TRURO HEIGHTS COMMUNITY WIND PROJECT

ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT

Proponent
Truro Heights Wind Limited Partnership

Document Prepared By
Strum Consulting

May 2013

May 3, 2013

Mr. Steve Sanford
Nova Scotia Environment
5151 Terminal Road, 5th floor
Halifax, NS B3J 2P8

Dear Mr. Sanford,

Re: Environmental Assessment Registration
Truro Heights Community Wind Project

Truro Heights Wind GP, Ltd. in its Capacity as general partner for Truro Heights Wind Limited Partnership Truro Heights Wind Limited Partnership is pleased to submit the Truro Heights Community Wind Project Environmental Assessment Registration Document to Nova Scotia Environment.

Contact information is provided as follows:

Danny Splettstosser, Secretary
Heights Millbrook Wind GP, Ltd.
4845 Pearl East Circle,
Suite 200, Boulder, Colorado 80301, USA
Phone: 303.953.5180
Email: splettstosser@juwi.com

Should you have any questions or concerns, please do not hesitate to contact us.

Thank you,

Danny Splettstosser
Secretary
Truro Heights Wind GP, Ltd. in its Capacity as general
partner for Truro Heights Wind Limited Partnership

EXECUTIVE SUMMARY

Truro Heights Wind Limited Partnership has proposed to develop a 4.0 megawatt, two-turbine wind project in the community of Hilden, Nova Scotia. The proponent is Truro Heights Wind Limited Partnership, a partnership between the Eskasoni First Nation and juwi Wind Canada Ltd. The partnership is utilizing Community Wind Farms Inc. for local development services. The proposed Project location is approximately 5.5 km southwest of Truro, Nova Scotia in the Municipality of the County of Colchester (45°18'55"N, 63° 20'26"W), and will consist of approximately 44.5 ha of privately owned land (PID 20206330). The Project will be co-located with another proposed 6.0 MW, three-turbine wind project (Millbrook Community Wind), which will be majority owned by the Millbrook First Nation. These two projects combined result in five turbines and will have the total capacity to generate approximately 10 MW and provide power to 3,300 homes.

The Truro Heights Wind Project has been developed in support of Nova Scotia's "Renewable Electricity Plan: A Path to Good Jobs, Stable Prices and a Cleaner Environment", which is a strategic plan designed to decrease the province's dependence on carbon-based energy sources (fossil fuels) and move towards greener, more affordable and more reliable sources of electricity. The Project is proposed under the province of Nova Scotia's recently developed Community Feed-In-Tariff program.

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 Environmental Assessment and the registration document have been completed according to the methodologies and requirements outlined in the document "A Proponent's Guide to Wind Power Projects: Guide for Preparing an Environmental Assessment Registration Document", as well as accepted best practices for conducting environmental assessments. As the Project consists of two turbines, it is considered a small project. Based on the known existence of four bird species considered to be provincially 'At Risk' or 'Maybe at Risk'; and the presence of bat hibernacula less than 25 km from the Project site, the Project is classified as having a 'Very High' potential sensitivity. As such, the Project is determined to be a Category 4.

As part of the methodology of the assessment, a number of environmental components were identified and evaluated based on the potential for interaction with the Project:

- Atmospheric environment;
- Geophysical environment;
- Freshwater environment (including fish and fish habitat);
- Terrestrial habitat (including wetlands);
- Terrestrial vegetation;
- Terrestrial fauna;
- Avifauna;
- Bats;
- Local demographics and industry;
- Land use and value;
- Recreation and tourism;

- Cultural and heritage resources;
- Mi'kmaq resources;
- Human health;
- Shadow flicker;
- Electromagnetic interference;
- Visual landscape; and
- Sound.

Details of this preliminary assessment are provided in Section 7.1. Based on field data, associated research and the expertise of the Project team, mitigation strategies and best management practices that were identified in Section 4.0 were applied to each component to avoid or mitigate potential effects of the Project. Where these practices and strategies were considered to be insufficient to fully mitigate potential effects, or where additional information was required, the component was identified as a valued environment component and subject to further assessment. The following valued environment components were identified:

- species of conservation interest;
- avifauna; and
- bats.

An effects assessment was then completed for each valued environment component (Section 14). The effects assessment utilized an interaction matrix to evaluate interactions between the Project phases and each valued environment component and then considered the following elements to assess potential effects:

- Description of potential negative environmental effects;
- Mitigation measures;
- Residual effects;
- Significance of residual environmental effects; and
- Monitoring or follow up programs.

Best practices and standard mitigation methods will be implemented during all phases of the Project, to ensure methods and practices are comprehensive and are adhered to. Furthermore, an environmental protection plan will be developed and communicated to all employees working on the Project. The potential for accidents and malfunctions was also considered for each Project phase.

The effects assessment for the identified valued environment components determined that there are no significant environmental concerns or impacts (residual or cumulative) that may result from the Project that cannot be effectively mitigated or monitored.

The Project team is committed to ongoing consultation with government stakeholders, First Nations communities, and members of the local community throughout all phases of the Project.

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List of Acronyms

ACCDC	Atlantic Canada Conservation Data Centre
ARD	Acid Rock Drainage
ARIA	Archaeological Resource Impact Assessment
ATV	All-terrain Vehicle
AQHI	Air Quality Health Index
BMP	Best Management Practice
CanWEA	Canadian Wind Energy Association
CCME	Canadian Council of Ministers of the Environment
CEA	Cumulative Effects Assessment
CEAA	Canadian Environmental Assessment Act
COMFIT	Community Feed-In-Tariff
CORDA	Colchester Regional Development Agency
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPI	Consumer Price Index
CSA	Canadian Standards Association
CWS	Canadian Wildlife Service
CWFI	Community Wind Farms Inc,
dBA	Decibel
DEM	Digital Elevation Model
DFO	Fisheries and Oceans Canada
DND	Department of National Defense
EA	Environmental Assessment
EC	Environment Canada
EMF	Electromagnetic Field
EPP	Environmental Protection Plan
ESCP	Erosion and Sediment Control Plan
GHG	Greenhouse Gas
GIS	Geographical Information System
HC	Health Canada
IBAs	Important Bird Areas
IBoF	Inner Bay of Fundy
IPCC	Intergovernmental Panel on Climate Change
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
MBBA	Maritime Breeding Bird Atlas
MBCA	Migratory Birds Convention Act
MEKS	Mi'kmaq Ecological Knowledge Study
MORI	Market & Opinion Research International
MSDS	Material Safety Data Sheet
MTO	Ministry of Transportation of Ontario
MW	Megawatt
NOAA	National Oceanic and Atmospheric Administration
NRCan	Natural Resources Canada
NSDE	Nova Scotia Department of Energy
NSDNR	Nova Scotia Department of Natural Resources
NSE	Nova Scotia Environment
NSEA	Nova Scotia Environment Act
NSESA	Nova Scotia Endangered Species Act
NSMNH	Nova Scotia Museum of Natural History
NSPI	Nova Scotia Power Inc.
NSTBD	Nova Scotia Topographic Database
NSTIR	Nova Scotia Department of Transportation and Infrastructure Renewal
NWCC	National Wind Coordinating Collaborative
PID	Property Identification Number

OHSA	Nova Scotia Occupational Health and Safety Act
RABC	Radio Advisory Board of Canada
RCMP	Royal Canadian Mounted Police
REMO	Regional Emergency Management Organization
SARA	Species at Risk Act
SOCI	Species of Conservation Interest
SWPP	Source Water Protection Plan
TAFL	Technical and Administrative Frequency Lists
TSS	Total suspended solids
UTM	Universal Transverse Mercator
VEC	Valued Ecosystem Component
WHMIS	Workplace Hazardous Materials Information System
ZVI	Zone of Influence

1.0 PROJECT INFORMATION

1.1 Project Introduction

Truro Heights Wind Limited Partnership intends to construct and operate a 4 megawatt (MW) wind project (the Project) at a site in the community of Hilden. The Project is to be "co-located" directly adjacent to the proposed Millbrook Community Wind Project (6 MW project). The two Projects are expected to share common infrastructure (e.g. road access and utility right of way) and will be constructed on similar timelines. Therefore, for the purposes of the environmental assessment (EA), the two Projects are largely presented together as one Project site, incorporating turbines 1 to 3 on PID 20215711 (Millbrook Community Wind), turbines 4 and 5 situated on PID 20206330 (Truro Heights Community Wind), and all associated access roads within those boundaries. The extension of Tower Road to the Project site (extends across PIDs 20206595, 20206629, 20206546, and 20354015), is also evaluated as part of the EA and is referred to as the "Tower Road Extension". Further details on the spatial boundaries of the assessment can be found in Section 6.3.

The Project has been developed in support of Nova Scotia's "Renewable Electricity Plan: A Path to Good Jobs, Stable Prices and a Cleaner Environment" (Renewable Electricity Plan) (NSDE 2010), which is a strategic plan designed to decrease the province's dependence on carbon-based energy sources (fossil fuels) and move the province towards greener, more affordable and more reliable sources of electricity. Nova Scotia recognizes the numerous benefits of supporting the development of renewable energy within the province, as currently 82% of the province's energy comes from non-renewable sources, mostly from outside of the province (NSPI 2013). Dependence on fossil fuels increases the vulnerability of Nova Scotians to rising international energy prices, weakens energy security, and takes valuable revenue out of the province (NSDE 2010). Negative impacts to human health, particularly in developing countries, and the environment, mainly in the form of climate change, are among the widely cited problems associated with fossil fuel consumption around the world.

In its most recent assessment report, "Climate Change 2007 - Impacts, Adaptation and Vulnerability", the United Nations Intergovernmental Panel on Climate Change (IPCC) provides a detailed synopsis of the impacts associated with climate change on both global and regional scales. Evidence from all continents indicates that many biological systems and habitats are currently being affected by regional climate change. Ecological changes include: changes to the thermal dynamics and quality of aquatic habitats; shifts in migratory timing and ranges of fauna and flora; changes in fish abundance; and increased risk of extinction and loss of forest habitat (IPCC 2007).

Canadian climate experts acknowledge that the debate has largely evolved from questions about the reality and causes of climate change, to what actions can be taken to adapt to the realities of a changing climate. As the second most important and fastest growing (along with solar) renewable energy source in Canada (NRCan 2009), wind energy is a critical component of Canada's renewable energy strategy. Wind energy is emission-free, with every MW of wind energy generated reducing greenhouse gas (GHG) emissions by as much as 2,500 tons per year, and improving air quality (NSDE 2009).

The goal of Nova Scotia's Renewable Electricity Plan is to gradually transition the province of Nova Scotia to local, renewable energy sources, including wind, tidal and solar technologies. In order to

reach this objective, the province has set a commitment of 25% renewable energy by 2015, and 40% by 2020 (NSDE 2010). The plan encourages the participation of community-based organizations in this opportunity, through the incorporation of the community-based feed-in tariff (COMFIT) program. Numerous benefits can be expected from the transition to renewable energy, and may include:

- Long term stability in energy prices;
- Long term security in locally-sourced energy supply, and decreased dependence on international markets;
- Creation of jobs and economic opportunities throughout the province;
- Community investment and economic return;
- Protection of human health and the environment;
- Retaining revenue within the province;
- Educational opportunities for youth and the broader community about renewable energy technology, its benefits, and the role played in Nova Scotia's energy future.

As part of this overall strategy, the Truro Heights Community Wind Project, combined with the Millbrook Community Wind Project, will contribute to meeting Nova Scotia's renewable energy goals by producing enough green energy to provide 3,300 NS homes with stable, locally-produced renewable energy.

The Project is committed to sharing economic opportunities with the local community and First Nations communities, throughout the development and life-span of the Project. Long term economic benefits will be created from the Project through job creation, tax revenue, revenue for the Eskasoni First Nation, and the creation of a community sustainability fund. As the lead proponent of the Project, Eskasoni First Nation will be critical to forming successful, long-term professional relationships with these communities, ensuring local job-creation and the utilization of local Mi'kmaq contractors. No public funding is required for this Project.

1.2 Project Summary

This section of the EA report provides a summary of the Project, description of the proponent, and regulatory requirements. The structure of the overall document and the investigators and authors involved are also provided.

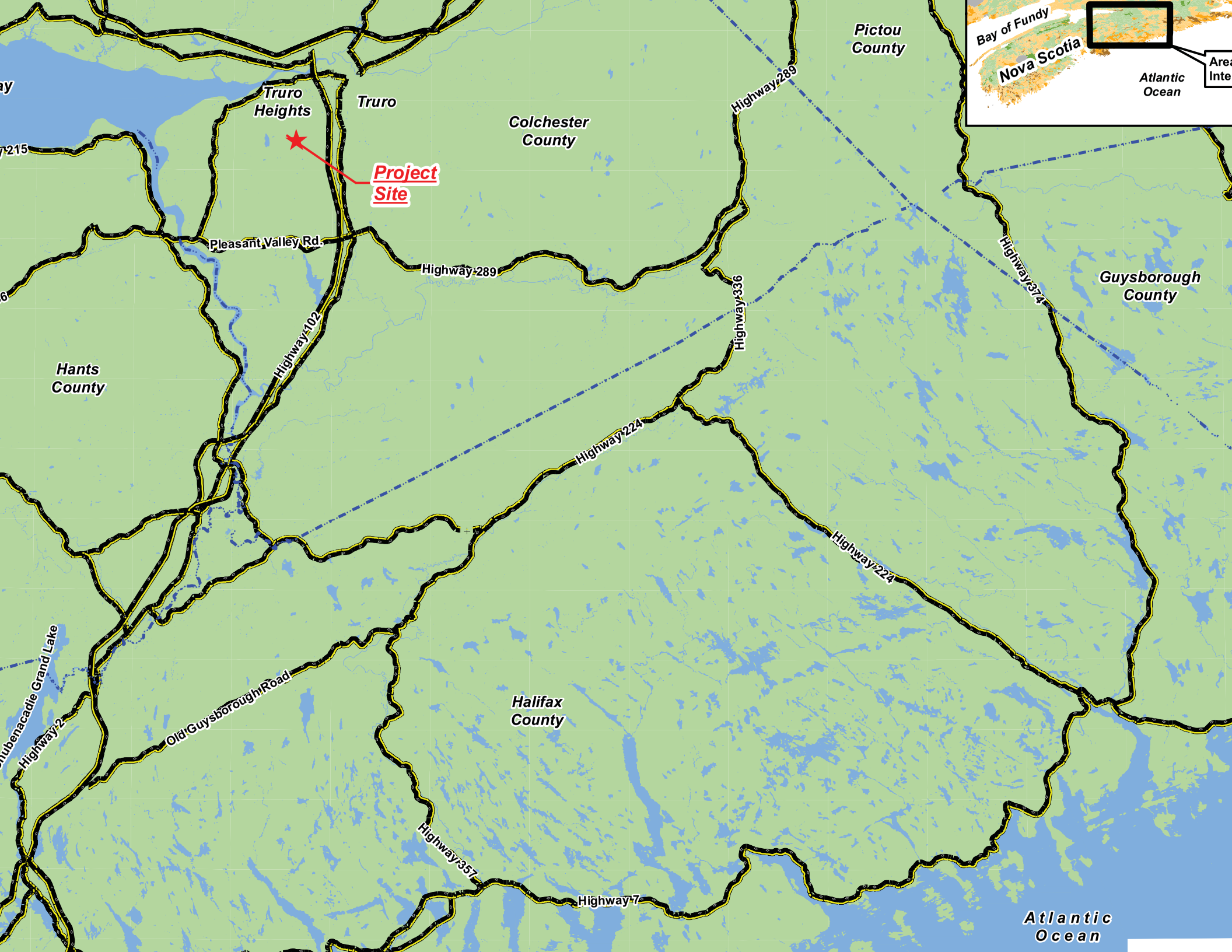
Table 1.1: Project Summary

General Project Information	Truro Heights Wind Limited Partnership intends to construct and operate a 4 MW wind project at a site in the community of Hilden. The Project will be constructed and operated conjointly with the Millbrook Community Wind Project, which consists of a 6 MW wind project proposed by the Truro-Millbrook Wind Limited Partnership.
Project Name	Truro Heights Community Wind Project
Proponent Name	Truro Heights Wind Limited Partnership
Proponent Contact Information	Danny Splettstosser 4845 Pearl East Circle, Suite 200, Boulder, Colorado 80301 Phone: 303.953.5180 Fax: 303.953.5185 Email: splettstosser@juwi.com; please cc: j.rogers@juwi.com
Project Location	• The Project is located near the community of Hilden, approximately 5.5 km southwest of Truro, Nova Scotia (Drawing 1.1); • The Project site is located within Colchester County, Nova Scotia; • The approximate center of the Truro Heights Project footprint is located at 45°18'58"N, 63° 20'26"W; • The Truro Heights Project footprint includes Property Identification Number (PID) 20206330.
Landowner(s)	Joseph Wynn (Truro Heights Project footprint) Wade Dickie (Millbrook Project footprint) 3031611 Nova Scotia Ltd. (Tower Road extension)
Closest distance from a turbine to a seasonal or permanent residence	719 m from Turbine 5 (Truro Heights Project footprint) 1.1 km from Turbine 2 (Millbrook Project footprint)
Expected rated capacity of proposed project in MW	4 MW (Truro Heights Project) 6 MW (Millbrook Project)
Project Website	www.truroheightswindfarm.ca

1.3 Proponent Description

The proponent is Truro Heights Wind Limited Partnership, a partnership that is being formed between the Eskasoni First Nation and juwi Wind Canada Ltd. (juwi). The partnership is utilizing Community Wind Farms Inc. (CWFI) for local development services.

Eskasoni First Nation is located alongside the Bras d'Or Lake in Eastern Cape Breton, Nova Scotia. Eskasoni is the largest Mi'kmaq community in the world with close ties to traditional culture and beliefs. The community has a proud history of supporting its young population with events that promote a healthy and active lifestyle among its 4,000 community members. With a dedication to improving the lives of its future generation, the Eskasoni community strives to be culturally rich and respectful of its ecosystem based on concepts of shared responsibility. The Eskasoni First Nation is the lead proponent of the Project. Under the COMFIT rules, the Eskasoni First Nation will be the majority owner of the Project. Additionally, Eskasoni First Nation will be instrumental in ensuring the Project is developed in a manner that is harmonious with the local community and cultural


Truro Heights
Truro
Colchester County
Pictou County
Project Site
Pleasant Valley Rd.
Highway 289
Highway 102
Highway 336
Highway 374
Guysborough County
Hants County
Highway 224
Halifax County
Old Guysborough Road
Highway 2
Highway 357
Highway 7
Atlantic Ocean
Bay of Fundy
Nova Scotia

surroundings. Eskasoni First Nation will also help the team maximize local economic benefits to the community through job creation and utilization of local contractors.

juwi is the Canadian subsidiary of the juwi Group; an experienced renewable energy project developer with more than 2,600 MW of renewable energy projects successfully developed world wide, largely consisting of projects <20 MW each. The juwi Group has an extensive track record of community based projects with local investment opportunities, as well as turn-key projects for local municipalities, and co-operatives. The role of juwi Group will be to lead technical aspects of wind project development, fund early development activities, and act as the lead arranger in Project financing and construction. Upon completion the Project will be minority owned by juwi Wind Canada. Additional information about juwi is available at: http://www.juwinorthamerica.com/ or http://www.juwi.com/.

CWFI has been retained by the Truro Heights Wind Limited Partnership and is responsible for conducting all the day to day development, community relations and permitting work associated with the Project. CWFI is a Nova Scotia based company focused on developing community based wind projects across Nova Scotia. The principals have accumulated 25 years of experience in the development of wind farms in Nova Scotia and across North America, and understand the complexity of the business as well as the benefits that can be passed directly to local communities. CWFI has extensive experience working with municipalities, First Nations, community groups and landowners across Nova Scotia to develop a portfolio of wind farms under the COMFIT program. Additional information about CWFI is available at: http://www.communitywind.ca/.

1.4 Regulatory Framework

1.4.1 Federal

A federal EA is not anticipated to be required for the Project as it is not located on federal land nor is it listed as a physical activity that constitutes a "designated project" as listed under the *Regulations Designating Physical Activities* of the *Canadian Environmental Assessment Act (CEAA)*, (2012).

Additional federal requirements are provided in Section 12.2 and 17.0.

1.4.2 Provincial

The Project is subject to a Class I EA as defined by the *Environmental Assessment Regulations* under the *Nova Scotia Environment Act (*NS*EA)*. 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 document "A Proponent's Guide to Environmental Assessment" (NSE 2009a).

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" (NSTIR 2009).

Additional provincial permits will be required and are listed in this report in Section 17.0.

1.4.3 Municipal

Land use by-laws exist in the Municipality of the County of Colchester, which require approval for wind power projects. Approval is generally in the form of a development agreement. "The Municipality of Colchester Wind Turbine Development Bylaw" outlines licensing requirements, as well as several setbacks and guidelines (Appendix A). All required municipal permits (Section 17.0) and approvals will be obtained prior to construction.

1.5 Structure of Document

Table 1.2 outlines the content of each section of the EA report.

Table 1.2: EA Report Structure

Section	Content
Section 1	Project Information
Section 2	Project Description including an overview of Project location, activities and schedule
Section 3	Project Schedule
Section 4	General Environmental Mitigation/Best Practices
Section 5	Environmental Management
Section 6	Project Scope
Section 7	EA Methodology
Section 8	Biophysical Environment
Section 9	Socio-Economic Environment
Section 10	Cultural and Heritage Resources
Section 11	Mi'kmaq Ecological Knowledge Study
Section 12	Other Considerations
Section 13	Consultation and Engagement.
Section 14	Effects Assessment
Section 15	Effects of the Environment on the Project
Section 16	Cumulative Effects Assessment
Section 17	Other approvals
Section 18	Conclusions
Section 19	References

1.6 Author of the Environmental Assessment

This EA was completed by Strum Consulting, an independent, multi-disciplinary team of consultants with extensive experience in undertaking EAs across Atlantic Canada and internationally. This report was prepared and reviewed by:

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2.0 PROJECT DESCRIPTION

2.1 Turbine Specifications

The Project will be powered by two wind turbines, each rated at 2.0 MW, for a nominal capacity of 4.0 MW in total. Under optimal conditions the turbines will be in operation, or available for operation in excess of 93% of the time over an expected lifespan of 25 years. The turbine model will be selected following the analysis of the wind data from the Project site in summer 2013. Several models have been evaluated as part of the planning process, with some being excluded due to preliminary modeling results related to sound and shadow flicker. Of the technologies still under consideration, modeling has been completed using the turbine specifications that result in the most conservative conditions (e.g. tallest hub height, longest blade length, most power/sound output), as appropriate to the specific modeling assessment.

2.2 Project Phases

The proposed Project will include three phases: site preparation and construction; operations and maintenance; and decommissioning. Activities and requirements associated with each phase are discussed in the following sections. Standard environmental mitigation measures that have been incorporated into Project design are presented in Section 4.0.

2.2.1 Site Preparation and Construction

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

- Staging and storage facilities;
- Temporary offices;
- Laydown areas for construction and maintenance equipment;
- Temporary sanitary facilities;
- Water and rinsing facilities;
- Utilities and communications; and
- Garbage collection and off-site disposal.

Site preparation activities include, but are not limited to:

- Land surveys for placement of roads, turbines, and associated works;
- Geotechnical investigations;
- Placement of erosion and sedimentation control measures; and
- Clearing of trees and grubbing areas for construction.

General construction activities include, but are not limited to:

- Access road upgrading and construction;
- Laydown area and turbine pad construction;
- Transportation of turbine components;
- Turbine assembly;
- Grid connection;
- Removal of temporary works and site restoration; and
- Commissioning.

Weather constraints may affect the proposed schedule and weather dependent activities (e.g. turbine delivery construction) which will be 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 (*1989*).*

Equipment needs will likely include, but may not be limited to:

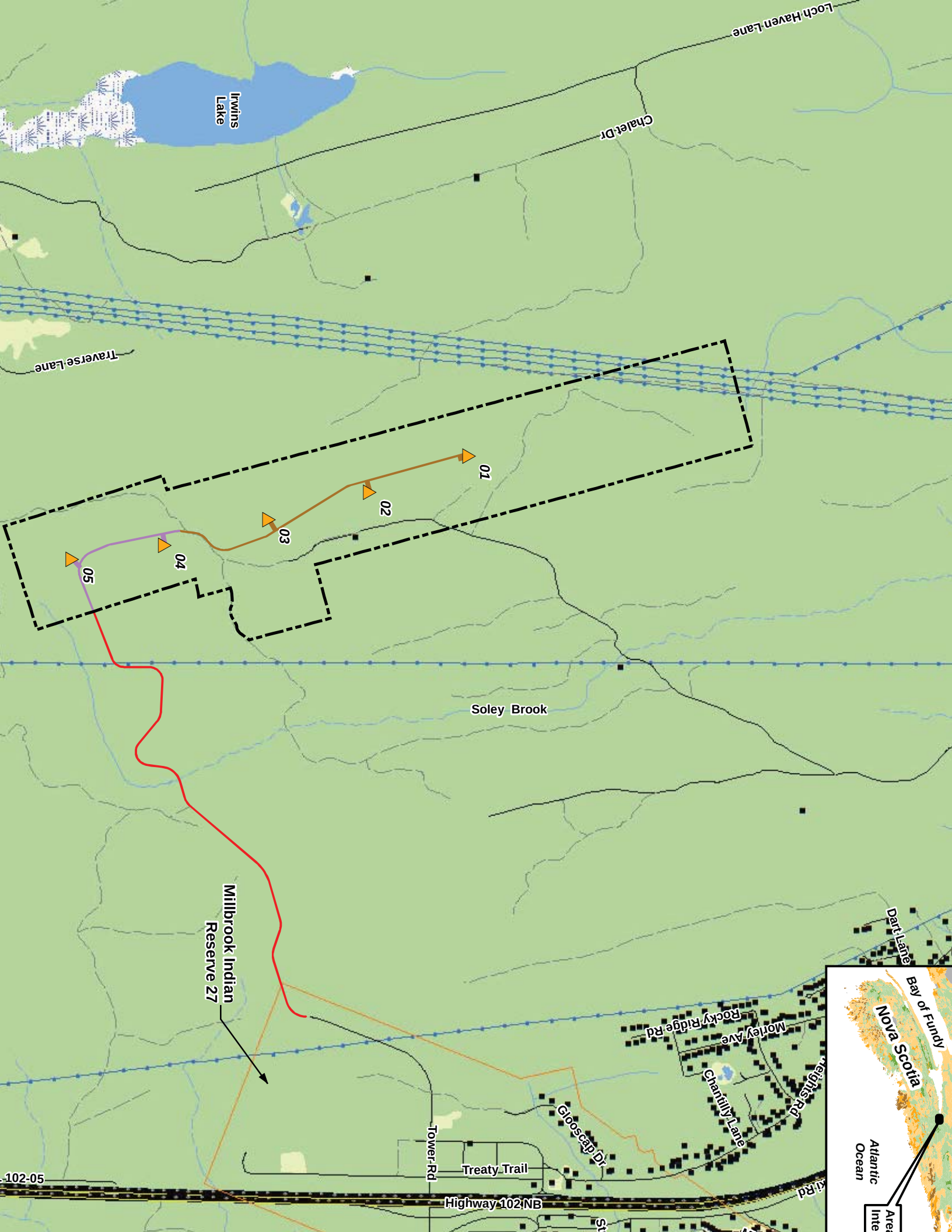
- Light trucks;
- Drilling rigs;
- Backhoes; and
- Bunch feller (and similar harvesting equipment).

Access Road Construction
Approximately 2.4 km of new road construction off of Tower Road will be required to provide direct access to the Project site. Within the Project site boundaries an additional 0.72 km of new road construction will be required to provide access to the Truro Heights turbines (Drawing 2.1). The access road is expected to be 10 m wide, including shoulders and ditching. In some instances, the construction right of way (ROW) width could temporarily be up to 20 m to accommodate cut and fill areas and/or wide turns. Minimal upgrades, if any, are expected for the existing Tower Road.

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 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, or re-used.

The following equipment is typically used during road upgrading and construction:

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


Loch Haven Lane
Irwins Lake
Chalet Dr
Traverse Lane
01
02
03
04
05
Soley Brook
Millbrook Indian Reserve 27
Dart Lane
Rocky Ridge Rd
Morley Ave
Chantilly Lane
Heights Rd
Glooscap Dr
Tower Rd
Treaty Trail
Highway 102 NB
102-05
Bay of Fundy
Nova Scotia
Atlantic Ocean

Laydown Area and Turbine Pad Construction
General activities during the creation of the laydown and turbine pad construction areas may include, but are not limited to:

- Installation of erosion and sedimentation control measures;
- Removal of vegetation;
- Removal of overburden and soils;
- Blasting/chipping of bedrock (to be determined);
- Pouring and curing of concrete pads (complete with reinforcing steel);
- Placement of competent soils to bring area to grade; and
- Compaction of soils.

The tower foundations will be approximately 15 m diameter (typical for a 2 MW wind turbine) and extend to a depth of 3 m below grade.

During construction, the laydown area at each turbine location is expected to be approximately 1 ha in size. Following construction, much of this area will be reclaimed, such that the permanent area of disturbance at each turbine location will be approximately 0.14 ha. The exact arrangement of each turbine pad and crane pad will be designed to suit the specific requirements of the turbine and the surrounding topography during the detailed design process.

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

Equipment expected to be used for laydown area and turbine pad construction includes but is not limited to:

- Excavators;
- Dump trucks;
- Bull dozers;
- Rollers;
- Graders;
- Crusher (not required if a local quarry can supply gravel sizes);
- Concrete trucks;
- Light cranes; and
- Light trucks.

Transportation of Turbine Components
A preliminary Transportation and Access Evaluation was completed to determine appropriate routes and means for equipment and materials to be delivered to the Project site. At this time the exact turbine manufacture and model have not been selected, so a typical 2.0 MW unit was assumed with all components delivered to the Port of Halifax.

A desktop review of possible routes was conducted and an appropriate route was selected and surveyed by field crews. Of the possible conflicts identified, the overpasses on the 102 Highway

pose the largest potential for problems. If wind turbine components are too large to fit under an overpass, an alternate route must be chosen.

It is not anticipated that any of the potential conflicts identified will require major upgrades to existing infrastructure to transport wind turbine components assuming a typical 2.0 MW turbine is selected. While it may be necessary to provide traffic control, temporarily remove street signs and guardrails, and adjust overhead wire crossings to allow trucks to pass, no road infrastructure upgrades are anticipated.

All transportation activities will adhere to provincial timing, size and weight restrictions. Transportation of heavier equipment and materials to the site will adhere to road weight restrictions, including all Spring Weight Restrictions. Access points will be designed with proper height and width to accommodate large trucks and will adhere to commercial stopping sight distances.

The following is the proposed route from the Port of Halifax to the Project site:

1. Truck traffic carrying turbine components will leave the Port of Halifax on Marginal Road and continue to Terminal Road.
2. Traffic will turn right from Terminal Road onto Lower Water Street and continue until Lower Water merges with Barrington Street.
3. Trucks will travel on Barrington Street until the Windsor Street Exchange, where they will continue to the Bedford Highway.
4. Once on the Bedford Highway, truck traffic will continue until reaching Hammonds Plains Road where they will turn left and head west toward the 102 Highway.
5. Traffic will then turn right onto the northbound onramp.
6. Truck traffic will travel northbound on Highway 102 for approximately 80 km until reaching Exit 13A where it will exit and turn left onto Tower Road heading west.
7. Traffic will then travel west on Tower Road for approximately 1 km before entering the Project site access road.

Turbine Assembly

The wind turbine assembly includes tower sections, the nacelle, the hub, and three-blade rotors (a total of eight major components). All sections 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. Specialized equipment may be required for the safe and efficient handling of wind turbine components.

The tower sections will be erected in sequence on the turbine foundation, followed by the nacelle, hub, and rotors (rotors are usually attached to the hub on the ground prior to lifting). This assembly will occur with the use of cranes. Erection will depend on weather, specifically wind and lightening conditions. Typical assembly duration should be between 2 to 5 days.

Equipment expected to be used for turbine assembly includes but is not limited to:

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

Grid Connection
Electricity produced from the turbine will be stepped up to 25.0 kV via a pad mounted transformer, located adjacent to each turbine. The adjacent pad mounted transformers may or may not be required depending on the final turbine model. A power line will connect the turbines, and a line extension from the first turbine will extend the circuit to interconnect with distribution lines owned by Nova Scotia Power Inc. (NSPI) at Tower Road.

Equipment expected to be used for this process includes but is not limited to:

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

Removal of Temporary Works and Site Restoration
Once construction has been completed, all temporary works will be removed and the site will be appropriately graded.

Equipment expected to be used for this process includes but is not limited to:

- 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 the units can begin.

Commissioning will require coordination with NSPI. The performance tests will be completed by qualified wind power technicians and NSPI employees.

Additional testing may also be required for transformers and power lines, all of which will be performed by qualified engineers and technical personnel.

2.2.2 Operations and Maintenance
Maintenance will conform to manufacturer equipment specifications, industry best management practices (BMPs), and standard operating procedures.

The life span of the Project is estimated to be a minimum of 25 years. During this time, roads will be used to access the turbines by staff and maintenance personnel. The roads will be maintained with additional gravel and grading, as required. During the winter months, all roads will be plowed,

sanded, and/or salted, as required for safe driving and to ensure access in the event of an emergency.

A vegetation management plan will be initiated to ensure that access roads and turbine locations remain clear of vegetation. Timing of vegetation management will depend on site specific conditions.

Due to the potential for public access to the wind farm, signage will be affixed and maintained on 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 (e.g. ice throw, high voltage). 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 blades or other turbine components. The most common vehicle during maintenance work will be light/medium pickup trucks.

2.2.3 Decommissioning

As noted above, the operational life of the Project is estimated to be 25 years. Prior to year 25, NSE will be either provided with decommissioning plans or a copy of the new power purchase agreement.

Generally, the decommissioning phase will follow the same steps as the construction phase:

- Dismantling and removal of the turbines from the Project site;
- Removal of the turbine foundations to 3 feet below grade and reinstatement with top soil to ensure stabilization of the land;
- Removal, recycling (where possible), and disposal of conductor, poles and other equipment; and
- Reinstatement and stabilization of land.

3.0 PROJECT SCHEDULE

Table 3.1 presents the Project schedule from EA approval to Project decommissioning.

Table 3.1: Project Schedule

Project Activity	Timeline
Pre-EA Submission Studies	2012 to 2013
EA Approval	Summer 2013
Follow-up Environmental Studies	2013/2014
Geotechnical Assessment	Spring 2013
Engineering Design	Winter 2013-Summer 2014
Power Purchase Agreement	Early 2014
Clearing	Winter 2014
Construction	Spring-Fall 2014
Commissioning	Fall 2014
Operations	2014-2039
Decommissioning	Expected 2040

4.0 GENERAL ENVIRONMENTAL MITIGATION

The following general environmental mitigation is considered to be standard practice and will be implemented as part of the Project design. Specific mitigation, monitoring, and follow-up that may be required to address residual environmental effects are discussed in Section 14.

4.1 Clearing and Grubbing

- Environmentally sensitive features will be identified and clearly marked where feasible (e.g., watercourses, wetlands, areas of high archaeological potential).
- All watercourses will be kept free of chips and debris resulting from clearing activities.
- Appropriate erosion and sedimentation controls will be implemented to stabilize the slopes/banks on either side of watercourses and prevent sediment run-off.
- All clearing and grubbing activities will adhere to provincial timing requirements, as well as those required under the *Migratory Birds Convention Act* (*MBCA*) to avoid key nesting periods for migratory birds.

4.2 Blasting (if necessary)

- Blasting will be conducted in accordance with provincial legislation and subject to terms and conditions of applicable permits.
- All blasts will be conducted and monitored by certified professionals.
- Once the location of any required blasting is confirmed and the geotechnical investigation is completed, the need to implement mitigation measures or monitoring programs will be evaluated (e.g., pre-blast survey, acid rock drainage (ARD)).
- If required, all protective measures will be outlined in the Environmental Protection Plan (EPP) and approved by NSE in advance of blasting activities.
- Landowners will be notified of any blasting activities.
- Where blasting is planned within 500 m of residences, activities will comply with the requirements of any applicable existing by-laws.
- Following any blasting or disturbance of soils or bedrock, exposed soils or bedrock will be recovered with soil and re-vegetated as required to minimize any exposure.
- Blasting near watercourses will only occur in consultation with Fisheries and Oceans Canada (DFO), and will follow the requirements of the *Fisheries Act* as well as the requirement of the DFO Factsheet: "Blasting – Fish and Fish Habitat Protection" (DFO 2010a); and/or the DFO "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters" (Wright and Hopky 1998), as applicable.
- If sulphide bearing materials are identified through pre-construction geotechnical surveys, these areas will be referenced in the EPP.
- Rock removal in known areas of elevated potential will conform to relevant legislation (e.g., the Sulphide Bearing Material Disposal Regulation of the NS*EA*), and in consultation with relevant regulatory departments.

4.3 Transportation

- A notice will be placed in public areas along Tower Road to inform local residents of signage removal or road infrastructure alterations. Removed signage and guardrails will be immediately replaced and appropriate temporary signage will be provided as necessary to ensure public safety.

- To the extent possible, transportation of materials through Halifax will avoid high traffic times (7-9 am and 3-6 pm; Monday to Friday). All travel will be conducted using safe work practices for transporting oversized loads. Consideration will be given to transporting turbine blades and other oversized loads at night to avoid high traffic periods and allow lane closures, as necessary, to navigate turns along the route.
- Equipment transport will utilize a minimum number of vehicles to minimize impacts to road-way flow and impacts on air quality from exhaust.
- Upgrades will be made to roads and overhead wires, branches, and signs if conflicts arise. Modifications and subsequent reinstatement will be completed to NSTIR specifications.

4.4 Avifauna

- Tree clearing activities will be executed in a manner that complies with the *Migratory Bird Convention Act* (*MBCA*) and the *Species at Risk Act* (*SARA*), specifically to avoid incidental take.
- Primary mitigation for avifauna will be through Project planning and scheduling of clearing activities, on a best-efforts basis, to avoid key migratory bird nesting periods.
- Where feasible, vegetation management activities will take place outside of the identified bird breeding season (May-August) and will not involve herbicides.

4.5 Dust and Noise

- Where required, dust will be controlled by using water or a suitable, approved dust suppressant.
- Construction equipment will be maintained in good working order and properly muffled.
- Noise control measures (e.g., sound barriers, shrouds, enclosures) will be used where warranted.
- Noise-generating construction activities will comply with the requirements of existing by-laws (where applicable).
- All reasonable efforts will be made to restrict construction-related noise and lighting to between the hours of 8am – 6pm, wherever possible. During specific phases of construction, completion of some activities (e.g. “flying” of rotors and towers) may be required outside of these hours due to the nature of the Project.
- Construction and decommissioning will be scheduled in consultation with Community Liaison Committee (CLC) to minimize noise impacts.
- Engine idling will be restricted.

4.6 Erosion and Sedimentation Control

Contractors will use the erosion and sedimentation control measures listed below at all sites where soil or sub-soil has been exposed and there is potential for erosion:

- A site specific erosion and sedimentation control plan will be developed as part of the EPP during the design phase of the Project, which will include a drainage plan.
- The area of exposed soil will be limited, and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover) will be minimized through scheduled work progression.
- Both temporary and permanent control measures for erosion and sedimentation will be implemented in an appropriate time frame.

- Erosion and sedimentation control structures will be maintained and inspected regularly with particular emphasis before and after forecasted heavy rain events, and with consideration of the timing and types of activities involved.
- With the exception of temporary water crossing locations, travel through wetlands and within watercourse buffers with machinery will be avoided, when feasible. If travel through a wetland is required, the appropriate mitigation measures will be employed, (e.g., geotextile matting, work timed to occur during frozen ground conditions, and travel routed through drier portions of the wetland).
- Care will be taken to ensure that the potential for surface run-off containing suspended materials or other harmful substances is minimized.
- Where necessary, erosion and sedimentation control measures will remain in place after work is completed, areas have stabilized, and natural re-vegetation occurs. All temporary erosion and sedimentation control materials will eventually be removed from the construction site.
- Permits/approvals related to site construction will be kept on-site.

4.7 Watercourse Crossings

- All required watercourse crossings will comply with existing regulatory requirements including the "Nova Scotia Watercourse Alteration Specifications" (NSE 2010).
- Crossing of watercourses will not result in permanent diversion, restriction, or blockage of natural flow.
- Crossings will be restricted to a single location on a watercourse and occur at right angles to the watercourse or wetland.
- Crossings should be located in areas which exhibit a stable soil type and where grades approaching the crossings will not be too steep.
- The approaches to watercourse crossings will be stabilized with brush mats, where necessary. Stream banks prone to erosion may require additional stabilization. Material used to stabilize/repair stream banks will be clean, non-erodible, and will not come from the stream bank or bed.
- Any wash water from the cleaning of construction vehicles will be disposed of on-site, using standard industry practices and following environmental regulations/guidelines for the protection of watercourses.

4.8 Wetlands

- Wetlands will be avoided to the extent possible. Where unavoidable, wetland crossings/alteration will be completed in accordance with the *Nova Scotia Wetland Conservation Policy* and the wetland alteration application process during the permitting stage of the Project.
- Crossing of wetlands will not result in permanent diversion, restriction or blockage of natural flow.
- Hydrologic function of wetlands will be maintained.
- Run-off from construction activities will be directed away from wetlands.
- Any wash water from the cleaning of construction vehicles will be disposed of on-site, using standard industry practices and following environmental regulations/guidelines for the protection of wetlands.

- Work vehicles and/or heavy equipment will be cleaned and inspected prior to use to prevent the introduction of weed/invasive/non-native species to sensitive habitats such as wetlands.

4.9 Dangerous Goods Management

- All fuels and lubricants used during construction will be stored according to containment methods in designated areas, located a minimum 30 m from surface waters, wetlands, and private wells.
- Where possible, refueling in the field will not occur within 30 m of watercourses, water bodies and wetlands.
- Storage of all hazardous materials will comply with Workplace Hazardous Materials Information System (WHMIS) requirements. Appropriate material safety data sheets (MSDS) will be located at the storage site.
- Transportation of dangerous goods will comply with the *Transportation of Dangerous Goods Act* (1992).
- Equipment will be kept in good working order, will be inspected regularly, and any observed leaks will be repaired.

4.10 Waste

- Solid wastes, including waste construction material, will be disposed of in approved facilities.
- Temporary storage of waste materials on-site will be located at least 30 m from known watercourses, wetlands, and water bodies.
- Waste materials will be removed from the site by a qualified waste hauler and disposed/recycled in accordance with provincial waste regulations. All applicable materials will be stored as per WHMIS requirements and transported as per the *Transportation of Dangerous Goods Act* requirements.

4.11 Excavation and Site Reinstatement

- All soils removed during the excavation phase will be stored according to provincial regulations and best practice guidelines.
- Any soil needed for backfilling, after foundations have 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.
- Once backfilled material has stabilized, temporary erosion and sedimentation controls will be removed. Attention will be paid during site reinstatement to ensure areas will promote wildlife return to the area, to the extent possible.

5.0 ENVIRONMENTAL MANAGEMENT

5.1 Environmental Protection Plan

The EPP will be submitted following EA approval of the Project. The EPP will be approved by NSE prior to start of construction of the Project and will detail best practices and mitigative measures to be employed during construction to minimize potential environmental effects. The EPP document is the primary mechanism for ensuring that mitigation is implemented, as determined through the EA

process, to avoid or mitigate potential adverse environmental effects that might otherwise occur from construction activities, and as required by applicable agencies through permitting processes.

The EPP is a plan for all Project personnel, including contractors, and describes the responsibilities, expectations, and methods for environmental protection associated with Project activities. The EPP will incorporate:

- means to comply with requirements of relevant legislation;
- environmental protection measures identified as part of the EA; and
- environmental commitments made as part of the EA.

A suggested Table of Contents for the EPP is provided in Appendix B.

6.0 PROJECT SCOPE

As a Class 1 EA, this registration document and supporting studies have been developed to meet all requirements under Section 9(1A) of the NS*EA.*

In addition, the document has been prepared using the following provincial guidelines:

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

The following regulatory bodies have been contacted by the Project team to provide input into the Project planning process and advice regarding the EA scope:

- Canadian Wildlife Service (CWS);
- Nova Scotia Department of Communities, Culture and Heritage;
- NSE; and
- Nova Scotia Department of Natural Resources (NSDNR).

During the EA review process, additional consultation may be required with these and other agencies.

6.1 Site Sensitivity

Potential wind farms are assigned a category level, according to a matrix provided in "A Proponent's Guide to Wind Power Projects" (NSE 2012a). This matrix considers the overall Project size and the sensitivity of the Project 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.

As the Project consists of two turbines, it is considered a small project. Based on the known existence of four bird species considered to be 'At Risk' or 'Maybe at Risk' (Section 8.7); and the presence of a bat hibernacula less than 25 km from the Project site (Section 8.8), the Project is

classified as having a 'Very High' potential sensitivity. As such, the Project is determined to be a Category 4.

6.2 Assessment Scope

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

The EA focuses on specific environmental components called valued environmental components (VECs). VECs are specific components of the biophysical and human environments that, if altered by the Project, may be of concern to regulatory agencies, Aboriginals, stakeholders, resource managers, scientists, and/or the general public. VECs incorporate biological systems as well as human, social, and economic conditions that are affected by changes in the biological environment. As such, VECs can relate to ecological, social, cultural, or economic systems that comprise the environment as a whole.

The scope of the assessment for this Project includes: preliminary assessment of potential interactions between selected environmental components and the Project, identification off VECs; identification of environmental effects; and identification of the standards or thresholds that are used to determine the significance of residual environmental effects. This scoping relies upon direction from regulatory authorities; consideration of input from stakeholders; and the professional judgment of the Project team.

6.3 Spatial and Temporal Boundaries of the Assessment

6.3.1 Spatial Boundaries

The Project is to be "co-located" directly adjacent to the proposed Millbrook Community Wind Project (three, 2 MW turbines). The Projects are expected to share common infrastructure (e.g. shared access from Tower Road and shared utility right of way) and will be constructed on similar timelines. Therefore, for the purposes of the EA, the two Projects are presented together as one Project site, with the footprints of each specifically identified (Drawing 2.1).

The Millbrook footprint includes turbines 1 to 3 located on PID 20215711 and the Truro Heights footprint includes turbines 4 and 5 situated on PID 20206330. All associated access roads within the footprints are considered part of the Project site. The extension of Tower Road to the Project site (extends across PIDs 20206595, 20206629, 20206546, and 20354015) is also evaluated as part of the EA and is referred to as the "Tower Road Extension".

Baseline data and predictive modeling for the environmental components were selected and evaluated in consideration of the entire Project site (e.g., both Projects) and all five turbines.

For the purpose of data collection and the socio-economic environment, the Municipality of the County of Colchester was considered. In addition, residences located within a 2 km radius of the Project site were assessed as potential receptors for the purposes of evaluating potential effects from sound and shadow flicker.

6.3.2 Temporal Boundaries

The temporal scope of this assessment covers the construction, operation, and decommissioning phases of the Project, and associated activities, as described in Sections 2.2.1, 2.2.2, and 2.2.3. Accidents, malfunctions, and unplanned events are addressed separately.

6.4 Site Optimization

As part of the Project planning process, a detailed constraints analysis was conducted to ensure that potential effects to the environment and neighboring residents were minimized. This analysis was continually updated and refined based on the results of Project specific desktop studies, modeling, and field assessments. As a result, several layout iterations were reviewed to reflect a growing knowledge of the Project site and surrounding community. Specifically, layout and turbine model modifications were incorporated into the planning process in consideration of the following:

- Sighting within an optimal wind regime;
- Maintenance of a minimum 176 m buffer between turbine locations and field identified watercourses;
- Avoidance of lakes, or other visible open water bodies as identified in 1:50,000 provincial mapping;
- Maintenance of a minimum 83 m buffer between turbine locations and field identified wetlands;
- Avoidance of known protected areas, field identified archaeological resources, significant habitats, wildlife sites, provincial parks or reserves;
- Avoidance of Mi'kmaq resources;
- Maintenance of a minimum 700 m setback (Colchester County setback) between turbines and occupied dwellings, daycares, hospitals, and schools;
- Predictive sound modeling results to meet NSE standards (i.e. 40 dBA for dwellings, daycares, hospitals, and schools);
- Predictive shadow flicker modeling results to meet NSE standards (i.e. no more than 30 hours of flicker per year and no more than 30 minutes of flicker on the worst day for dwellings, daycares, hospitals, and schools);
- Maintenance of 1.0 times the total turbine height from property boundaries, in accordance with Colchester County by-laws ; and
- Maintenance of a 1.0 times the total turbine height from public roads in accordance with Colchester County by-laws.

This siting exercise, using the above noted constraints and setbacks, resulted in the current turbine locations that this EA was based on. Through this process, these locations were selected to provide a minimal disturbance to surrounding land uses, local residents and environmental features.

7.0 ENVIRONMENTAL ASSESSMENT METHODOLOGY

The methodological framework used in this EA has been developed to meet the requirements of the NS*EA*. This framework is based on a structured approach that:

- focuses on issues of greatest concern;
- considers Aboriginal concerns as well as concerns raised by the public and other stakeholders; and

- integrates mitigative measures into Project design.

The methodology provides an overview of the baseline conditions and an assessment of VECs that reflect key issues of concern. Within the specified spatial and temporal boundaries, the potential for interaction between individual VECs and Project activities are determined. Where there is potential for Project-related environmental effects, each effect is assessed using the results of preliminary investigations, guidance from regulators, and the collective knowledge and expertise of the Project team. The residual Project-related environmental effects, (e.g., after mitigation has been applied), are characterized using specific criteria (direction, magnitude, geographic extent, duration, frequency, and reversibility) that are applied to each VEC. The significance of these residual effects is then determined based on pre-defined and VEC-specific thresholds.

Project-related environmental effects are assessed and include potential interactions; mitigation and environmental protection measures proposed to reduce or eliminate adverse environmental effects; and the characterization of the residual environmental effects of the Project. The ultimate focus of the assessment is on residual environmental effects that remain after planned mitigation has been applied.

7.1 Preliminary Assessment

A preliminary assessment of potential interactions between selected environmental components and the Project was undertaken to identify VECs. This preliminary assessment is summarized in Table 7.1. For some of the identified environmental components, additional information has been provided in the report. Many of the interactions can be addressed using industry BMPs and adhering to existing regulations to mitigate potential effects. Where environmental BMPs and regulations are considered to be insufficient to fully mitigate potential effects, or where additional information is required, the components are identified as VECs and are therefore subject to further assessment in Section 14.0. Specific environmental requirements and mitigation practices are identified in the effects assessment and will be refined in subsequent environmental regulatory permitting processes.

Table 7.1: VEC Selection Table

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
Atmospheric Environment	Atmospheric environment includes consideration of air quality and climate conditions. Concerns include: - Dust generation from construction and operation activities. - Interaction with air quality due to exhaust emissions, including GHG emissions from Project equipment and vehicles during construction and operation. Only minimal amounts of dust and air emissions are expected. Mitigation for these effects is provided in Section 4. Project-related emissions are anticipated to be temporary, localized, and minor in nature. Measurable changes to the atmospheric environment are not expected.	No	Section 8.1
Geophysical Environment	Geophysical components include consideration of hydrogeology, groundwater, and bedrock and surficial geology. Concerns include: - Damage from blasting to domestic water sources. - Localized disturbances to surface soils and shallow bedrock. - Presence of radon gas. - Presence of karst topography. Once the location of any required blasting is confirmed and the geotechnical investigation is completed, the need to implement mitigation measures or monitoring programs will be evaluated. No domestic wells occur within 1 km of the proposed turbine locations therefore blasting activities (if completed) are not expected to impact private water supplies. The likelihood of ARD to occur at the site will be determined following the results of the geotechnical evaluation. If ARD is found to be present, it will be handled in accordance with the *Sulphide Bearing Material Disposal Regulations* under the NS*EA*. As a proactive measure, any structures placed at the Project site can be provided with venting if radon is suspected. Further mitigation for disturbance or exposure of this rock type (e.g. from blasting) will be outlined in the EPP. The presence of karst topography will be assessed during as part of the geotechnical investigation. Impacts from karst topography, if any, are expected to be manageable through avoidance and mitigation. Project-related effects on the geophysical environment are anticipated to be temporary, localized, and minor in nature. Measurable changes to the geophysical environment are not expected.	No	Section 8.2

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
Freshwater Environment	Freshwater environments involve consideration of fish and fish habitat, which may be impacted by watercourse crossings, erosion and sedimentation etc. Concerns include: - Loss or damage of fish habitat. - Decreased water quality. - Mortality of aquatic species. It is expected that three watercourse crossings will be required along proposed access roads (refer to Section 8.3.3). All construction activities near watercourses will comply with the applicable regulations and guidelines. Mitigation related to construction around watercourses and other watercourse related mitigation is described in Section 4. Project-related effects on the freshwater environment are anticipated to be temporary, localized, and minor in nature. Measurable changes to the freshwater environment are not expected.	No	Section 8.3
Terrestrial Habitat, Flora and Fauna (including wetlands)	Terrestrial habitat involves consideration of general and specialized terrestrial habitats, such as wetlands, as well as terrestrial flora and fauna. *(Note: Birds and rare species have been considered separately)*. Concerns include: - Habitat fragmentation. - Introduction of invasive species. - Damage to wetland ecosystems. - Mortality of some smaller faunal species due to clearing activities. - Loss of vegetation and effects to fauna and flora species due to herbicide application (vegetation management). Habitat fragmentation is considered to be minimal due to the small-scale clearing required. Environmental protection practices will be incorporated into clearing and grubbing activities as described in Section 4. Mitigation to control and prevent the introduction of invasive species is provided in Section 4 and will be included as part of the Project Vegetation Management Plan. Loss of fauna is considered minimal due to the small scale clearing requirements (e.g., approximately 2.61 ha) and attention to seasonal mitigation. Effects to terrestrial flora and fauna will be mitigated through adherence to various protection legislation, as described in Section 4. Avoidance of wetland habitat has been taken into consideration in Project planning and design including	No	Section 8.4, 8.5, and 8.6

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	access roads and placement of turbines. Additional mitigative measures provided in Section 4 will be employed to protect wetland habitat and micro siting will be completed, as necessary, prior to construction and once wetland boundaries are confirmed. Project-related effects on the terrestrial environment are anticipated to be temporary, localized, and minor in nature. Measurable changes to the terrestrial habitat and flora and fauna are not expected.		
Species of Conservation Interest (SOCI)	SOCI are those species assessed as being at risk or sensitive to some degree. For the purposes of this EA, SOCI include those species assessed as: • ""Endangered", "Threatened", or "Special Concern" r under *SARA;* and • "Endangered", "Threatened " or "Vulnerable" under the Nova Scotia *Endangered Species Act* (NS*ESA*) Consideration is also given to species: • Ranked as "Red" or "Yellow" under the NSDNR General Status Ranks of Wild Species in Nova Scotia; and • Listed "Endangered", "Threatened", or "Special Concern" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Based on the above criteria, one fish SOCI, and three fauna SOCI have potential to occur at the Project site. No plant SOCI were identified at the Project site during field surveys. Concerns include: - Sensory disturbance. - Direct and indirect adverse environmental effects to habitat (loss or alteration). - Effects to fish passage/migration. - Direct mortality of individuals. Loss of terrestrial fauna and aquatic SOCI is considered minimal due to the small scale clearing requirements, and attention to seasonal mitigation. Effects to flora and fauna will be mitigated by adherence to *SARA* and NS*ESA* as described in Section 4. However, due to special status of some species under federal and provincial federal legislation SOCI are considered further in the assessment.	Yes	Sections 8.3, 8.5, 8.6 and 14.2.1

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
Avifauna	The effects of wind turbines on avifauna are variable and depend on factors such as the development design, topography of the area, habitats affected, and the bird community in the wind farm area. Concerns include: - Mortality resulting from direct collision. - Habitat alteration. - Sensory disturbance. The requirements as set out in the *MBCA* will be adhered to for clearing activities (Section 4). Due to the potential effects of wind turbines on avifauna, this component is considered for further assessment.	Yes	Sections 8.7 and 14.2.2
Bats	The installation of wind turbines has the potential to effect bats both directly and indirectly. Concerns include: - Mortality resulting from direct collision and/or barotrauma. - Habitat alteration. - Sensory disturbance. The significance of these effects at the population level depends on a number of biotic and abiotic variables, including the number of individuals affected and the stability of the population, season, physiologic condition of the individuals affected, and weather factors. Due to the potential effects of wind turbines on bat populations, this component is considered for further assessment.	Yes	Sections 8.8 and 14.2.3
Socio-Economic Environment	Socio-economic aspects such as economy, land use/value, and recreation and tourism may be affected by the Project; however these effects may be positive and/or negative. The Project will likely create more local jobs, increase municipal tax revenues, and provide community sustainability fund, thereby resulting in a positive change for economy. Effects to land use are not expected in the area since the Project is located on privately owned land. Research has consistently demonstrated that, in a variety of spatial settings and across a wide temporal scale, sale prices for homes surrounding wind energy facilities are not significantly different from those attained for homes sited away from wind energy facilities. The Project represents a small footprint on privately owned land. Therefore, effects to the broad recreational/tourism community are not expected. Effects on the socio-economic environment are expected	No	Section 9.1, 9.2, and 9.3

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	to be positive in nature, or temporary, localized, and minor in nature. Measurable changes to the local economy, recreation and tourism are not expected.		
Archaeological and Heritage Resources	Archaeological and heritage resources are defined as any physical remnants found on top of and/or below the surface of the ground, including on or below the sea floor, that inform us of past human use of, and interaction with, the physical environment. Archaeological and heritage resources noted for NS include areas of high archaeological potential, registered archaeological sites, and paleontological resources (e.g., fossils). Effects from the Project on this component include surface or subsurface disturbance during the construction and decommissioning activities. An effect from the operation and maintenance phase is not anticipated as those activities will take place where construction-related ground disturbance has already occurred. An Archaeological Resource Impact Assessment (ARIA) was performed for the site and indicated that no negative effects to cultural and heritage resources are expected. Effects to cultural and heritage resources are therefore considered to be non-existent. Procedures related to potential discovery of archaeological items or sites during construction/decommissioning will be described in the EPP.	No	Section 10
Mi'kmaq Resources	If present, traditional Mi'kmaq flora and fauna resources may be affected by ground disturbance during construction and decommissioning activities. A Mi'kmaq Ecological Knowledge Study (MEKS) was completed for the Project. The results of the consultation process show that Mi'kmaq ecological and traditional resources associated with the Project site are still accessible by the surrounding communities and are being utilized by a wide range of community sectors, from youth to elders. Vegetation and habitat surveys associated with the study will be completed in June 2013. The final report will provide complete analysis and presentation of field data. Based on these preliminary results, future planning and collaboration between the proponent and local Mi'kmaq communities will be maintained through the application of Mi'kmaq Ecological Knowledge.	No	Section 11
Human Health	The public is often concerned about the potential for effects to human health from wind turbines. Concerns include: • Sound. • Shadow flicker. • Infrasound. • Electromagnetic fields (EMF). • Effects to air quality from dust and air emissions. • Risk of ice throw. A literature review regarding the potential for effects to	No	Section 12, Appendix C

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	human health from wind turbines was completed (Appendix C). The main findings from this review are as follows: - There is no evidence that the levels of infrasound produced by the turbines present a risk to human health. - There is no discernible evidence that there are health risks associated with EMFs. - Effects to air quality are expected to be temporary, minor, and localized in nature (additional information regarding air quality is provided 'Atmospheric Environment', above). - Setbacks and safety awareness measures minimize any potential risk from ice throw (additional information regarding safety measures, including ice throw, are provided in Section 15). *(Note: Shadow flicker and sound have been considered separately).* Effects to human health are considered minimal or non-existent due to the size and location of the wind farm, mitigation, and setback distances. Measureable changes to human health are not expected.		
Shadow Flicker	Shadow flicker can occur when rotating blades cast flickering shadows during times of direct sunlight. Modeling results indicate that all residential receptors are predicted to comply with the industry standard of no more than 30 hours of shadow flicker per year and no more than 30 minutes of shadow flicker on the worst day. Shadow flicker, therefore, is not expected to be an issue at any existing residence/dwelling in the vicinity of the Project.	No	Section 12.1
Sound	Sound is generated during all phases of the wind farm. Concerns include: - Noise during construction and decommissioning phases. - Annoyance and unpleasantness, for local residents in close vicinity, from turbine blades during operation. Construction and decommissioning phases will be short-term. Effects of noise created during these phases are expected to be temporary, minor, and localized in nature. Construction and decommissioning will be scheduled in consultation with the CLC to minimize noise impacts. Measurable changes to sound during construction and decommissioning are not expected. A study was carried out of the existing ambient sound levels near the Project site. Average existing sound levels at two locations near the Project site boundaries were observed to be 50.2 and 49.3 dBA during the monitoring program. Modeling results for wind farm operation indicate that all non-participating residential receptors are predicted to	No	Section 12.4

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	comply with the NSE standard of 40 dBA (exterior of the residence). Effects from sound during operation are therefore considered minimal due to the size and location of the wind farm and setback distances. Post-construction monitoring will be completed during operation, as required.		
Electromagnetic interference (EMI)	The rotating blades and support structures of wind turbines can interfere with various types of electromagnetic signals emitted from telecommunication and radar systems. An EMI study completed for this Project indicated that there were no objections regarding EMI effects associated with the Project provided to date.	No	Section 12.2
Visual Landscape	Wind farms create visual effects to the local landscape. A visual assessment was completed for the Project. Predicted view planes generated by the assessment are presented in Section 12.3. Effects to the visual landscape are considered minimal to non-existent due to the size and location of the wind farm, setback distances, and the significant tree cover in the vicinity of the Project site.	No	Section 12.3

Based on the preliminary assessment of potential interactions, summarized in Table 7.1, VECs identified for further assessment in this EA are as follows:

- SOCI;
- Avifauna; and
- Bats.

8.0 BIOPHYSICAL ENVIRONMENT

8.1 Atmospheric Environment

8.1.1 Weather and Climate

Nova Scotia's climate is quite varied and is largely governed by coastal influences and elevation (Davis and Browne 1996). The Project (centered at 45°18'55"N, 63° 20'26"W) lies within the Valley and Central Lowlands Ecoregion of Nova Scotia, which includes the Annapolis Valley, and the watersheds of the Minas Basin and the Musquodobit Valley (Neily *et al*. 2003). This region is protected from direct coastal influences by the North Mountain and its promontory, Cape Split. Two notable uplands bordering the ecoregion, the Rawdon Hills and Wittenburg Ridge, also shelter the adjacent lowlands. As a result, the ecoregion records some of the hotter summer temperatures within the province (Neily *et al*. 2003). The typical growing season in the area of the Project site is 198 days (Webb and Marshall 1999).

Local temperature and precipitation data were obtained from the Truro meteorological station (45°22'00.00N, 63°16'00.00W) located approximately 8 km northeast of the Project site. For the period from 1971-2000, the mean annual temperature was 5.8°C, with a mean daily high of 11.1°C

and a mean daily low of 0.5°C (EC 2011a). January and February were the coldest months (-6.9°C and -6.5°C, respectively), while the warmest months were July and August (18.4 °C and 17.8°C, respectively) (EC 2011a).

From 1971 to 2000, mean annual snowfall was 229.1 cm and rainfall was 991.4 mm (EC 2011a). Most snowfall is received in January and February (51.9 cm and 49.2 cm, respectively), while the rainiest months are September, October and November (101.3 mm, 104.6 mm, and 101.1 mm, respectively) (EC 2011a).

Environment Canada (EC) measures wind conditions in Nova Scotia at those meteorological stations that are under long term observation. The closest such station to the Project site is the Truro station mentioned above. The Canadian Climate Normals (1971-2000) for this station indicate an annual maximum wind speed of 13 km/h, most commonly out of the west (EC 2011a). The maximum hourly wind speed for this station was 93 km/h, recorded on January 24th, 1963, with the highest single wind gust measuring at 134 km/h on February 2nd, 1976 (EC 2011a). According to the Nova Scotia Wind Atlas (NSDE 2007), average wind speeds at 30 m and 50 m above the ground at the Project site range from 16.2-19.8 km/hr, and range from 19.8-23.4 km/hr at 80 m above the ground.

8.1.2 Air Quality

Currently in Nova Scotia, 42% of total greenhouse gas (GHG) emissions come from electricity use and 90% of electricity comes from fossil fuels (NSDE 2009). Because of this heavy reliance on coal and other fossil fuels for electricity, every MW of wind power installed reduces GHG emissions by as much as 2,500 tonnes per year (NSDE 2011). By reducing Nova Scotia's reliance on fossil fuels, wind energy will therefore contribute to improving local air quality (NSDE 2011).

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) (EC 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+). The AQHI monitoring station closest to the Project site is located at Pictou, approximately 62 km northeast of the Project site. The AQHI at this site is usually low at all times of the year (EC 2011b).

Mitigation measures for potential effects to the atmospheric environment are provided in Section 4.0.

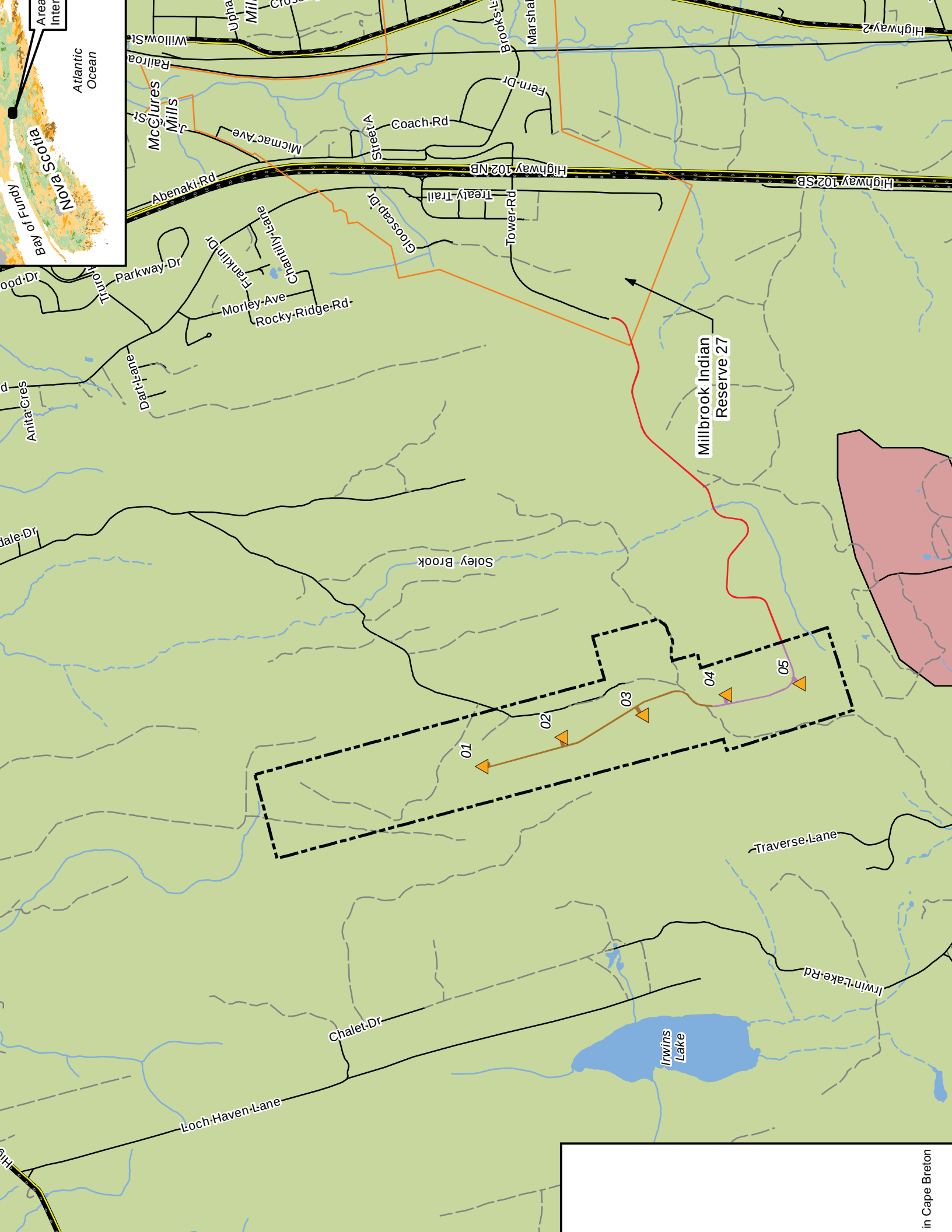
8.2 Geophysical Environment

8.2.1 Physiography and Topography

The Project site lies within the Central Lowlands Ecodistrict, located on a hummocky to undulating glacial till plain where imperfectly drained, deep, compacted, loam to clay loam till is the dominant surficial material (Neily *et al*. 2003). Topography in the area is flat to rolling with few surface boulders. Elevation on the Project site ranges from 128 m at the northern boundary to a high of 153 m near the centre of the site, then sloping to an elevation of 136 m at the southern boundary.

8.2.2 Surficial Geology

The surficial geology of the Project site is characterized as a silty till plain otherwise referred to as ground moraine (Drawing 8.1). The silty compact material is derived from both local and distant sources. Till thickness ranges from 3 – 30 m, masking bedrock undulations (Stea *et al*. 1992). The predominant soils in the area are fine textured, comprised of loams, silts and clays. Deep, reddish-brown soils are characteristic of the ecodistrict and have been derived from the underlying Carboniferous rock. The drainage has been restricted on most of the soils due to glacial compaction of these finer textured soils (Neily *et al.* 2003).


Atlantic Ocean
Nova Scotia
Bay of Fundy
Area of Interest
Millbrook Indian Reserve 27
Irwins Lake
Soley Brook
01
02
03
04
05
Abenaki Rd
Highway 102 NB
Highway 102 SB
Highway 2
Coach Rd
Tower Rd
Treaty Trail
Parkway Dr
Morley Ave
Rocky Ridge Rd
Chalet Dr
Loch Haven Lane
Traverse Lane
Irwin Lake Rd
Dart Lane
Anita Cres
Fern Dr
Railroad
Willow St
McClures Mills
Micmac Ave
Street A
Gloscap Dr
Franklin Dr
Chantilly Lane
Truro
Brooks-L
Marshal

8.2.3 Bedrock Geology

Bedrock geology across the Project site consists of Late Devonian – Early Carboniferous aged sedimentary rocks of the Horton Group and Early Carboniferous aged Windsor Group (Keppie 2000) (Drawing 8.2). Bedrock underlying the northern and central portions of the Truro Heights Project footprint consists of the Horton Group, composed of sandstone, coal, siltstone, shale and conglomerates. Horton rocks in the area are folded and cut by numerous faults with small stratigraphic displacement (Hennigar 1972). West and east of Truro, Triassic deposits lie unconformably against Carboniferous Horton strata (Nova Scotia Museum of Natural History 1996). In both areas, the Carboniferous strata are harder and form low rolling hills. The remaining southern extent of the Truro Heights Project footprint is underlain by undifferentiated marine sedimentary rocks of Windsor age that conformably overlie the Horton sediments (Hennigar 1972). The Windsor Group consists of red and green sandy shales, limestone, minor dolomite, anhydrite, and gypsum.

Rocks of the Windsor Group typically have alternating layers of carbonates (limestone), evaporites (gypsum, rock salt and potash), and 'redbeds' (shales, sandstones and conglomerates). Soluble rocks such as evaporites and limestones have the potential to form solution/collapse features, resulting in karst landscapes in some areas. The occurrence of karst landscapes such as sinkholes, is a potential geological hazard, particularly where structures rest on or near the surface. The effects of karst topography, if any, are expected to be manageable through further study, avoidance routing, and mitigation.

According to the NSE Well Log Database, there are no drilled wells located within a 1 km radius of the Project footprint (NSE 2011a). However a total of seven wells were identified within a 2 km radius, ranging in depths from 6.1 m to 54.8 m. All seven wells were drilled through varying surficial materials including clay, gravel, mud, stones, and boulders ranging from 2.4 m to 15.2 m in thickness, followed predominately by shale, however two wells encountered gypsum and one slate.

Upha
Mill
Cross
Brooks-L
Marshal
Highway-2
Willow-St
Railroa
Fern-Dr
McClures Mills
James-St
McIsaac-Ave
Coach-Rd
Street-A
Highway-102-NB
Highway-102-SB
Abenaki-Rd
Treaty-Trail
Gloscap-Dr
Tower-Rd
Parkway-Dr
Franklin-Dr
Chantilly-Lane
Morley-Ave
Rocky-Ridge-Rd
Millbrook Indian Reserve 27
Anita-Cres
Dart-Lane
Soley-Brook
01
02
03
04
05
Traverse-Lane
Irwin-Lake-Rd
Chalet-Dr
Irwins Lake
Loch-Haven-Lane

8.2.4 Hydrogeology and Groundwater

Groundwater Quantity

Water supplies near the Project site are generally derived from individually drilled wells. According to the NSE Well Log Database (NSE 2011a) of logs for wells constructed between 1920 and 2010, wells near the Project site have been reportedly installed through varying bedrock formations including: shale, gypsum, quartzite, conglomerate, slate and sandstone bedrock. A summary of the pertinent well properties included in these logs is presented in Table 8.1.

Table 8.1: Summary of Drilled Well Records within Approximately 2 km of the Project site

	Drilled Date (yr)	Well Depth (m)	Casing Length (m)	Estimated Yield (Lpm)	Water Level (m)	Overburden Thickness (m)	Water Bearing Fractures (m)
Minimum	1988	19.8	6.7	6.8	1.1	1.5	8.8
Maximum	2008	43.5	31.1	68.1	6.7	30.5	41.2
Average	2001	31.9	14.4	42.2	4.1	11.3	23.6
Geomean	2001	30.7	12.2	34.7	3.5	7.6	21.4
Number of well records	8	8	8	8	6	8	6

Source: NSE 2011a

Based on short term driller's estimates for the wells in Table 8.1, the average yield is approximately 42.2 liters per minute (11.1 gallons per minute) and average well depth is approximately 31.9 m (104.6 ft). These yields represent very short term yields estimated by the driller at the completion of well construction. Fracture depths ranged from 8.8 m (28.9 ft) to 41.2 m (135.1 ft). The closest drilled well to a proposed turbine within the Truro Heights footprint, is located approximately 1 km southwest of turbine 5, along Little Brook Road.

The NSDNR Pump Test Database (NSDNR 2011) provides longer term yields for select wells throughout the province. Two regional wells drilled through quartzite bedrock and located within a 10 km radius of the Project site indicate long term safe yields (Q_{20}) of 9.1 Lpm (2.4 gpm) and 272.7 Lpm (72.0 gpm), and apparent transmissivity (T) values of 1.03 and 35.9 m^2/d.

An observation well (No. 014) is located in Truro, Colchester County, approximately 5.5 km northeast of the Project site that forms part of the NSE Nova Scotia Groundwater Observation Well Network (NSE 2011b). This observation well was drilled to a depth of 91.4 m through sandstone bedrock of the Wolfville Formation. This well has been monitored since 1971. The groundwater levels appear to have decreased slightly between 1971 and 1991. There is a data gap between 1991 and 2002 when no monitoring was carried out at this well; however, sometime after 1991 the groundwater levels in this well increased and have remained relatively consistent since 2003 when monitoring began again. The increased water level at this well is believed to be a result of the decommissioning of a municipal water supply well in 1994, which was located within 1 km of the observation well.

Groundwater Quality

The Horton Group commonly contains good quality calcium bicarbonate groundwater typically low in dissolved solids and hardness, low in iron, and generally slightly basic (Hennigar 1972). Waters with relatively poor quality, due to a high concentration of sulphate are usually found where Horton rocks are located down-gradient from Windsor rocks in the groundwater flow system. Large amounts of bicarbonate hardness may be due to a close association with limestones in the Windsor Group or due to the solution of calcareous beds within the Horton Group.

Windsor Group groundwater is generally of very poor quality, due to the occurrence of evaporate deposits contributing to excessive amounts of sulphates, hardness and total dissolved solids (Hennigar 1972). These waters are generally classed as calcium bicarbonate or calcium sulphate waters.

The presence of uranium, radium, and radon has been documented in the Carboniferous-aged Horton Group. Mineralization is typically associated with reducing agents such as hydrocarbons, plant material and/or phosphate-rich lacustrine rocks. When released to outdoor air, radon is diluted and is not a concern; however, in enclosed spaces the gas can sometimes accumulate to high levels (Okunade et al. 2008). The current Canadian guideline for radon in indoor air is 200 Becquerels (Bq) per m^3. Radon soil gas emissions were monitored in 2007 – 2008, at known uranium occurrences, in Millet Brook, NS. The radon gas concentrations were shown to dissipate very rapidly to negligible concentrations in ambient air at 10 cm aboveground directly over the mineralized source (Goodwin 2008). All other parameters typically meet the Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada 2012).

Mitigation measures for potential effects to the geophysical environment are provided in Section 4.0.

8.3 Freshwater Environment

The Project site lies within the Central Lowlands Ecodistrict, which is part of the Valley and Central Lowlands Ecoregion (Neily *et al.* 2003). A defining feature of this ecodistrict is the extent to which it is drained by large rivers that empty into the Bay of Fundy, including the Stewaicke and the Shubenacadie Rivers (Neily *et al*. 2003). There are few freshwater lakes within the ecodistrict (Webb and Marshall 1999), which combined with rivers and streams account for just 1.5% of the ecodistrict's area (Neily *et al.* 2003).

The Project site lies within the Salmon River Watershed (1DH). The Salmon River originates in the Cobequid Hills in the central-northeastern part of Colchester County, before turning west and flowing through the Town of Truro. The Salmon River empties into Cobequid Bay, forming an estuary at the eastern extreme of the Minas Basin. Prominent water bodies in the Salmon River Watershed include Folly Lake, MacElmon's Pond, and Farm Lake.

There are no lakes or areas of open water mapped at the Project site (Drawing 8.3). The closest water body is Irwin's Lake, a 29 ha lake situated within the Shubenacadie River Watershed located approximately 1.5 km to the west. The largest lake in the vicinity of the Project site is Shortts Lake, located approximately 8.8 km to the south.

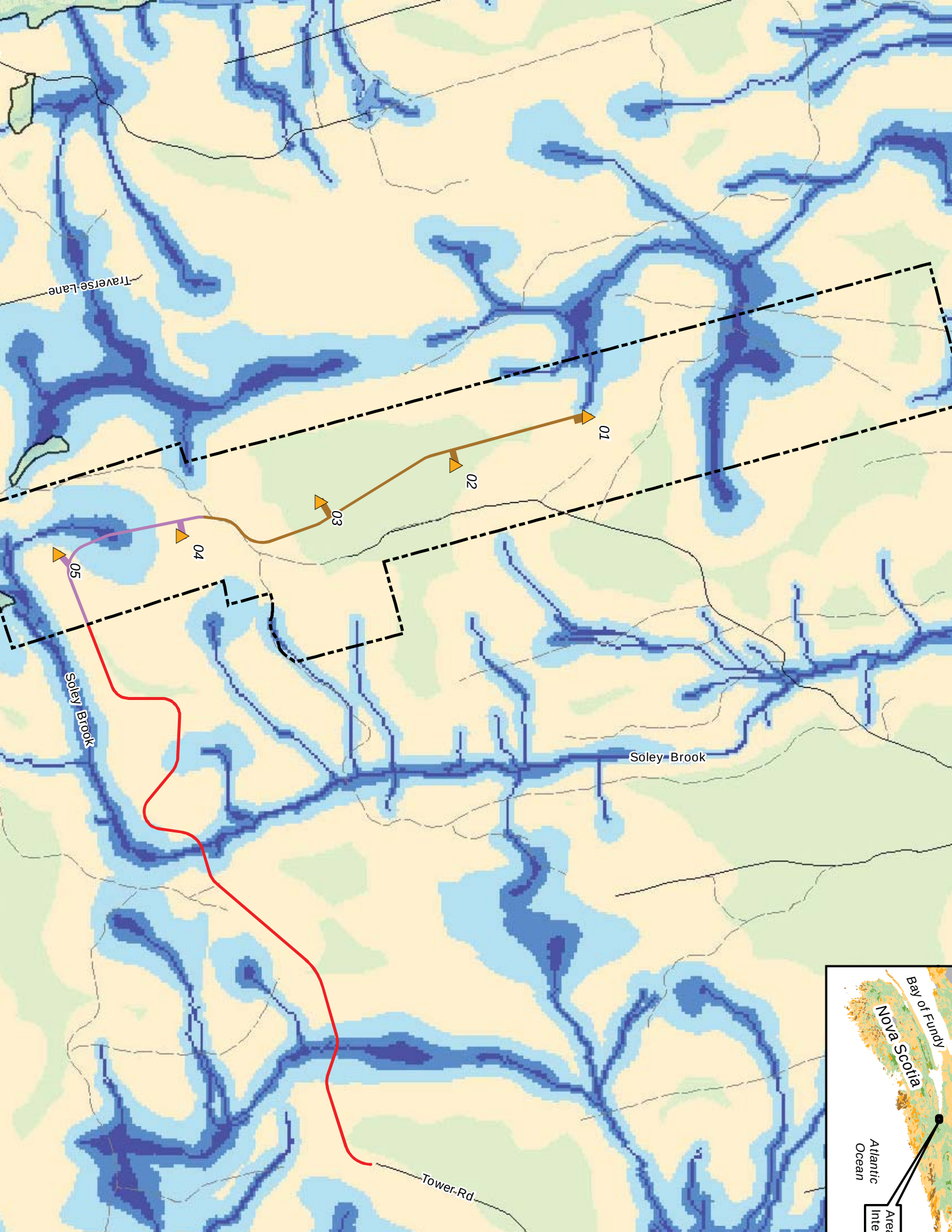
A total of ten lakes within Colchester County are included in the Nova Scotia Lake Inventory Program, which determines the baseline biophysical attributes of lakes throughout the province (NSE 2012b). With the exception of Shortts Lake, the remaining lakes are located at distances greater than 20 km from the Project site. The maximum depth of Shortts Lake, as determined from this survey, is 14 m, with mean depth of 3.6 m. Surface water temperature at the lake during the most recent survey in August 2005 was 22.6°C, while dissolved oxygen concentrations at the lake surface and bottom were 8.2 mg/L and 0.3 mg/L, respectively. The lake maintains a relatively neutral acidity level with pH readings ranging from 6.6 to 7.2 in August 2005 (NSE 2012b).

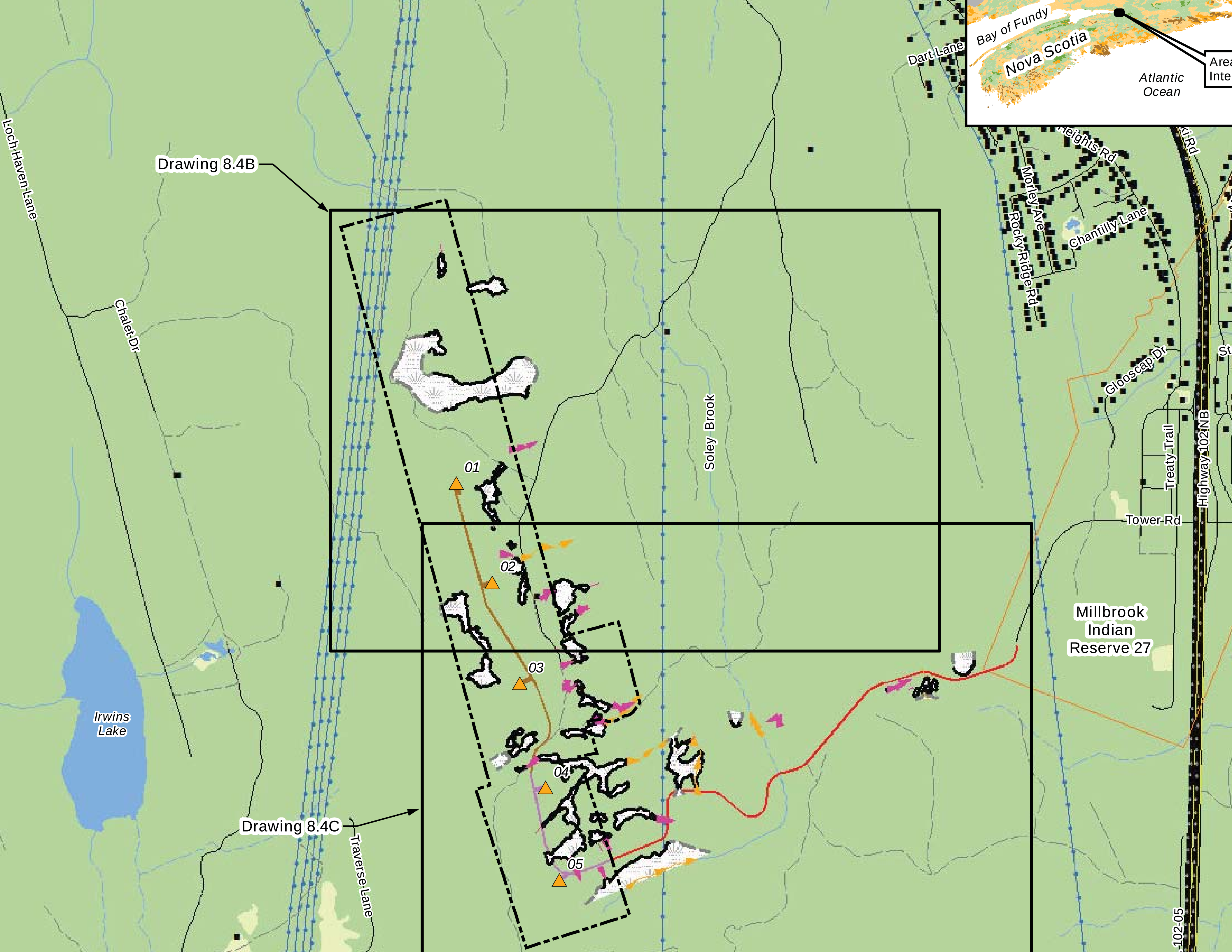
There are no mapped watercourses located within Project site boundaries (Drawings 8.3). A mapped watercourse originates just outside of the northern site boundary (Drawing 8.3) and flows to the north into Cobequid Bay (Minas Basin). Soley Brook (watercourse 5), located approximately 0.6 km to the east of the Project site boundary, is a mapped watercourse crossing the access road from Tower Road to the Project site, draining water from south to north toward Cobequid Bay.

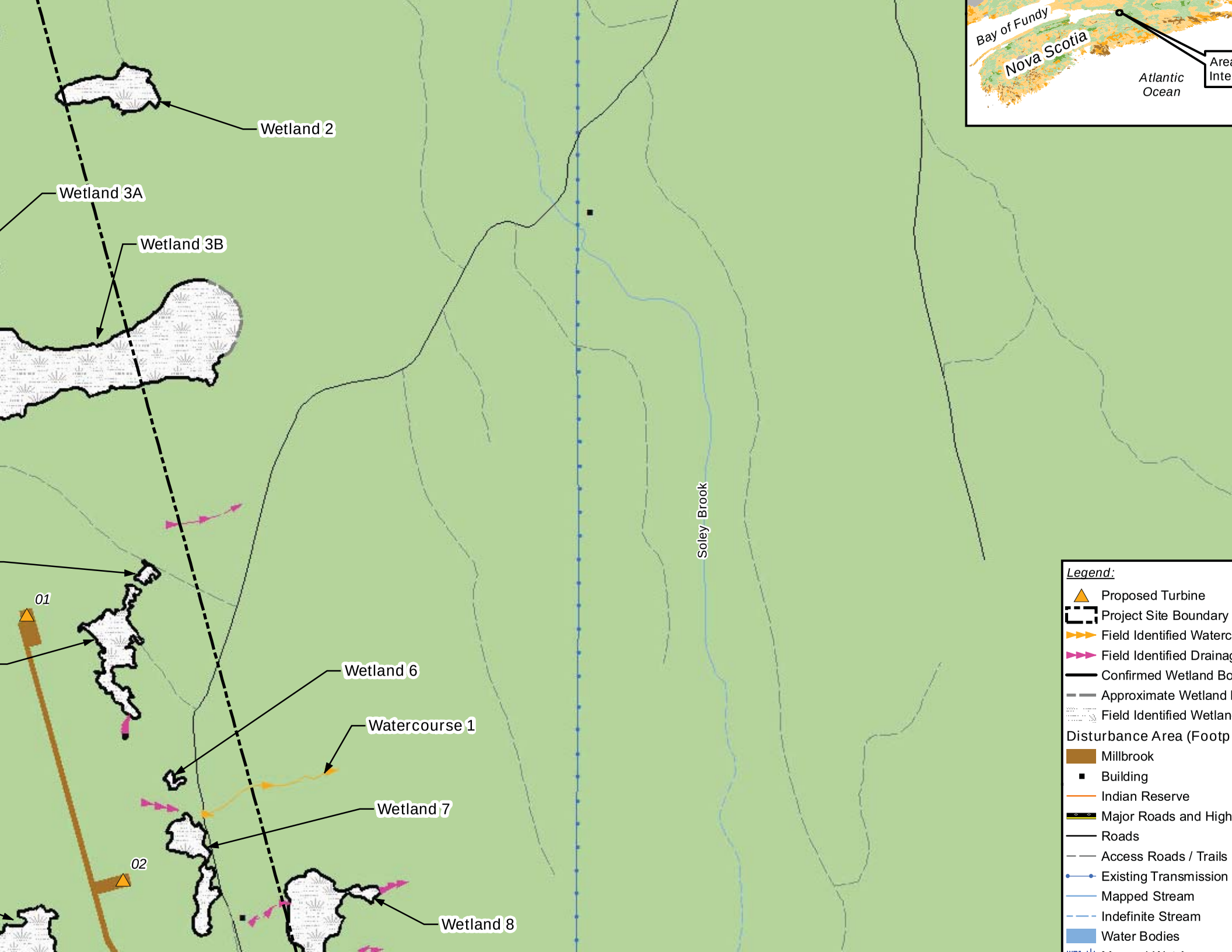
Four additional watercourses were identified during field assessments completed in June-October, 2012 (Drawings 8.4A-C). General characteristics for these watercourses are provided in Table 8.2.

Table 8.2: Watercourse Characteristics

Feature ID	Wetted Width (m)	Depth (cm)		Substrate	Drainage Direction
		Observed	Bankfull		
Watercourse 1	0.4	5	20	Organic fines with cobble	West to east
Watercourse 2	0.5	12	25	Organic fines with cobble and boulder	Southwest to northeast
Watercourse 3	1.2	25	10	Gravel with cobble and sand	West to east/northeast
Watercourse 4	1 to 1.5	15	20	Organic fines with cobble	South to north
Watercourse 5 (Soley brook)	1.5 to 2	25	35	Cobble with boulder and sand	South to north
Watercourse 6	1 to 1.5	10	30	Organic fines	North to south


Traverse Lane
01
02
03
04
05
Soley Brook
Soley Brook
Tower Rd
Bay of Fundy
Nova Scotia
Atlantic Ocean


Drawing 8.4B
Drawing 8.4C
Loch Haven Lane
Chalet Dr
Traverse Lane
Irwins Lake
Soley Brook
01
02
03
04
05
Millbrook Indian Reserve 27
Tower Rd
Treaty Trail
Highway 102 NB
Glooscap Dr
Chantilly Lane
Morley Ave
Rocky Ridge Rd
Heights Rd
Dart Lane
Bay of Fundy
Nova Scotia
Atlantic Ocean


Wetland 2
Wetland 3A
Wetland 3B
Soley Brook
01
02
Wetland 6
Watercourse 1
Wetland 7
Wetland 8
Bay of Fundy
Nova Scotia
Atlantic Ocean
Legend:
Proposed Turbine
Project Site Boundary
Field Identified Waterc
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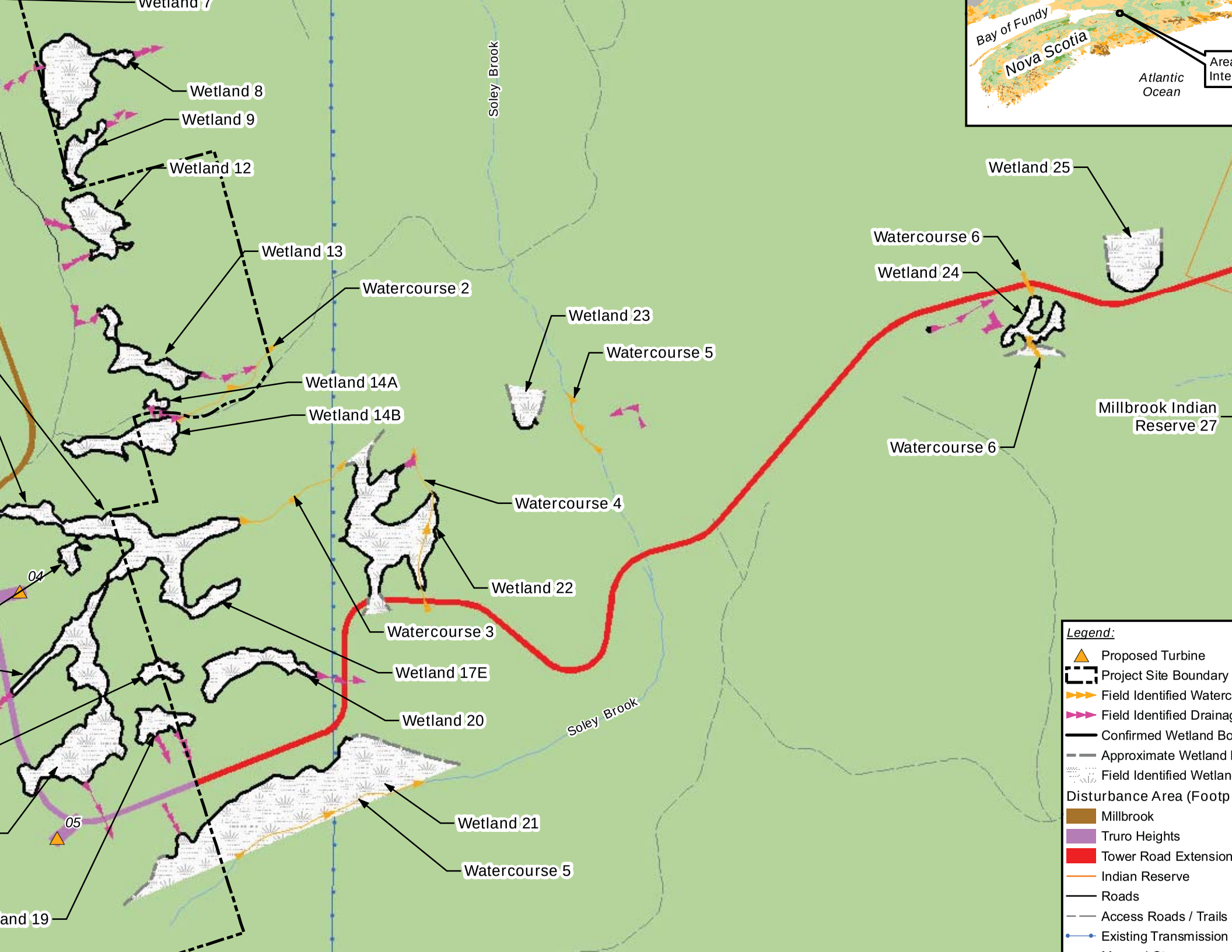
Confirmed Wetland Bo
Approximate Wetland
Field Identified Wetlan
Disturbance Area (Footp
Millbrook
Building
Indian Reserve
Major Roads and High
Roads
Access Roads / Trails
Existing Transmission
Mapped Stream
Indefinite Stream
Water Bodies


Wetland 7
Wetland 8
Wetland 9
Wetland 12
Wetland 13
Watercourse 2
Wetland 14A
Wetland 14B
Soley Brook
Wetland 23
Watercourse 5
Wetland 25
Watercourse 6
Wetland 24
Millbrook Indian Reserve 27
Watercourse 6
Watercourse 4
Wetland 22
Watercourse 3
Wetland 17E
Wetland 20
Soley Brook
Wetland 21
Watercourse 5
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05
and 19
Bay of Fundy
Nova Scotia
Atlantic Ocean
Legend:
Proposed Turbine
Project Site Boundary
Field Identified Waterc
Field Identified Drainag
Confirmed Wetland Bo
Approximate Wetland
Field Identified Wetlan
Disturbance Area (Footp
Millbrook
Truro Heights
Tower Road Extension
Indian Reserve
Roads
Access Roads / Trails
Existing Transmission

8.3.1 Watercourse Crossings

Three watercourse crossings will be required for Watercourse 4, 5, and 6, in association with the proposed Tower Road extension to the Project site (Drawing 8.4C). No watercourse alteration impacts are expected with turbine laydown areas or access roads.

Any required watercourse crossings will comply with the "Nova Scotia Watercourse Alteration Specifications" (NSE 2010).

Additional micro siting for watercourses will be completed as necessary, once the final layout is confirmed.

8.3.2 Freshwater Fish and Fish Habitat

For the purposes of the EA, all watercourses at the Project site have been assumed to be 'fish bearing' and will be treated as such throughout site development plans.

A review of the Atlantic Canada Conservation Data Centre (ACCDC) database for fish species recorded within a 100 km radius of the Project site was completed. All species, including status rankings, are provided in Table 8.3.

Table 8.3: Fish Species Recorded within a 100 km radius of the Project site

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Atlantic salmon (Gaspé-Southern Gulf of St. Lawrence, Outer Bay of Fundy, and NS Southern Uplands populations)	*Salmo salar*	No Status	Not Listed	Special Concern (Gaspé-Southern Gulf of St. Lawrence pop.); Endangered (Outer Bay of Fundy pop.); Endangered (NS Southern	Red
Atlantic salmon Inner Bay of Fundy Pops	*Salmo salar*	Endangered	Not Listed	Endangered	Red
Atlantic sturgeon	*Acipenser oxyrinchus*	Not Listed	Not Listed	Threatened	Red
Striped bass	*Morone saxatilis*	No Status	Not Listed	Threatened	Red

Source: ACCDC 2012

[1] Government of Canada 2012; [2] NS *ESA* 2007; [3] COSEWIC 2012; [4]NSDNR 2010

Fish species recorded within a 100 km radius of the Project site were screened against the criteria outlined in the document "Guide to Addressing Wildlife Species and Habitat in an EA Registration Document" (NSE 2009b) to develop a list of priority species (e.g., SOCI), which are assessed further as a VEC.

In the context of this EA, SOCI include those that are:

- Listed under *SARA* as "Endangered", "Threatened", or "Special Concern";
- Listed under the NS *ESA as "*Endangered*"*, "Threatened", or "Vulnerable";
- Assessed by COSEWIC as "Endangered", "Threatened", or "Special Concern"; or
- Assessed by NSDNR as "Red" (at risk or may be at risk) or "Yellow" (sensitive).

Priority fish species include:

- Atlantic salmon (Gaspé-Southern Gulf of St. Lawrence, Outer Bay of Fundy, and NS Southern Uplands populations) – "Special Concern" and "Endangered" (COSEWIC), "Red" (NSDNR);
- Atlantic salmon (Inner Bay of Fundy population) – "Endangered" (*SARA*), "Endangered" (COSEWIC) "Red" (NSDNR);
- Atlantic sturgeon – "Threatened" (COSEWIC), "Red" (NSDNR);
- Striped bass – "Threatened" (COSEWIC), "Red" (NSDNR).

Atlantic Salmon
Atlantic salmon are an anadromous species native to the North Atlantic Ocean and coastal rivers, which undertakes long feeding migrations to the ocean as older juveniles and adults, and return to freshwater streams to reproduce. The species requires rivers that are clear, cool and well oxygenated, with pools and shallow riffles and gravel, rubble, rock or boulder bottoms for reproduction (NS Fisheries and Aquaculture 2007; COSEWIC 2010a).

Atlantic salmon identified by ACCDC within 100 km of the Project site may include those from the Gaspé-Southern Gulf of St. Lawrence, NS Southern Uplands, Outer Bay of Fundy and/or Inner Bay of Fundy populations, or designatable units (DUs). All watercourses identified at the Project site form part of the Salmon River watershed, therefore any Atlantic salmon present on site would form part of the Inner Bay of Fundy (IBoF) population.

Atlantic Salmon (Inner Bay of Fundy Population)
Inner Bay of Fundy (IBoF) salmon spawns in those rivers of Nova Scotia and New Brunswick that drain into the Minas Basin and Chignecto Bay (COSEWIC 2010a). Although iBoF Atlantic salmon have been recorded in 32 rivers in recent years, including the Salmon River, the population is estimated to have declined by 94% in the past decade (DFO 2008). Currently the Atlantic salmon is listed as extirpated from the Salmon River (Atlantic Salmon Federation 2012; COSEWIC 2010a), though this particular river has been identified to have a high potential capacity for restoring salmon populations and recovery efforts are underway (DFO 2008).

The recovery strategy for the species includes a live gene-banking program which has been developed to prevent the imminent extinction of the species (DFO 2010b), and several key populations are maintained in DFO Biodiversity Centres in NB and NS. These stocks will be used to restore self-sustaining populations in select Inner Bay of Fundy rivers. Extirpations in rivers without the support of the gene-banking program persist; however, juvenile abundance has increased in a small number of rivers receiving support from the program. Recent discussions with DFO confirm

that releases of Atlantic salmon into the Salmon River are ongoing as part of the program, and that the species is now present at various locations within the watershed (C. Hominick, pers. comm.).

All on-site watercourses drain northwards into Cobequid Bay and form part of the Salmon River watershed. Though the Atlantic salmon is listed as extirpated from the Salmon River, the species can likely be encountered at various reaches of the watershed due to DFO stocking initiatives.

Potential effects of the Project on this species, as well as proposed species-specific mitigation measures, are discussed in more detail in Section 14.2.1.

Atlantic Sturgeon
Little is known about the habitat requirements for Atlantic sturgeon at the northern extent of its range, but important freshwater habitats for the species appear to be rivers with access to the sea, preferably with deep channels. Research suggests that the anadromous species spawns in freshwater over hard-bottom substrates at depths of 1-3 m in areas of strong currents, under waterfalls, and in deep pools just above the marine-freshwater demarcation (COSEWIC 20011). Juveniles remain in freshwater for their first summer before migrating to estuaries in winter. Juveniles remain in the freshwater-estuary system for 3 to 5 years before migrating to the near-shore marine environment as adults (NOAA 2006).

Occurring in rivers and estuaries near North Atlantic shore environments, the Atlantic sturgeon has been reported in the Annapolis, Avon, Shubenacadie, St. Croix and LaHave River systems, as well as the Minas Basin (Colligan *et al.* 1998; COSEWIC 2011). In Canada, the species is known to spawn only in two areas, the St. John River and middle St. Lawrence. Historically, the St. Croix River was also a known spawning area, although the current status of this population is unknown.

Although the watercourses on the Project site drain into the Cobequid Bay, they are not conducive to the spawning habitat requirements of Atlantic sturgeon, therefore it is unlikely that this species would be found at the Project site.

Striped Bass
The striped bass is an anadromous species typically associated with estuaries and coastal waters, which spawns and over-winters in fresh and occasionally brackish water.

In Nova Scotia, the Annapolis River and the Shubenacadie–Stewiacke River system in the Bay of Fundy historically supported spawning populations (Rulifson and Dadswell 1995, as cited in COSEWIC 2004). Today, the species is known to spawn only in two rivers in eastern Canada: the Miramichi and the Shubenacadie. Catches have been recorded throughout the province, including in the Annapolis River, River Phillip, Shubenacadie and Grand lakes, and the Minas Basin. The Shubenacadie River population ascends the river to overwinter in Shubenacadie and Grand lakes, then returns downstream to spawn in the Stewiacke River (a tributary of the Shubenacadie). Spawning occurs in the portion of the river affected by a tidal bore (COSEWIC 2004). Though the on-site watercourses are connected to known marine habitat in the Bay of Fundy, they do not form part of the Shubenacadie-Stewiacke system, therefore it is unlikely that striped bass would migrate through the Project site.

General mitigation measures for aquatic fauna are provided in Section 4.0. Where required, species-specific mitigation is provided in Section 14.

8.4 Terrestrial Habitats

The Project site is situated within the Valley and Central Lowlands Ecoregion and specifically located within the Central Lowlands Ecodistrict (Neily *et al*. 2003). Impermeable clays have led to the establishment of large, peat-based wetlands and poorly-drained black spruce (*Picea mariana*) forests, with tolerant hardwood stands occurring on well-drained hills (Neily *et al*. 2003). Red spruce (*Picea rubens*) stands with hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*) can be found in particularly well-drained slopes. A unique feature of the ecodistrict is the association of red pine (*Pinus resinosa*) with black spruce at poorly-drained, fire disturbed sites.

The majority of the Project site is forested, with softwood stands representing the dominant habitat feature (Table 8.4; Drawing 8.5).

Table 8.4: Habitat Types at the Project Site

Habitat Type	Area (ha)	Percent of Site
Softwood	115.83	65%
Mixed woods	45.28	26%
Powerline Corridor	8.02	5%
Clear cut	3.37	2%
Hardwood	2.91	2%
Wind Throw	1.36	1%
Treed Bog	0.319	0%
Total	**177.089**	**100%**

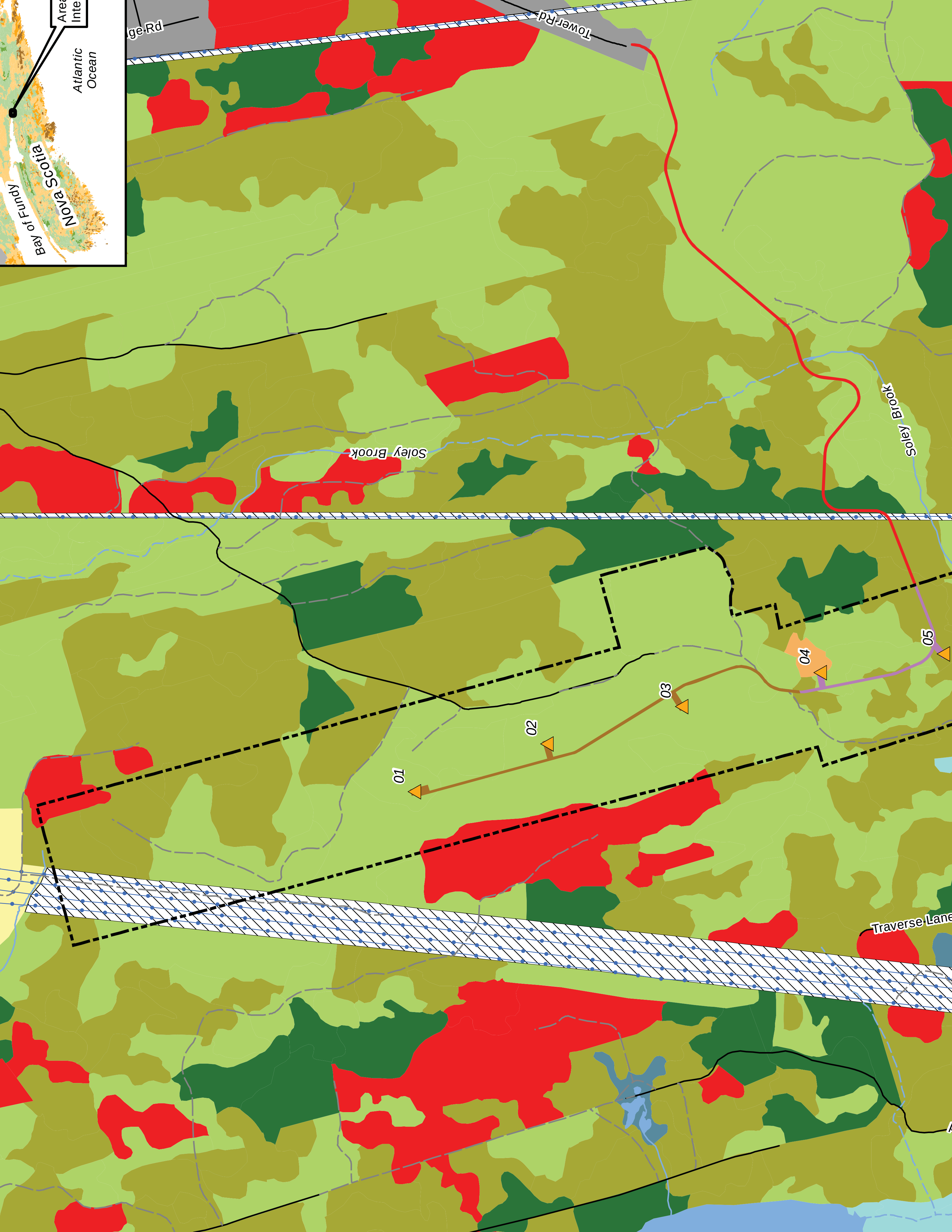
Source: NSDNR 2012a

The Project site is characterized by forest stands of mostly shade intolerant species developing on imperfectly drained soils. Young softwood dominates the central portions of the Project site, with older, balsam fir/red maple/white birch stands occurring in the northern and southern extents. Small cutover areas extend into the Project site, and a powerline corridor bisects the northwestern corner of the site. These open areas increase edge habitat and add diversity to the otherwise forested landscape.

The Millbrook Project construction footprint includes a small disturbance area (e.g. access road, turbine pad, and laydown area) of approximately 4.42 ha, representing 2.49% of the total Project site area. The Truro Heights Project construction footprint includes a disturbance area of 2.72 ha, representing 1.53% of the total Project site area. Habitats within the Project site consist almost exclusively of young softwood stands, with only a small length of access road (approximately 22 m) extending through mid-aged mixed wood. An additional 2.45 ha disturbance area will result from the creation of an access road extending from Tower Road to access both Projects. Habitat along the majority of the road length consists of young softwood. A small part of the disturbed habitat (less than 0.1 ha) will also include mid-aged softwood and hardwood stands; habitat types which are relatively common in the general area.

The permanent Project footprint, meanwhile, will be significantly reduced due to the reclamation of part of the turbine laydown area used during the construction phase. The Millbrook permanent Project footprint, therefore, will include a total disturbance area of 1.84 ha, representing 1.04% of the Project site, whereas the Truro Heights permanent Project footprint will include a disturbance area of 1.01 ha, representing 0.56% of the Project site.

General mitigation measures for terrestrial habitats are provided in Section 4.0.


Atlantic Ocean
Nova Scotia
Bay of Fundy
Tower Rd
Soley Brook
Soley Brook
Traverse Lane
01
02
03
04
05

8.4.1 Wetlands

A desktop identification of the location and extent of potential wetlands across the Project site was completed by reviewing the following information sources:

- Satellite and aerial photography;
- Nova Scotia Wet Areas Mapping database (WAM) (NSDNR 2012b);
- Nova Scotia Geomatics Centre; and
- NS Significant Species and Habitats database (NSDNR 2012c). ;

Topographic mapping and the NSDNR Significant Species and Habitat database does not indicate the presence of any wetlands within the Project site (Drawing 8.3). There is, however, a watercourse extending from the northwestern Project boundary to the north.

The WAM for the Project site shows several streams that drain the eastern slopes of the Project site (Drawing 8.3). Additional wet areas, defined as having a depth to water table of 0.5 m or less, are identified in the north and south extents of the Project site. These wet areas may represent unmapped watercourses or areas of drainage (NSDNR 2012b).

Seventeen areas of wetland habitat were delineated during field surveys completed in summer 2012 (Drawings 8.4A-C). Wetland habitat characterizations are provided in Table D1, Appendix D. Wetlands identified at the Project site and along the Tower Road extension are all treed swamps or shrub swamps. The treed swamps are located throughout the central and southern portions of the Project site, with a large shrubs swamp occupying approximately 6 ha of the northern Project site area. In northern portions of the Project site, the general movement of water is to the northwest, toward off-site watercourses that drain into the Cobequid Bay. The wetlands located near the eastern Project site boundary drain down slope to the east where they appear to join a watercourse (Watercourse 5) off-site that flows north into the Cobequid Bay (Drawing 8.4C). The wetlands located near the western Project site boundary appear to be isolated at the top of a plateau, and do not have an obvious drainage direction.

The treed/shrub swamp habitats on the Project site are for the most part tolerant hardwood or mixed wood dominated habitats that appear to have been disturbed by silviculture activities. The herbaceous under stories of these wetlands are dominated by sedges (*Carex spp.*), bulrushes (*Scirpus spp.*) or ferns. Typical hydrological indicators of wetland habitat include saturated soils, standing surface water, and shallow (<30 cm) water table depths. The soils in these wetlands are for the most part comprised of a thin organic horizon over depleted mineral soils or sandy soils with redoximorphic features.

Based on the current Project site layout, it is expected that one wetland (Wetland 17f) will be directly impacted by new road construction on the Truro Heights Project footprint. It is estimated that 405.2 m^2 of wetland will be impacted by the construction of the road (based on a total road width of 10 m). No wetland alterations are expected within the Millbrook Project footprint.

One wetland (Wetland 22) along the Tower Road extension will require a small alteration of 254.9 m^2. Once the detail design for the Tower Road extension is complete, additional micro siting for wetlands will be completed, as necessary.

Wetland alterations represent a small area of disturbance. Overall, it is expected that the Project will have a minimal effect on wetland habitat and hydrological functions. A provincial wetland alteration permit will be sought for alteration locations as required by the Nova Scotia Wetland Alteration Application process during the permitting stage of the Project. Detailed mitigation measures and BMPs to reduce adverse effects on the altered wetland, as well as the adjacent, non-altered wetlands will be outlined as part of this process. Any compensation required for direct impacts to wetland habitat will be provided in accordance with NSE requirements.

8.5 Terrestrial Vegetation

CCDC records indicate that 279 vascular and 13 nonvascular plant species have been identified within 100 km of the Project site (ACCDC 2012). Of the 292 species identified by ACCDC, 177 vascular and one nonvascular plant SOCI were identified within 100 km of the Project site. This preliminary list was used to develop a short list of plant SOCI that might be present at the Project site. The short list of plant SOCI is provided in Appendix E.

A plant survey was completed in October 2012 within the Project site boundaries. A complete list of plant species identified during the survey is provided in Appendix E.

No vascular plant SOCI were observed during this survey.

General mitigation measures for Project-related effects to terrestrial vegetation are provided in Section 4.0.

8.6 Terrestrial Fauna

A review of the NS Significant Species and Habitat Database (NSDNR 2012c) and ACCDC data (ACCDC 2012) for species recorded within a 100 km radius of the Project site was completed. A comparison of habitat mapping data (Section 8.5) to known habitat requirements for species expected to occur within the area, and for all SOCI, was also completed.

Species identified during field studies or that have been recorded within a 100 km radius of the Project site were screened against the criteria outlined in the document "Guide to Addressing Wildlife Species and Habitat in an EA Registration Document" (NSE 2009b) to develop a list of priority species, as presented in the sections that follow.

8.6.1 Mammals

The Nova Scotia Significant Species and Habitats Database (NSDNR 2012c) contains 47 unique species and/or habitat records pertaining to mammals within a 100km radius of the Project site. These records include:

- Forty-four records that are classified as "Deer Wintering", which relate to known over-wintering habitat for White-tailed deer (*Odocoileus virginianus).* The closest identified deer wintering ground is located approximately 7.7 km to the southeast, in the area of Little River and Brandy Brook.
- One record classified as "Species of Concern" which relates to Long-tailed shrew (*Sorex dispar*).

- One record is classified as "Species at Risk", which relates to Southern flying squirrel (*Glaucomys volans*); and
- One record is classified as "Other Habitat", which corresponds to American black bear (*Ursus americanus*).

The ACCDC database (2012) indicates that three species of terrestrial mammals (excluding bats) have been recorded within a 100 km radius of the Project site (Table 8.5).

Table 8.5: Mammal Species Recorded within a 100 km radius of the Project Site

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Long-tailed shrew	*Sorex dispar*	Not Listed	Not Listed	Not Listed	Yellow
Mainland Moose	*Alces alces*	Not Listed	Endangered	Not Listed	Red
Southern flying squirrel	*Glaucomys volans*	Not Listed	Not Listed	Not at Risk	Yellow

Source: ACCDC 2012
[1]Government of Canada 2012; [2]NS *ESA* 2007; [3]COSEWIC 2012; [4]NSDNR 2010

Of note, is that sightings of many of the most common species are unreported to ACCDC, and are therefore under-represented or absent from the database. Consequently, a review of the ACCDC data reveals predominantly rare or noteworthy species despite the fact that these species certainly represent a small fraction of the existing mammal community in any area.

Field surveys (between February 2012 and March 2013) of mammalian fauna at the Project site consisted of direct observation of individuals, as well as the indirect identification of species by sound and/or sign (e.g. scat, tracks, scent, dens, lodges).

Snow-tracking surveys, targeting Mainland moose, but encompassing all other wildlife species, were conducted in February and March 2013. A detailed methodology for snow-tracking surveys is provided in Appendix F.

Table 8.6 lists the mammal species observed/identified at or near the Project site during all field surveys.

Table 8.6: Mammal Species Observed/Identified during Field Surveys

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
American porcupine	*Erethizon dorsatum*	Not Listed	Not Listed	Not Listed	Green
Bobcat	*Lynx rufus*	Not Listed	Not Listed	Not Listed	Green
Coyote	*Canis latrans*	Not Listed	Not Listed	Not Listed	Green
Ermine	*Mustela erminea*	Not Listed	Not Listed	Not Listed	Green
Red fox	*Vulpes vulpes*	Not Listed	Not Listed	Not Listed	Green
Red squirrel	*Tamiasciurus hudsonicus*	Not Listed	Not Listed	Not Listed	Green
Short-tailed shrew	*Blarina brevicauda*	Not Listed	Not Listed	Not Listed	Green
Snowshoe hare	*Lepus americanus*	Not Listed	Not Listed	Not Listed	Green
Southern red-backed Vole	*Myodes gapperi*	Not Listed	Not Listed	Not Listed	Green

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
White-footed deer mouse	*Peromyscus leucopus*	Not Listed	Not Listed	Not Listed	Green
White-tailed deer	*Odocoileus virginianus*	Not Listed	Not Listed	Not Listed	Green

[1]Government of Canada 2012; [2]NS *ESA* 2007; [3]COSEWIC 2012; [4]NSDNR 2010

Priority mammal species include:

- Long-tailed shrew – "Yellow" (NSDNR);
- Mainland moose – "Endangered" (NS *ESA*), "Red" (NSDNR); and
- Southern flying squirrel – "Yellow" (NSDNR).

Long-tailed shrew
Long-tailed shrew are closely associated with steep, talus slopes, usually close to running water, and the presence of rocks is considered a principal habitat component (Kirkland 1981).

Long-tailed shrew in Nova Scotia was thought to be found only in the Cobequid Mountains (Scott 1987; Woolaver *et al*. 1998), but more recent research has identified an additional population 60 km to the southwest, near Wolfville (Shafer and Stewart 2006). ACCDC data indicate that the closest observation of Long-tailed shrew to the Project site was 33 ± 10 km away.

No indication of Long-tailed shrew was observed during field studies, although small mammals can be difficult to observe in the absence of targeted surveys (e.g., live-trapping). Furthermore, no talus slope habitat is present at the Project site. Considering that the range of this species in Nova Scotia does not coincide with the Project location and that suitable habitat is absent, it is highly unlikely that Long-tailed shrew occur at the Project site.

Mainland moose
Habitat requirements for Mainland moose change throughout the year. Early successional growth, such as that provided by recent cutovers, offers quality foraging habitat for moose, and interspersed wetlands provide suitable summer habitat for cows and calves (Parker 2003; Snaith & Beazley 2004). Mature softwood forest is used as escape cover throughout the year, and also provides thermal relief during the summer months (Broders *et al*. 2012) and relief from deep snows in winter (Telfer 1970).

Five significant concentration areas for Mainland moose have been identified in Nova Scotia (NSDNR 2012d), and the Project site is located within 2.5 km of the southeastern extent of the Cobequid Concentration area. ACCDC records, meanwhile, indicate that the closest observation of this species to the Project site was 49 ± 10 km away.

No evidence of Mainland moose was observed at the Project site, including during targeted snow-tracking surveys conducted in January and March 2013. While the Project site lacks key habitat features to support the year-round needs of Mainland moose, namely aquatic sites and extensive foraging habitat, the Project site forms part of a diversified landscape which may support this species. It is possible that Mainland moose occur at the Project site, particularly during the winter months when softwood habitat is more heavily exploited.

Potential effects of the Project on this species, as well as proposed species-specific mitigation measures, are discussed in more detail in Section 14.2.1.

Southern flying squirrel
Southern flying squirrel requires mast bearing trees for forage and tree cavities for nesting and in the Atlantic Region, southern flying squirrels select older forest stands (COSEWIC 2006). In Nova Scotia, the species demonstrates a particular affinity to red oak (*Quercus rubra*) which is most commonly found in mixed wood stands as opposed to pure hardwood stands (Lavers 2004).

In Nova Scotia, Southern flying squirrel occur primarily in a region bounded by the South Mountain in the north, Kentville in the east, New Ross in Lunenburg County to the south, and extends to Kejiimkujik National Park in the west (COSEWIC 2006). ACCDC data indicate that the closest observation of this species to the Project site was 82 ± 10 km away.

No indication of Southern flying squirrel was observed during field studies. Furthermore, red oak was not identified at the Project site during intensive botany surveys, a finding which is supported by local habitat mapping. Given that this key habitat feature is absent and that the known geographic range of the species in Nova Scotia does not coincide with the Project location, it is highly unlikely that Southern flying squirrel occurs at the Project site.

8.6.2 Herpetofauna
The NS Significant Species and Habitats Database (NSDNR 2012c) contains 32 unique records corresponding to reptile habitat within a 100km radius of the Project site, with no such records in relation to amphibians. These records include:

- Thirty-one records that are classified as “Species at Risk”, of which 30 pertain to Wood turtle (*Clemmys insculpta*) and 1 relates to Common snapping turtle (*Chelydra serpentina*).
- Two records for Wood turtle that are located within 10 km of the Project site; one along the Chiganois River 6.8km to the northwest, and one along the Little River 9.4 km to the south.
- One record is classified as “Species of Concern” which corresponds to Painted turtle (*Chrysemys picta*).

The ACCDC database identifies two terrestrial herpetofauna taxa within a 100km radius of the Project site (Table 8.7).

Table 8.7: Reptile and Amphibian Species Recorded within a 100 km Radius of the Project Site

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Four-toed salamander	*Hemidactylium scutatum*	Not Listed	Not Listed	Not at Risk	Green
Wood turtle	*Clemmys insculpta*	Threatened	Vulnerable	Threatened	Yellow

Source: ACCDC 2012
[1]Government of Canada 2012; [2]NS *ESA* 2007; [3]COSEWIC 2012; [4]NSDNR 2010

The same data limitations and interpretations as noted for the mammalian fauna (Section 8.6.1) are also applicable to the reptile and amphibian data.

Field surveys of amphibian and reptile species were conducted in conjunction with other surveys between February 2012 and March 2013. Species were either identified directly through visual observation, or indirectly using other evidence (e.g., calls, egg masses, tadpoles, etc.). Table 8.8 lists the amphibian and reptile species identified at or near the Project site during field surveys.

Table 8.8: Herpetofauna Species Recorded During Field Surveys

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
American toad	*Anaxyrus americanus*	Not Listed	Not Listed	Not Listed	Green
Green frog	*Lithobates clamitans*	Not Listed	Not Listed	Not Listed	Green
Eastern red-backed salamander	*Plethodon cinereus*	Not Listed	Not Listed	Not Listed	Green
Spotted salamander	*Ambystoma maculatum*	Not Listed	Not Listed	Not Listed	Green

[1]Government of Canada 2012; [2]NS *ESA* 2007; [3]COSEWIC 2012; [4]NSDNR 2010

Priority herpetofauna species include:

- Common snapping turtle – "Special Concern" (*SARA*), "Special Concern" (COSEWIC); and
- Wood turtle – "Threatened" (*SARA*), "Vulnerable" (NS *ESA*), "Threatened" (COSEWIC), "Yellow" (NSDNR).

None of the priority species listed above were observed during field surveys.

Common snapping turtle
Common snapping turtle, despite its conservation status, is considered relatively common in mainland Nova Scotia (Davis and Browne 1996). Common snapping turtle habitat is usually associated with slow moving water of moderate depth, with a muddy bottom and dense vegetation. Established populations are typically found in ponds, lakes and river edges (COSEWIC 2008).

The species has a widespread distribution across mainland Nova Scotia, including Colchester County (COSEWIC 2008), although ACCDC records do not include Common snapping turtle records within 100 km of the Project site.

No indication of Common snapping turtle was observed during field studies. Furthermore, watercourses at the Project site are relatively small and of shallow depth, and open water features are absent. Given the apparent lack of suitable habitat, it is unlikely that Common snapping turtle occurs at the Project site.

Wood turtle
Wood turtle requires three key habitat components: a watercourse, sandy substrate for nesting, and a forested area for thermal relief during the summer months (MacGregor and Elderkin 2003).

The species is found throughout the province but seems to be most abundant in central Nova Scotia, including the Salmon River and Shubenacadie River watersheds (MacGregor and Elderkin 2003).

ACCDC data indicate that the closest observation of this species to the Project site was 10 ± 10 km away.

No indication of Wood turtle was observed during field studies. However, suitable watercourse and associated riparian habitat is present at the Project site to support Wood turtles throughout the annual cycle (Drawing 8.5). Given that the species is concentrated in central Nova Scotia, and that suitable habitat is present, it is very likely that the individual Wood turtle home ranges include part of the Project site.

Potential effects of the Project on this species, as well as proposed species-specific mitigation measures, are discussed in more detail in Section 14.2.1.

8.6.3 Butterflies and Odonates

The NS Significant Species and Habitats database (NSDNR 2012c) contains five unique records corresponding to butterflies and Odonates within a 100 km radius of the Project site. These habitat features include:

- Three records classified as "Species of Concern" and pertain to Jutta arctic (*Oeneis jutta*) and Little bluet (*Enallagma minusculum*).
- One record is classified as "Species at Risk" and relates to the Ebony boghaunter (*Williamsonia fletcheri*).
- One record is classified as "Other Habitat" and corresponds to the Hoary elfin (*Incisalia polia*).

The database contains no records of butterflies or Odonates within 10 km of the Project site.

The ACCDC database contains records of 69 unique taxa of butterfly and Odonates within a 100 km radius of the Project site (Table 8.9).

Table 8.9: Unique Butterfly and Odonate Species Recorded within a 100 km radius of the Project Site

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Acadian hairstreak	*Satyrium acadica*	Not Listed	Not Listed	Not Listed	Undetermined
Amber-winged spreadwing	*Lestes eurinus*	Not Listed	Not Listed	Not Listed	Green
Aphrodite fritillary	*Speyeria aphrodite*	Not Listed	Not Listed	Not Listed	Green
Arctic fritillary	*Boloria chariclea*	Not Listed	Not Listed	Not Listed	Yellow
Aurora damsel	*Chromagrion conditum*	Not Listed	Not Listed	Not Listed	Green
Azure bluet	*Houstonia caerulea*	Not Listed	Not Listed	Not Listed	Green
Baltimore checkerspot	*Euphydryas phaeton*	Not Listed	Not Listed	Not Listed	Green
Banded hairstreak	*Satyrium calanus*	Not Listed	Not Listed	Not Listed	Undetermined
Band-winged meadowhawk	*Sympetrum semicinctum*	Not Listed	Not Listed	Not Listed	Green

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Bog elfin	*Callophrys lanoraieensis*	Not Listed	Not Listed	Not Listed	Red
Bronze copper	*Lycaena hyllus*	Not Listed	Not Listed	Not Listed	Green
Brook snaketail	*Ophiogomphus aspersus*	Not Listed	Not Listed	Not Listed	Red
Brush-tipped emerald	*Somatochlora walshii*	Not Listed	Not Listed	Not Listed	Green
Clamp-tipped emerald	*Somatochlora tenebrosa*	Not Listed	Not Listed	Not Listed	Green
Common branded skipper	*Hesperia comma*	Not Listed	Not Listed	Not Listed	Green
Common roadside-skipper	*Amblyscirtes vialis*	Not Listed	Not Listed	Not Listed	Green
Compton tortoiseshell	*Nymphalis l-album*	Not Listed	Not Listed	Not Listed	Green
Crimson-ringed whiteface	*Leucorrhinia glacialis*	Not Listed	Not Listed	Not Listed	Green
Delicate emerald	*Somatochlora franklini*	Not Listed	Not Listed	Not Listed	Yellow
Early hairstreak	*Erora laeta*	Not Listed	Not Listed	Not Listed	Red
Eastern comma	*Polygonia comma*	Not Listed	Not Listed	Not Listed	Not Listed
Eastern pine elfin	*Callophrys niphon*	Not Listed	Not Listed	Not Listed	Green
Eastern red damsel	*Amphiagrion saucium*	Not Listed	Not Listed	Not Listed	Green
Ebony boghaunter	*Williamsonia fletcheri*	Not Listed	Not Listed	Not Listed	Red
Elfin skimmer	*Nannothemis bella*	Not Listed	Not Listed	Not Listed	Green
Forcipate emerald	*Somatochlora forcipata*	Not Listed	Not Listed	Not Listed	Red
Gray comma	*Polygonia progne*	Not Listed	Not Listed	Not Listed	Green
Green comma	*Polygonia faunus*	Not Listed	Not Listed	Not Listed	Green
Greenish blue	*Plebejus saepiolus*	Not Listed	Not Listed	Not Listed	Not Listed
Harlequin darner	*Gomphaeschna furcillata*	Not Listed	Not Listed	Not Listed	Yellow
Harpoon clubtail	*Gomphus descriptus*	Not Listed	Not Listed	Not Listed	Yellow
Harvester	*Feniseca tarquinius*	Not Listed	Not Listed	Not Listed	Green
Henry's elfin	*Callophrys henrici*	Not Listed	Not Listed	Not Listed	Green
Hoary comma	*Polygonia gracilis*	Not Listed	Not Listed	Not Listed	Yellow
Hoary elfin	*Callophrys polios*	Not Listed	Not Listed	Not Listed	Green
Jutta arctic	*Oeneis jutta*	Not Listed	Not Listed	Not Listed	Red
Juvenal's duskywing	*Erynnis juvenalis*	Not Listed	Not Listed	Not Listed	Green
Kennedy's emerald	*Somatochlora kennedyi*	Not Listed	Not Listed	Not Listed	Red

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Lake darner	*Aeshna eremita*	Not Listed	Not Listed	Not Listed	Green
Lance-tipped darner	*Aeshna constricta*	Not Listed	Not Listed	Not Listed	Green
Laurentian skipper	*Hesperia comma*	Not Listed	Not Listed	Not Listed	Green
Maine snaketail	*Ophiogomphus mainensis*	Not Listed	Not Listed	Not Listed	Red
Milbert's tortoiseshell	*Aglais milberti*	Not Listed	Not Listed	Not Listed	Green
Monarch	*Danaus plexippus*	Special Concern	Not Listed	Special Concern	Yellow
Mottled darner	*Aeshna clepsydra*	Not Listed	Not Listed	Not Listed	Green
Mustard white	*Pieris oleracea*	Not Listed	Not Listed	Not Listed	Yellow
Northern cloudywing	*Thorybes pylades*	Not Listed	Not Listed	Not Listed	Yellow
Northern pearly-eye	*Lethe anthedon*	Not Listed	Not Listed	Not Listed	Green
Northern pygmy clubtail	*Lanthus parvulus*	Not Listed	Not Listed	Not Listed	Green
Ocellated darner	*Boyeria grafiana*	Not Listed	Not Listed	Not Listed	Yellow
Orange bluet	*Enallagma signatum*	Not Listed	Not Listed	Not Listed	Red
Petite emerald	*Dorocordulia lepida*	Not Listed	Not Listed	Not Listed	Green
Prince baskettail	*Epitheca princeps*	Not Listed	Not Listed	Not Listed	Yellow
Quebec emerald	*Somatochlora brevicincta*	Not Listed	Not Listed	Not Listed	Red
Question mark	*Polygonia interrogationis*	Not Listed	Not Listed	Not Listed	Green
Racket-tailed emerald	*Dorocordulia libera*	Not Listed	Not Listed	Not Listed	Green
Riffle snaketail	*Ophiogomphus carolus*	Not Listed	Not Listed	Not Listed	Green
Rusty snaketail	*Ophiogomphus rupinsulensis*	Not Listed	Not Listed	Not Listed	Red
Salt and pepper skipper	*Amblyscirtes hegon*	Not Listed	Not Listed	Not Listed	Green
Salt marsh copper	*Lycaena dospassosi*	Not Listed	Not Listed	Not Listed	Not Listed
Satyr comma	*Polygonia satyrus*	Not Listed	Not Listed	Not Listed	Yellow
Skillet clubtail	*Gomphus ventricosus*	Not Listed	Not Listed	Not Listed	Red
Ski-tailed emerald	*Somatochlora elongata*	Not Listed	Not Listed	Not Listed	Green
Sphagnum sprite	*Nehalennia gracilis*	Not Listed	Not Listed	Not Listed	Green
Striped hairstreak	*Satyrium liparops*	Not Listed	Not Listed	Not Listed	Undetermined
Subarctic darner	*Aeshna subarctica*	Not Listed	Not Listed	Not Listed	Green
Taiga bluet	*Coenagrion resolutum*	Not Listed	Not Listed	Not Listed	Red

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Twin-spotted spiketail	*Cordulegaster maculata*	Not Listed	Not Listed	Not Listed	Green
Zebra clubtail	*Stylurus scudderi*	Not Listed	Not Listed	Not Listed	Red

Source: ACCDC 2012

[1]Government of Canada 2012; [2]NS *ESA* 2007; [3]COSEWIC 2012; [4]NSDNR 2010

Field studies of butterfly and Odonate species were conducted in conjunction with other surveys in summer 2012. Species were identified by direct observation of individuals. Table 8.10 lists the butterfly species found at or near the Project site during field surveys.

Table 8.10: Butterfly and Odonate Species Observed During Field Surveys

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Cabbage white	*Pieris rapae*	Not Listed	Not Listed	Not Listed	Exotic
Canadian tiger swallowtail	*Papilio canadensis*	Not Listed	Not Listed	Not Listed	Green
Mourning cloak	*Nymphalis antiopa*	Not Listed	Not Listed	Not Listed	Green
White admiral	*Limenitis arthemis*	Not Listed	Not Listed	Not Listed	Green

[1]Government of Canada 2012; [2]NS *ESA* 2007; [3]COSEWIC 2012; [4]NSDNR 2010

Priority butterfly and Odonate species include:

- Arctic fritillary – “Yellow” (NSDNR);
- Bog elfin – “Red” (NSDNR);
- Brook snaketail – “Red” (NSDNR);
- Delicate emerald – “Yellow” (NSDNR);
- Early hairstreak – “Red” (NSDNR);
- Ebony boghaunter – “Red” (NSDNR);
- Forcipate emerald – “Red” (NSDNR);
- Harlequin darner – “Yellow” (NSDNR);
- Harpoon clubtail – “Yellow” (NSDNR);
- Hoary comma – “Yellow” (NSDNR);
- Jutta arctic – “Red” (NSDNR);
- Kennedy's emerald – “Red” (NSDNR);
- Maine snaketail – “Red” (NSDNR);
- Monarch – “Special Concern” (*SARA*), “Special Concern” (COSEWIC), “Yellow” (NSDNR);
- Mustard white – “Yellow” (NSDNR);
- Northern cloudywing – “Yellow” (NSDNR);
- Ocellated darner – “Yellow” (NSDNR);
- Orange bluet – “Red” (NSDNR);
- Prince baskettail – “Yellow” (NSDNR);
- Quebec emerald – “Red” (NSDNR);
- Rusty snaketail – “Red” (NSDNR);
- Satyr comma – “Yellow” (NSDNR);
- Skillet clubtail – “Red” (NSDNR);

- Taiga bluet – "Red" (NSDNR); and
- Zebra clubtail – "Red" (NSDNR).

Monarch
Only the Monarch has been granted a designated conservation status at either the provincial or federal level. This species can be found in open-habitats with abundant wildflower growth. Milkweed (*Asclepias* sp.) is a critical element of breeding habitat, whereas asters (*Asteraciae* sp.) and goldenrods (*Solidago* sp.) provide necessary food resources during migration (Mersey Tobeatic Institute 2008).

Nova Scotia falls within the breeding range of this migratory species (COSEWIC 2010c), and individuals can be found throughout the province from May to October (Maritime Butterfly Atlas 2012).

No indication of Monarch was observed during field surveys. Furthermore, open habitat is limited at the Project site. However, considering the widespread distribution of the species in Atlantic Canada, it is possible that Monarch occurs at the Project site, particularly during the migratory period (late summer/early fall). However, it is unlikely that the Project site provides sufficient nectar resources to support a large congregation of migratory Monarchs.

Potential effects of the Project on this species, as well as proposed species-specific mitigation measures, are discussed in more detail in Section 14.2.1.

The requirements as set out in *SARA* and *NSESA* will be adhered to for Project activities. Additional general mitigation measures for terrestrial fauna are provided in Section 4.0. Where required, species-specific mitigation is provided in Section 14.

8.7 Avifauna
The Project site is dominated by forest stands of varying composition and successional stage. In addition, field studies have identified several areas of wetland habitat throughout the Project site. This diversity of habitat types provides foraging, breeding, and roosting habitat for a variety of resident and migratory bird species. Baseline information was utilized to gain insight into protected avifauna habitats, species utilization of the area, and to identify SOCI potentially occurring at or near the Project site.

The closest Important Bird Area (IBA) (IBA Canada 2012) is the Cobequid Bay located 1.56 km north of the Project site. Part of a network of IBAs at the head of the Bay of Fundy, the Cobequid Bay IBA provides key staging habitat for thousands of migratory shorebirds each autumn. Up to 40,000 Semipalmated Sandpipers, representing approximately 1.2% of the global population, have been recorded in Cobequid Bay during late July and early August, when they gather to feed on the millions of amphipods present in the mudflats that become exposed during the Bay of Fundy's low tide. Other shorebird species that congregate in Cobequid Bay include Semipalmated Plover (*Charadrius semipalmatus*), Black-bellied Plover (*Pluvialis squatarola*), Red Knot (*Calidris canutus*), Sanderling (*Calidris alba*), Least Sandpiper (*Calidris minutilla*), Dunlin (*Calidris alpine*), and White-rumped Sandpiper (*Calidris fuscicollis*). In addition, up to 3,000 Canada Geese (*Branta canadensis*) have been recorded at this IBA during the spring migration (IBA Canada 2012).

The Project site is contained within two map squares of the Maritime Breeding Bird Atlas (MBBA); the southern half of the Project site falls within map square 20MR71, while the northern half of the Project site falls within map square 20MR72 (MBBA 2012). In the most recent edition of the MBBA (covering the years 2006-2010), 101 species were identified as being possible, probable, or confirmed breeders within this area. The following SOCI are considered possible, probable, or confirmed breeder in the two map squares:

- American Bittern (*Botaurus lentiginosus*) – "Yellow" (NSDNR);
- Barn Swallow (*Hirundo rustica*) – "Threatened" (COSEWIC), "Yellow" (NSDNR);
- Black-billed Cuckoo (*Coccyzus erythropthalmus*) – "Red" (NSDNR);
- Blue-winged Teal (*Anas discors*) – "Red" (NSDNR);
- Bobolink (*Dolichonyx oryzivorus*) – "Threatened" (COSEWIC), "Yellow" (NSDNR);
- Chimney Swift (*Chaetura pelagica*) – "Threatened" (*SARA*), "Endangered" (NS *ESA)*, "Threatened" (COSEWIC), "Red" (NSDNR);
- Common Loon – "Red" (NSDNR);
- Common Nighthawk (*Chordeiles minor*) – "Threatened" (*SARA*), "Threatened" (COSEWIC), "Red" (NSDNR);
- Eastern Kingbird (*Tyrannus tyrannus*) – "Yellow" (NSDNR);
- Eastern Phoebe (*Sayornis phoebe*) – "Yellow" (NSDNR);
- Eastern Wood-Pewee (*Contopus virens*) – "Yellow" (NSDNR), "Special Concern" (COSEWIC);
- Gadwall (*Anas strepera*) – "Red" (NSDNR);
- Golden-crowned Kinglet (*Regulus satrapa*) – "Yellow" (NSDNR 2010);
- Gray Catbird (*Dumetella carolinensis*) – "Red" (NSDNR);
- Gray Jay (*Perisoreus canadensis*) – "Yellow" (NSDNR);
- Killdeer (*Charadrius vociferous*) – "Yellow" (NSDNR 2010);
- Pine Siskin (*Spinus pinus*) – "Yellow" (NSDNR 2010);
- Rose-breasted Grosbeak (*Pheucticus ludovicianus*) – "Yellow" (NSDNR);
- Ruby-crowned Kinglet (*Regulus calendula*) – "Yellow" (NSDNR);
- Spotted Sandpiper (*Actitis macularius*) – "Yellow" (NSDNR);
- Tree Swallow (*Tachycineta bicolor*) – "Yellow" (NSDNR);
- Wilson's Snipe (*Gallinago delicate*) – "Yellow" (NSDNR); and
- Wilson's Warbler (*Wilsonia pusilla*) – "Yellow" (NSDNR).

The NS Significant Species and Habitats database contains 493 unique records pertaining to birds and/or bird habitat within a 100 km radius of the Project site. These records include:

- 204 classified in the database as "Other Habitat", of which the majority relate to Bald Eagle (*Haliaeetus leucocephalus*) (151) but also include records of Osprey (*Pandion haliaetus*) (6), Gray Partridge (*Perdix perdix*) (2), and Common Eider (*Somateria mollissima*) (2), among others;
- 108 records classified as "Species of Concern", of which the majority relate to Common Loon (*Gavia immer*) (36), but also include records of unclassified Tern species (12), Common Tern (*Sterna hirundo*) (12), and Northern Goshawk (*Accipiter gentilis*) (6), among others;

- 104 records classified as "Species at Risk", primarily relating to Piping Plover (32), Peregrine Falcon (*Falco peregrinus*) (7), and Harlequin Duck (*Histrionicus histrionicus*) (7) but also include records of Common Tern (5) and Roseate Tern (*Sterna dougallii*) (3), among others; and
- 77 records classified as "Migratory Bird", including Great Blue unclassified shorebirds (23), Double-crested Cormorant (*Phalacrocorax auritus*) (16), Common Eider (12), Great Blue Heron (*Ardea herodias*) (10), and American Black Duck (*Anas rubripes*) (7), among others.

Table 8.11. Significant Habitat Features Related to Birds within a 25 km Radius of the Project Site

Species	Location	Distance from Project Site (km)	Direction
Bald Eagle	Chiganois River	8.07	N
Canada Goose	MacElmon's Pond	8.10	NW
Bald Eagle	Debert Wildlife Management Area	8.23	NW
Bald Eagle	Princeport	9.10	W
Bald Eagle	Masstown	9.65	NW
Bald Eagle	Green Creek	9.74	SW
Bald Eagle	Green Creek	9.76	SW

Source: NSDNR 2012c

The ACCDC database contains records of 60 bird species within a 100 km radius of the Project site. Table 8.12 lists these species as well as their respective provincial and national conservation status ranks.

Table 8.12: Bird Species Recorded within a 100 km Radius of the Project Site

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
American Coot	*Fulica americana*	Not Listed	Not Listed	Not at Risk	Undetermined
American Golden-Plover	*Pluvialis dominica*	Not Listed	Not Listed	Not Listed	Yellow
Arctic Tern	*Sterna paradisaea*	Not Listed	Not Listed	Not Listed	Red
Atlantic Brant	*Branta bernicla*	Not Listed	Not Listed	Not Listed	Yellow
Baltimore Oriole	*Icterus galbula*	Not Listed	Not Listed	Not Listed	Red
Barrow's Goldeneye	*Bucephala islandica*	Special Concern	Not Listed	Special Concern	Red
Bicknell's Thrush	*Catharus bicknelli*	Special Concern	Vulnerable	Threatened	Red
Black Guillemot	*Cepphus grylle*	Not Listed	Not Listed	Not Listed	Green
Black Tern	*Chlidonias niger*	Not Listed	Not Listed	Not at Risk	Red
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Not Listed	Not Listed	Not Listed	Red
Black-headed Gull	*Chroicocephalus ridibundus*	Not Listed	Not Listed	Not Listed	Green
Bobolink	*Dolichonyx oryzivorus*	No Status	Not Listed	Threatened	Yellow
Boreal Owl	*Aegolius funereus*	Not Listed	Not Listed	Not at Risk	Undetermined
Brown Thrasher	*Toxostoma rufum*	Not Listed	Not Listed	Not Listed	Undetermined
Common Goldeneye	*Bucephala clangula*	Not Listed	Not Listed	Not Listed	Green
Common Moorhen	*Gallinula chloropus*	Not Listed	Not Listed	Not Listed	Undetermined
Common Tern	*Sterna hirundo*	Not Listed	Not Listed	Not at Risk	Yellow
Eastern Bluebird	*Sialia sialis*	Not Listed	Not Listed	Not at Risk	Yellow
Eastern Meadowlark	*Sturnella magna*	No Status	Not Listed	Threatened	Yellow

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Eastern Phoebe	*Sayornis phoebe*	Not Listed	Not Listed	Not Listed	Yellow
Eskimo Curlew	*Numenius borealis*	Endangered	Not Listed	Endangered	Undetermined
Gadwall	*Anas strepera*	Not Listed	Not Listed	Not Listed	Red
Great Crested Flycatcher	*Myiarchus crinitus*	Not Listed	Not Listed	Not Listed	Red
Greater Scaup	*Aythya marila*	Not Listed	Not Listed	Not Listed	Green
Greater Yellowlegs	*Tringa melanoleuca*	Not Listed	Not Listed	Not Listed	Yellow
Harlequin Duck	*Histrionicus histrionicus*	Special Concern	Endangered	Special Concern	Red
Horned Lark	*Eremophila alpestris*	Not Listed	Not Listed	Not Listed	Green
Hudsonian Godwit	*Limosa haemastica*	Not Listed	Not Listed	Not Listed	Yellow
Indigo Bunting	*Passerina cyanea*	Not Listed	Not Listed	Not Listed	Undetermined
Least Sandpiper	*Calidris minutilla*	Not Listed	Not Listed	Not Listed	Green
Long-eared Owl	*Asio otus*	Not Listed	Not Listed	Not Listed	Red
Marsh Wren	*Cistothorus palustris*	Not Listed	Not Listed	Not Listed	Undetermined
Northern Cardinal	*Cardinalis cardinalis*	Not Listed	Not Listed	Not Listed	Green
Northern Goshawk	*Accipiter gentilis*	Not Listed	Not Listed	Not at Risk	Green
Northern Mockingbird	*Mimus polyglottos*	Not Listed	Not Listed	Not Listed	Green
Northern Pintail	*Anas acuta*	Not Listed	Not Listed	Not Listed	Red
Northern Shoveler	*Anas clypeata*	Not Listed	Not Listed	Not Listed	Red
Peregrine Falcon	*Falco peregrinus*	Threatened	Vulnerable	Special Concern	Yellow
Philadelphia Vireo	*Vireo philadelphicus*	Not Listed	Not Listed	Not Listed	Undetermined
Purple Martin	*Progne subis*	Not Listed	Not Listed	Not Listed	Red
Purple Sandpiper	*Calidris maritima*	Not Listed	Not Listed	Not Listed	Yellow
Red Crossbill	*Loxia curvirostra*	Not Listed	Not Listed	Not Listed	Green
Red Knot rufa ssp	*Calidris canutus*	No Status	Endangered	Endangered	Red
Red Phalarope	*Phalaropus fulicarius*	Not Listed	Not Listed	Not Listed	Yellow
Red-breasted Merganser	*Mergus serrator*	Not Listed	Not Listed	Not Listed	Green
Red-necked Phalarope	*Phalaropus lobatus*	Not Listed	Not Listed	Not Listed	Yellow
Roseate Tern	*Sterna dougallii*	Endangered	Endangered	Endangered	Red
Rusty Blackbird	*Euphagus carolinus*	Special Concern	Not Listed	Special Concern	Red
Savannah Sparrow princeps ssp	*Passerculus sandwichensis*	Special Concern	Not Listed	Special Concern	Green
Scarlet Tanager	*Piranga olivacea*	Not Listed	Not Listed	Not Listed	Undetermined
Semipalmated Plover	*Charadrius semipalmatus*	Not Listed	Not Listed	Not Listed	Green
Short-eared Owl	*Asio flammeus*	Special Concern	Not Listed	Special Concern	Red
Solitary Sandpiper	*Tringa solitaria*	Not Listed	Not Listed	Not Listed	Green
Vesper Sparrow	*Pooecetes gramineus*	Not Listed	Not Listed	Not Listed	Red
Virginia Rail	*Rallus limicola*	Not Listed	Not Listed	Not Listed	Undetermined
Warbling Vireo	*Vireo gilvus*	Not Listed	Not Listed	Not Listed	Undetermined
Whimbrel	*Numenius phaeopus*	Not Listed	Not Listed	Not Listed	Yellow
Whip-Poor-Will	*Caprimulgus vociferus*	Threatened	Not Listed	Threatened	Red
Willow Flycatcher	*Empidonax traillii*	Not Listed	Not Listed	Not Listed	Yellow
Wood Thrush	*Hylocichla mustelina*	Not Listed	Not Listed	Not Listed	Undetermined

Source: ACCDC 2012
[1]Government of Canada 2012; [2]NS *ESA* 2007; [3]COSEWIC 2012; [4]NSDNR 2010

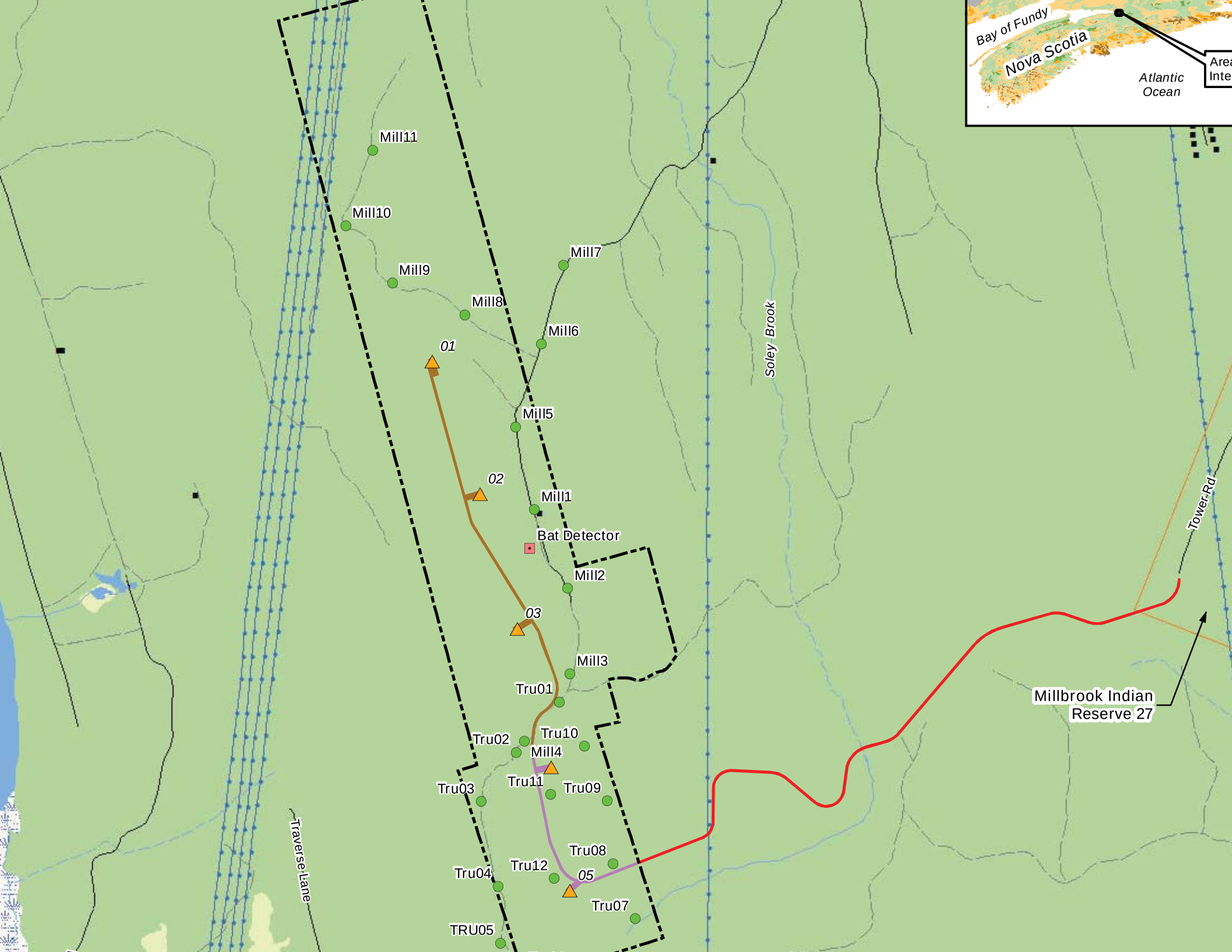
Field surveys were completed to gather data to characterize the year round, pre-construction (baseline) bird community at the Project site and were designed to capture changes in the diversity and abundance of bird species at the Project site coinciding with such important events as breeding and migration. All field surveys were designed in consultation with officials from NSDNR and CWS, and conformed to protocols outlined in the document "Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds" (CWS 2007).

For the purposes of this assessment, data obtained through avifauna surveys has been considered in conjunction with that collected for the adjacent Millbrook Community Wind Project. This approach was taken to ensure that data analysis and interpretation was representative of the bird community in the general Project area.

A summary of each survey is provided in the following sections. Detailed methodology and results for bird surveys are provided in Appendix G.

Winter Bird Survey

Twenty-four area searches were conducted at or near the Project site on February 21, 2012 and February 11, 2013 (Drawing 8.6). A total of 24 species were identified, including 324 individual birds (Tables G1/2, Appendix G). Black-capped Chickadee (*Parus atricapillus*), American Crow (*Corvus brachyrhynchos*), and American Goldfinch (*Carduelis tristis*) were the most abundant species, while Common Raven (*Corvus corax*) was also commonly observed. A flock of 27 European Starlings (*Sturnus vulgaris*) constituted the largest single congregation of winter birds.


Bay of Fundy
Nova Scotia
Atlantic Ocean
Mill11
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01
02
03
05
Bat Detector
Tru01
Tru02
Tru03
Tru04
TRU05
Tru07
Tru08
Tru09
Tru10
Tru11
Tru12
Soley Brook
Tower Rd
Traverse Lane
Millbrook Indian Reserve 27

Spring Migration Surveys
Spring migration surveys were conducted at or near the Project sites on April 28, May 7, and May 21, 2012, during which a total of 32 stopover count surveys were conducted at 11 locations (Drawing 8.6).

A total of 49 species, comprising 972 individual birds, were observed during the spring migration surveys (Tables G 3/4, Appendix G). American Robin (*Turdus migratorius*) was the most frequently observed and most abundant species, while White-throated Sparrow (*Zonotrichia albicollis*) was the second most frequently observed and abundant species. Black-throated Green Warbler (*Dendroica virens*), Hermit Thrush (*Catharus guttatus*), Magnolia Warbler (*Dendroica magnolia*) and Yellow-rumped Warbler (*Dendroica coronate*) were also commonly observed during these surveys.

Breeding Bird Surveys
Nine point count locations were surveyed on June 8 and again on June 20, 2012; an additional location was surveyed on June 8 (Drawing 8.6). A total of 877 individual birds, representing 52 species, were observed during these point counts (Table G5/6, Appendix G). Twenty-one of these species are considered probable breeders based upon the observation of breeding pairs and/or the establishment of permanent territories, and four species are confirmed breeders based upon the observation of nests, adults carrying food, or recently fledged young (MBBA 2006). The most frequently observed and abundant species were American Robin, Red-eyed Vireo (*Vireo olivaceus*), and Black-throated Green Warbler, respectively.

The vast majority of the species identified during the breeding bird surveys were passerines. However, a variety of non-passerine birds were also observed during these surveys, including Common Loon (*Gavia immer*) (waterfowl); Hairy Woodpecker (*Picoides villosus*), Northern Flicker (*Colaptes auratus*), and Pileated Woodpecker (*Dryocopus pileatus*) (woodpeckers); Osprey (*Pandion haliaetus*), Red-tailed Hawk (*Buteo jamaicensis*), and Sharp-shinned Hawk (*Accipiter striatus*) (birds of prey); and Ring-necked Pheasant (*Phasianus colchicus*) and Ruffed Grouse (*Bonasa umbellus*) (upland game birds).

Fall Migration Surveys
A total of 58 stopover count surveys were conducted at 25 locations at or near the Project sites boundaries on September 18, October 5, October 24, November 5, and November 15, 2012 (Drawing 8.6). Forty-nine species, consisting of 1,167 individual birds, were recorded during the fall migration surveys (Table G7/8, Appendix G). Blue Jay (*Cyanocitta cristata*), American Crow, and Golden-crowned Kinglet (*Regulus satrapa*) were the most frequently observed species. The most abundant species were Common Grackle (*Quiscalus quiscula*) and Red-winged Blackbird (*Agelaius phoeniceus*), both of which were observed in flocks in excess of 60 individuals. Passerines dominated the fall bird community at the Project site, although non-passerines species including Downy Woodpecker (*Picoides pubescens*), Hairy Woodpecker, Pileated Woodpecker, Northern Flicker (woodpeckers), Common Loon (waterfowl), Herring Gull (*Larus argentatus*) (waterbird), and Ruffed Grouse (upland gamebird) were also observed. No birds of prey were observed during the fall surveys.

Summary of Bird Surveys
The Project site is situated in a landscape interspersed with agricultural areas, urban development, and forest stands. Habitat at the Project site consists primarily of young softwood and mixed forest