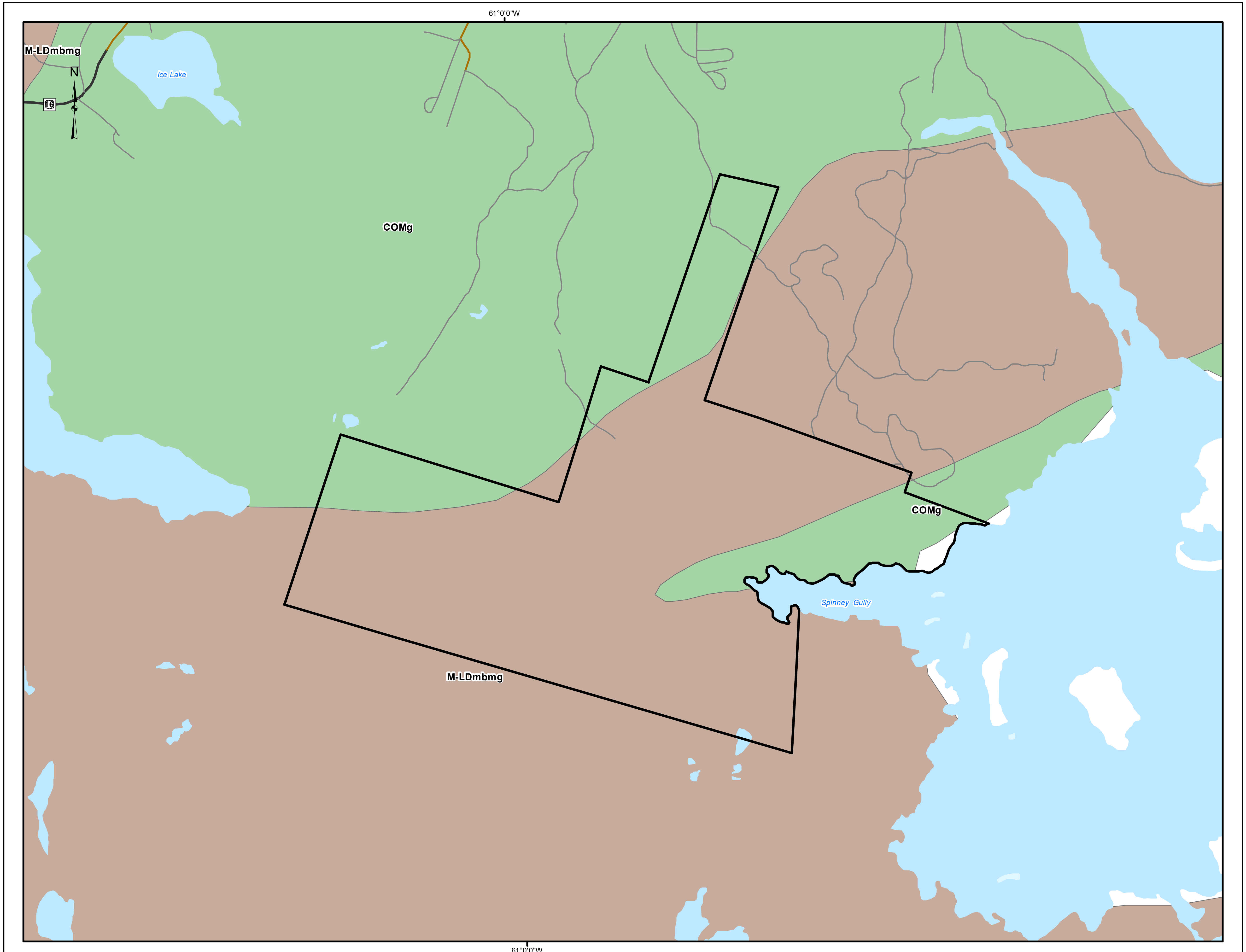
The Canso Barrens extend northeastwards from New Harbour to Cape Canso. The area is composed of round bodies of granite intruded into Meguma Group slates and greywacke (NS Museum of Natural History, 2012). The Meguma greywacke and slates have been extensively metamorphosed to form schists (NS Museum of Natural History, 2012). The granite appears as knolls in the landscape, rising up to 200 m above sea level (NS Museum of Natural History, 2012).

The main composition of granite within the site is muscovite biotite monzogranite. Granites have low matrix permeability, and fracture systems contribute the only significant permeability in these rocks (NS Museum of Natural History, 2012).

Sulfides occur in trace amounts throughout all granite rock units but concentrate locally near the contact with the sulphide-rich Meguma Group (Poulson et al., 1991; Samson, 2005). Geology mapping indicates a small portion of the Goldenville Formation of the Meguma Group lies within the Property Boundary; it is unlikely that any turbines will be located within this formation since it is immediately adjacent to shoreline. There is also a large deposit of this formation north of the Property Boundaries. The Goldenville Formation in other locations within Nova Scotia has been associated with Acid Rock Drainage (ARD).

ARD occurs when sulphide bearing rocks are exposed to oxygen and water, causing a natural oxidation process which can acidify the water. When this is coupled with surface run off into a watercourse or a wetland, habitat and species can be impacted.

Granitic regions in general are prone to higher levels of uranium in the subsurface. Radon gas is the radioactive gas that is formed when uranium breaks down naturally (NSEL, 2012). When radon is released to outdoor air, it is diluted by the atmosphere and is not a concern. However, in enclosed spaces like dwellings, it can sometimes accumulate to high levels (NSEL, 2012). The current Canadian guideline for radon in indoor air for dwellings is 200 Becquerels per cubic meter (200 Bq/m^3) (NSEL, 2012). Radon gas concentrations are shown to dissipate very rapidly to negligible concentrations in ambient air a mere 10 cm above the ground directly over the mineralized source (Goodwin, 2008).



SableWind

Sable Wind Project

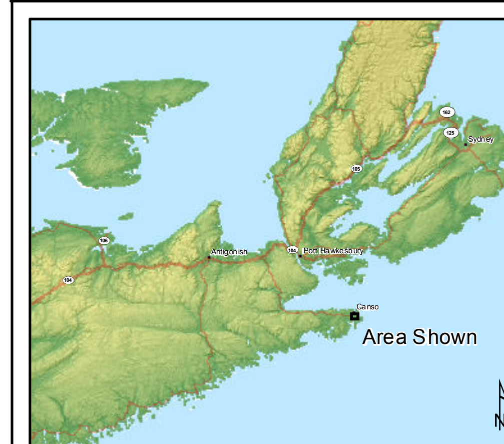
Bedrock Geology

Project Components
- Project Boundary

Provincial Layers
- Track/Trail
- Local Roads
- Collector
- Arterial
- Waterbody

Geology By Formation
- Goldenville Formation
- Middle - Late Devonian muscovite biotite monzogranite

Notes:



0 75 150 300 450 Meters

Date: June, 2012

Scale: 1:11,000
Projection: UTM Zone20 NAD83
Sources: NSDNR Minerals & Energy Map ME-2000-1, NSTDB 1:10,000

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4.2