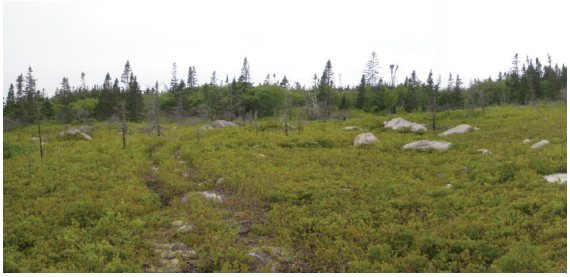
Environmental Assessment



Wedgeport Wind Farm

121510794

prepared for

ANAIAGLOBAL RENEWABLE ENERGIES

AnaiaGlobal
RENEWABLE ENERGIES

June 2012

Stantec

Executive Summary

Introduction

AnaiaGlobal Renewable Energies (Anaia), a joint venture between Membertou Corporate Division and GrupoGuascor - Dresser Rand, is proposing to construct and operate a wind energy facility to be located in the district of Argyle, Yarmouth County, Nova Scotia (the Wedgeport Wind Farm Project; the Project). As is standard practice in the renewable energy industry a Special Purpose Company (SPC) was created to be the sole proponent and owner of this Project; the SPC in this case is named 3250777 Nova Scotia Limited. All permits, agreements and approvals will therefore be given to the SPC.

The Wedgeport Wind Farm Project will include up to 25 turbines with a nameplate capacity of approximately 50 MW and will include an approximate 16 km long 138 kV transmission line to connect to the Tusket River Generating Station in Tusket, Nova Scotia. This Project has been proposed in response to the Request for Proposals for 300 gigawatt hours (GWh) of Renewable Energy from Independent Power Producers issued by Nova Scotia Renewable Electricity Administrator. This Project would be a key part of the Nova Scotia Government's plan to integrate renewable assets into its energy mix and will assist the Province to meet its 2015 renewable energy targets should a power purchase agreement (PPA) be awarded.

Pursuant to the Nova Scotia *Environment Act*, environmental registration with Nova Scotia Environment (NSE) is required for an electric generating facility which has a production rating of 2 MW or more derived from wind energy.This environmental assessment (EA) satisfies the requirements outlined for provincial environmental registration as a Class I Undertaking and was prepared following guidance from “The Proponent’s Guide to Wind Power Projects: Guide to Preparing an Environmental Assessment Registration Document” (NSE 2007, updated 2012). To date, the Project has no known triggers under the federal *Canadian Environmental Assessment Act* (*CEAA)*.

Project Overview

The Wedgeport Wind Farm Project will consist of the following components:

- Up to 25 wind turbine generators;
- 25 kV collection lines (to link the wind turbines to an onsite substation to be constructed);
- 575 V –25 kV range pad transformers located beside each turbine;
- onsite substation (to step up the electric output from 25 kV to 138 kV);
- onsite access roads (approximately 6 km in total length); and
- a 138 kV transmission line to Tusket Falls Power Generating Station (approximately 16 km long).

There will be no maintenance buildings on site and the onsite substation area will be fenced and graveled. Table E.1 summarizes the Project activities and proposed schedule.

Table E.1 Project Activity Schedule

Activity	Schedule
Clearing	December 2012-February 2013
Development of access roads	February-June 2013
Delivery of equipment	May-September 2013
Foundation construction	September-November 2013
Wind turbine installation	November-March 2013
Construction of overhead collection system	October-December 2013
Installation of substation equipment	October-December 2013
Installation of transmission line	February-June 2014
Turbine commissioning	June-August 2014
In-service	September 2014

Consultation and Engagement Summary

Public consultation and Mi'kmaq engagement is an integral part of the environmental planning process and plays a key role in addressing potential public concerns identified in early stages of the Project. Consultation activities have included the initial public announcement of the Project by Anaia, two public Open House meetings (May 2011; June 2012), meetings with stakeholders including local landowners and municipal representatives, and various informal meetings, phone calls and letters.

With respect to Mi'kmaq engagement, Anaia has had several meetings with representatives from the Nova Scotia Assembly of First Nations and the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO). The Acadia First Nation Reserve is located approximately 9.4 km from the Project. Although attempts to meet directly with Chief Deborah Robinson have thus far been unsuccessful, the Acadia First Nation has been informed of the Project through consultations with the Assembly and direct communication with the development office at the Acadia First Nation Band. The Native Council of Nova Scotia has also been contacted regarding the Project. In addition, Anaia commissioned Membertou Geomatics Consultants to undertake a Mi'kmaq Ecological Knowledge Study (MEKS) for the Project.

No specific concerns have been raised during Mi'kmaq engagement efforts with respect to Project impacts. As reported in the MEKS, there is current use of lands and resources for traditional purposes occurring within a 5 km radius of the Project Study Area although the Project is not anticipated to adversely affect this activity.

Environmental Assessment Methods and Approach

To meet requirements for the environmental assessment, a comprehensive field program aimed at characterizing the natural and social-economic environment of the Study Area was conducted between June 2011 and May 2012. This work included:

- avian breeding, fall migration, winter, owl and spring migration monitoring (2011-2012);
- terrestrial surveys, including a vascular plant inventory, wetland identification and mammal, reptile and amphibian species identification (June and August 2011);
- aquatic surveys (September 2011; May 2012);
- ambient sound monitoring (May 2012);
- archaeological survey (May 2012); and
- site visit to support the visual impact assessment (May 2012).

Desktop studies were used to assess hydrogeology, bats, and socio-economic issues. Predictive noise modeling and shadow flicker modeling were undertaken and photo montages were prepared from several vantage points.

Valued Environmental Components (VECs) selected for assessment include:

- Aquatic Environment (freshwater surface resources);
- Birds and Other Wildlife;
- Vegetation;
- Wetlands;
- Land Use and Communities;
- Archaeological and Heritage Resources; and
- Public Health and Safety.

Key Biophysical and Socio-economic Characteristics of the Project Study Area

The Project is located on a peninsula approximately 2.4 km west of the rural community of Wedgeport, and immediately northeast of the rural community of Little River Harbor in the District of Argyle, Yarmouth County, NS.

The Project Study Area is situated within the primary watershed 1EA (Tusket River). Field surveys confirmed that the Project Study Area contains one watercourse (Black Pond Brook) and one wetland drainage channel (Heath Brook), neither of which is considered to provide fish habitat. Terrestrial habitat within the Project Study Area consists largely of a mosaic of forest, woodland and barrens. A total of 186 vascular plant taxa were recorded within the Project Study Area during surveys conducted in June and August 2011. The plant species composition of the Project Study Area suggests an infertile area with low productivity. Ericaceous shrubs such as sheep laurel, blueberries and black huckleberry are abundant throughout the Project Study Area.

Five vascular plant species of conservation interest were encountered during the 2011 field surveys: southern twayblade (*Listera australis*), Elliott's goldenrod (*Solidago latissimifolia*), highbush blueberry (*Vaccinium corymbosum*), eastern skunk cabbage (*Symplocarpus foetidus*),

and Nova Scotia agalinus (*Agalinis neoscotica*). It is anticipated that all of these occurrences are avoidable through site design.

A total of 89 wetlands were identified within the Project Study Area through a combination of desktop and field surveys, accounting for an area of approximately 92 ha or nine percent of its area. Four wetland classes have been recognized within the Project Study Area: swamp, bog, marsh and shallow water.

A comprehensive bird survey program was conducted at the Project site extending a full calendar year. Two single incidents of species at risk were recorded during breeding bird surveys: Olive-sided Flycatcher and Whip-poor-will. Species of Conservation Concern included Common Loon, Willet, Turkey Vulture, Wilson's Snipe, and six passerines considered Sensitive (Eastern Wood-Pewee, Yellow-bellied Flycatcher, Gray Jay, Boreal Chickadee, Golden-crowned Kinglet, and Ruby-crowned Kinglet). Fall and spring migration surveys revealed the majority of bird species moving through the area were landbirds flying at or below tree level. Raptors (*e.g.*, Northern Harrier, Sharp-shinned Hawk and Turkey Vulture) were recorded regularly flying above tree level. Waterbirds (mostly gulls) were frequently observed flying through the area during fall and spring migration surveys, at heights above tree level. No mammal or herpetile species of conservation concern were detected during any of the field surveys.

Lands within the Project Study area are primarily privately owned lands but there are crown land parcels located in the southern end of the Project Study Area. Land use within the Project Study Area mainly includes informal recreation land uses. During field surveys, evidence of informal activities were observed including hiking trails, ATV use, hunting and berry picking. Forestry activity in the area was generally limited to private harvesting for personal uses. Residential land use nearest the Project includes homes on Comeaus Hill Road, Black Pond Road and seasonal cottages/camps on Goose Lake. The closest residence is a camp on Goose Lake located approximately 659 m from the nearest proposed turbine. The majority of residences on Comeaus Hill Road are located more than 1 km from the Project.

Background archaeological research and field surveys conducted in May 2012 did not identify any archaeological resources within the Project Study area and found no areas of high potential that would warrant either additional fieldwork or sub-surface testing.

Summary of Environmental Effects Assessment

Effects of the Project were evaluated for each of the VECs. Table E.2 summarizes residual effects and key mitigation for the VECs assessed.

Table E.2 Summary of VEC Assessment

VEC	Potential Effect	Key Mitigation	Residual Effect	Follow-up/Monitoring
Aquatic Environment	Potential interaction with watercourse/drainage channels through access road construction.	Avoidance where possible through site design. Implementation of erosion and sediment controls. Water Approval for watercourse alteration if applicable.	No significant adverse residual effects.	Follow-up surveys if turbine layout changes and new watercourse interaction is identified.
Wetlands	Potential direct and/or indirect effects to wetland habitat quality and/or quantity. Predicted loss of 1.41 ha of wetland given current layout.	Avoidance where possible through micrositing. Implementation of erosion and sediment controls. Water Approval for wetland alteration if applicable (including habitat compensation).	No significant adverse residual effects.	Follow-up surveys if turbine layout changes and wetlands cannot be avoided.
Vegetation	Loss of habitat and loss of species of conservation concern through site preparation. Project footprint is estimated to include 35.2 ha of land, with barren habitat most affected with current layout (11.3 ha).	Minimization of Project footprint and avoidance of plant species of conservation concern where possible during micrositing.	No significant adverse residual effects.	Follow-up surveys if turbine layout changes and areas not previously surveyed are identified.
Birds and Other Wildlife	Loss of habitat and changes in mortality risk.	Minimization of Project footprint, clearing outside breeding season, and ongoing monitoring during operations to determine if additional mitigation is required.	No significant adverse residual effects.	Post-construction bird and bat surveys
Land Use and Communities	All receptors are predicted to experience less than 40 dBA sound levels. There is one receptor (seasonal camp) within 1 km of the nearest turbine which is predicted to experience greater than 30 hours/year of shadow flicker based on worst case, conservative modeling.	Maintain setback >600m and maintain ongoing communication with landowners. If complaints are registered regarding noise or shadow flicker these incidents will be investigated and mitigation implemented as appropriate (*i.e.*, shutting down of specific turbines during certain times of	No significant adverse residual effects.	Proponent will maintain complaint registry and follow-up as appropriate.

Table E.2 Summary of VEC Assessment

VEC	Potential Effect	Key Mitigation	Residual Effect	Follow-up/Monitoring
		day/year to reduce shadow flicker exposure).		
Archaeological and Heritage Resources	Despite low potential, there is some risk of encountering unidentified resources during earthmoving activities.	Archaeological Contingency Plan as part of the Environmental Protection Plan to halt work in event of archaeological discovery and consult with Nova Scotia Museum regarding appropriate mitigation.	No significant adverse residual effects.	No follow-up or monitoring unless resource is encountered during construction.
Public Health and Safety	Safety risks associated with large equipment transportation to and use on site. Perceived health concerns by public regarding electromagnetic fields, shadow flicker, and noise.	Transportation study to document transport routes and identify safe transportation, appropriate setbacks from residences, complaint registry, and monitoring of extreme weather conditions (*e.g.*, icing) and need for site restriction.	No significant adverse residual effects.	Proponent will maintain complaint registry and follow-up as appropriate.

In consideration of design, planning and mitigation measures, residual environmental effects as a result of accidents and malfunctions are predicted to be not significant. Effects of the environment on the Project will also be mitigated to be not significant through proper design and adherence to construction and operating standards.

Other undertakings in the area which could potentially overlap spatially and/or temporally include the West Pubnico Wind Farm (approximately 19.7 km from the Project) and Scotian Windfields' Wedgeport COMFIT project located just outside Anaia's Project Study Area to the northwest. No significant adverse residual cumulative effects are predicted.

Conclusion

In consideration of implementation of the proposed mitigation measures, adverse residual environmental effects (including cumulative effects) are not predicted to occur as a result of Project activities. If the Proponent is awarded a PPA, the construction and operation of the Wedgeport Wind Farm Project will generate approximately 50 MW of clean renewable energy, producing energy sufficient to power approximately 20,000 homes annually and displacing energy on the provincial grid that is produced through non-renewable fuel sources. In addition, the Project is expected to positively contribute to the local and regional economy.

LIST OF ACRONYMS

Acronym	Definition
ACCDC	Atlantic Canada Conservation Data Centre
BAM	Beta Attenuation Monitor
CABIN	Canadian Aquatic Biomonitoring Network
CAR	Canadian Aviation Regulations
CCME	Canadian Council of Ministers of the Environment
CEAA	*Canadian Environmental Assessment Act*
COMFIT	Community Feed-in Tariff
COSEWIC	Committee of the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
dBA	A-weighted decibels
DC	Drainage Channel
DFO	Department of Fisheries and Oceans
DND	Department of National Defence
DNL	Day-night-level
EA	Environmental assessment
EHJV	Eastern Habitat Joint Venture
EMFs	Electromagnetic field
EPA	Environmental Protection Agency
EPP	Environmental Protection Plan
FAL	Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life
GU	General Use
GWh	Gigawatt hours
ha	Hectares
HADD	Harmful alteration, disruption or destruction
Hz	Hertz
IBA	Important Bird Area
igpm	Imperial gallons per minute
ISO	International Organization for Standardization
km	Kilometre
KMKNO	Nova Scotia Assembly of First Nations
kV	Kilovolt
L/min	Litres per minute
MBBA	Maritime Breeding Bird Atlas
m/s	Metres per second
MBCA	Migratory Birds Convention Act
MEKS	Mi'kmaq Ecological Knowledge Study
MW	Megawatt
NAPS	National Air Pollution Surveillance
NBDNR	New Brunswick Department of Natural Resources
NSDNR	Nova Scotia Department of Natural Resources
NSE	Nova Scotia Environment
NSPI	Nova Scotia Power Inc.
NSTIR	Nova Scotia Department of Transportation and Infrastructure Renewal
NWPA	*Navigable Waters Protection Act*
NWPP	Navigable Waters Protection Program
OBBN	Ontario Benthos Biomonitoring Network
OMNR	Ontario Ministry of Natural Resources

Acronym	Definition
PCBs	Polychlorinated Biphenyls
$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
POLs	Petroleum, oils and lubricants
PPA	Power purchase agreement
ppb	Parts per billion
RoW	Right-of-Way
SARA	*Species at Risk Act*
SCADA	Supervisory Control and Data Acquisition
SOCC	Species of Conservation Concern
SPC	Special Purpose Company
SWNDHA	South West Nova District Health Authority
VEC	Valued Environmental Component
VOR	Very High Frequency Omni Directional Range
WECO	Wind Energy in Cold Climates
WHMIS	Workplace Hazardous Materials Information System
WHO	World Health Organization
WNS	White-nose Syndrome
YSI	Yellow Springs International

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1.0 Introduction

AnaiaGlobal Renewable Energies (Anaia), a joint venture between Membertou Corporate Division and GrupoGuascor - Dresser Rand from the Basque region of Spain, is proposing to construct and operate a wind energy facility to be located in the district of Argyle, Yarmouth County, Nova Scotia (the Wedgeport Wind Farm Project; the Project). The Wedgeport Wind Farm Project will include up to 25 turbines with a nameplate capacity of approximately 50 MW and will include an approximate 16 km long 138 kV transmission line to connect to the Tusket River Generating Station in Tusket, Nova Scotia.

This Project has been proposed in response to the Request for Proposals for 300 gigawatt hours (GWh) of Renewable Energy from Independent Power Producers issued by Nova Scotia Renewable Electricity Administrator. The Wedgeport Wind Farm would have the capacity to contribute up to 50 megawatt (MW) of clean, renewable energy to the provincial grid, producing energy sufficient to power approximately 20,000 homes annually. This Project would be a key part of the Nova Scotia Government's plan to integrate renewable assets into its energy mix and will assist the Province to meet its 2015 renewable energy targets should a power purchase agreement (PPA) be awarded.

1.1 PROJECT PROPONENT

Anaia is a joint venture business partnership between Membertou First Nation and GrupoGuascor - Dresser Rand of the Basque Country of Spain, to develop renewable energy solutions in North America. Membertou belongs to the greater tribal group of the Mi'kmaw Nation and is situated 3 km from Sydney, Nova Scotia within its tribal district of Unama'ki (Cape Breton). It is one of five Mi'kmaw communities in Cape Breton, and one of thirteen in the Province of Nova Scotia. Membertou is an urban First Nation community consisting of over 1260 people, and one of five communities that make up the Cape Breton Regional Municipality. The Membertou Corporate Division, created in 2000, is committed to creating and enhancing business relationships between the Membertou First Nation and the Canadian and international business community.

GrupoGuascor is a global leader in renewable energy technologies, such as, solar, wind and bio-energy equipment and applications. GrupoGuascor is an industrial corporation specialized in customized energy solutions with a strong international presence, based on renewable energies and micro-energy solutions, and has an extensive experience of distributed generation. At the present, GrupoGuascor has international presence in more than 30 countries and more than 1.300 direct employees around the world. As of May 2, 2011, GrupoGuascor was acquired by the Dresser-Rand Group, Inc., through a Spanish subsidiary, Dresser-Rand Holdings Spain S.L.U. Dresser-Rand is among the largest global suppliers of custom-engineered rotating equipment for long-life, critical applications in the oil, gas, petrochemical and process industries.

Anaia's mission is "to develop renewable energy solutions in collaboration with First Nations and Native American communities as a way to build community sustainability".

As is standard practice in the renewable energy industry a Special Purpose Company (SPC) was created to be the sole proponent and owner of this Project; the SPC in this case is named 3250777 Nova Scotia Limited. All permits, agreements and approvals will therefore be given to the SPC.

The Proponent representative for the purpose of environmental assessment is:

Chief Terry Paul
President
3250777 Nova Scotia Limited

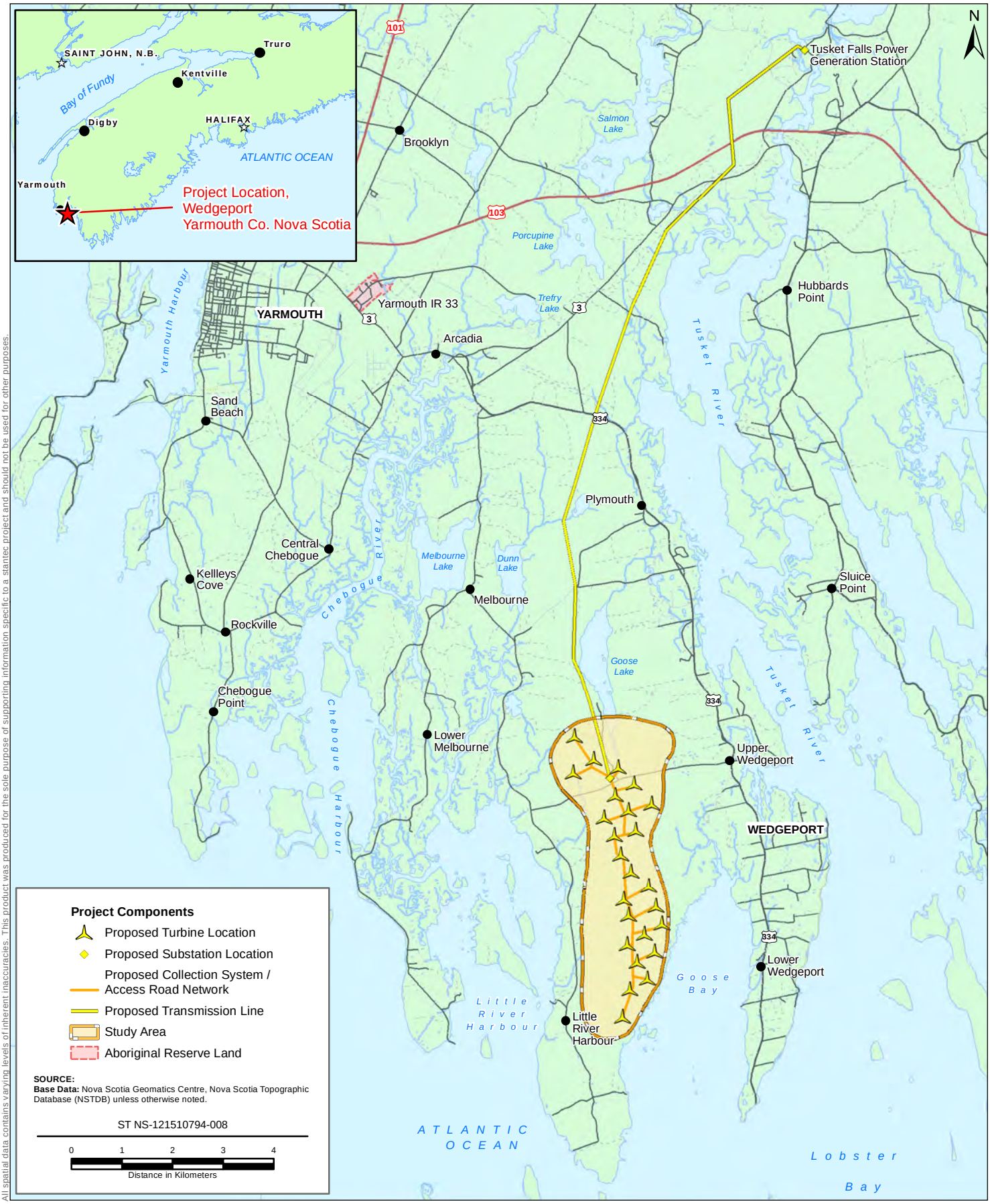
TD Centre
1791 Barrington Street, Suite 300
Halifax, Nova Scotia, B3J 3K9
Telephone: (902) 429-5445
Fax: (902) 429-5461

The Project is referred to as the Wedgeport Wind Farm Project.

1.2 PROJECT LOCATION

The Wedgeport Wind Farm will be located on the peninsula between Little River Harbour and Goose Bay approximately 2.4 km west of the town of Wedgeport in the district of Argyle, Yarmouth County, Nova Scotia (refer to Figure 1.1). The Project Study Area consists of approximately 1,012 ha (2,500 acres) of land. A 138 kV transmission line is proposed to extend approximately 16 km from the wind farm substation to the Tusket Falls Power Generating Station.

The Project Study Area consists mostly of barrens, undeveloped woodlands and immature and mature coniferous mixed forest. It is surrounded to the north by Goose Lake, to the east by Eastern Habitat Joint Venture lands and Goose Bay, to the south by private and crown lands, and to the west by Comeaus Hill Road. Black Pond Road intersects the Project Study Area.



All spatial data contains varying levels of inherent inaccuracies. This product was produced for the sole purpose of supporting information specific to a stantec project and should not be used for other purposes.

PREPARED BY: R Sutcliffe	WEDGEPORT WIND PROJECT	FIGURE NO.: 1.1
REVIEWED BY: G. Asche	**Project Location**	DATE: Jun 07, 2012
CLIENT: AnaiaGlobal		Stantec

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1.3 REGULATORY CONTEXT

1.3.1 Environmental Assessment

Pursuant to the Nova Scotia *Environment Act*, environmental registration with Nova Scotia Environment (NSE) is required for an electric generating facility which has a production rating of 2 MW or more derived from wind energy.

The Wedgeport Wind Farm Project will have a capacity of approximately 50 MW and is therefore subject to environmental registration. This environmental assessment (EA) satisfies the requirements outlined for provincial environmental registration as a Class I Undertaking and was prepared following guidance from "The Proponent's Guide to Wind Power Projects: Guide to Preparing an Environmental Assessment Registration Document" (NSE 2007, updated 2012). To date, the Project has no known triggers under the federal *Canadian Environmental Assessment Act* (*CEAA)*.

1.3.2 Environmental and Land Use Approvals

In addition to EA requirements, federal, provincial and municipal environmental and land use permits, licenses and approvals may be required for this Project. Table 1.1 summarizes approvals and authorizations likely to be required for the Project; this list is intended to be illustrative for EA purposes only.

Table 1.1 Required Environmental and Land Use Approvals

Approvals Required	Summary
Federal	
Canadian Aviation Regulations Standard 621.19	Section 5.9 of these regulations state that a wind turbine should have a flashing red or white beacon mounted on the highest practical point of the turbine if the structure is taller than 90 m. Lighting requirements have been determined in consultation with Transport Canada. Consultation is required with the appropriate regional Civil Aviation authority. The Proponent has initiated preliminary consultations with NAV Canada and Transport Canada as part of the project planning phase. NAV Canada reviewed a proposed turbine layout and indicated that three turbines north of Black Pond Road were in Yarmouth Airport's protected air space. The Proponent has since moved these turbines to the west to avoid the protected airspace. The Aeronautical Obstruction Clearance Form (#26-0427) will be completed once the final turbine layout is selected.
Provincial	
Water Approval for Watercourse Alteration (Activities Designation Regulations)	Alteration of any watercourse will require authorization from NSE under the Activities Designation Regulations. The Proponent proposes to avoid watercourses to the extent practical during detailed design; however due to the size of the site, some watercourses will have to be crossed. Based on the current proposed road layout, it is anticipated that there could potentially be at least one watercourse crossing.
Water Approval for Wetland Alteration (Activities Designation Regulations)	Alterations of a wetland will require authorization from NSE under the Activities Designation Regulations. The Proponent proposes to avoid wetlands to the extent practical through turbine siting and road layout design. If however, it is not practical to avoid a wetland, a functional analysis will be conducted and an application will be submitted for approval of the proposed alteration.

Table 1.1 Required Environmental and Land Use Approvals

Approvals Required	Summary
Working within Highway Right-of-Way (*Public Highways Act*)	The proposed transmission line may disturb the surface, soil, or any structure within a highway right-of-way (including the road surface) in Nova Scotia requires a Working within Highway Right-of-Way Permit from Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR).
Use of Right-of-Way for Pole Lines Permit (*Public Highways Act*)	Approval from NSTIR may be required for installation of transmission line if the line is to proposed to be installed within a highway right-of-way.
Special Move Permit with Department of Transportation and Infrastructure Renewal (*Public Highways Act*)	A Special Move Permit and any associated approvals will be obtained for heavy load transport as required.
Municipal	
Municipality of the District of Argyle	The Proponent will make application to the Municipality of the District of Argyle for a Development Permit specific to the construction of the wind farm development. Separate building permits will be required for each installation (*e.g.*, turbine). The application will involve a surveyed plan showing setbacks from property lines.

1.4 REPORT ORGANIZATION

This EA Report is intended to meet the requirements for an EA Registration in accordance with the Nova Scotia *Environment Act* and has been structured to address requirements in The Proponent's Guide to Wind Power Projects: Guide to Preparing an Environmental Assessment Registration Document" (NSEL 2007, updated 2012). Table 1.2 outlines the structure of the document.

Table 1.2 EA Report Organization

Section 1	Introduces the Project and the regulatory regime.
Section 2	Provides Project detail on components and activities required to support this EA.
Section 3	Describes the consultation program undertaken for this Project.
Section 4	Describes the assessment method and scope of the assessment
Section 5	Describes the existing environment of the Project site, including both biophysical and socioeconomic elements
Section 6	Presents the assessment of potential environmental effects for each Valued Environmental Component (VEC).
Section 7	Identifies the potential cumulative effects of the Project in association with other existing and planned projects.
Section 8	Assesses the potential for accidents and malfunctions associated with the Project
Section 9	Examines the effects of the environment on the Project
Section 10	Identifies follow-up measures that are intended to be implemented for the Project.
Section 11	Provides the summary and conclusions of the Project.
Section 12	Presents the signature page.
Section 13	Supporting documents used to prepare the report are listed as references.
Appendices	Technical reports and supporting information are presented in appendices at the end of this document.

1.5 EA AUTHORSHIP

This EA was completed by Stantec Consulting Ltd. (Stantec), an independent, multi-disciplinary team of consultants with extensive experience in undertaking environmental assessments across Canada and internationally. Specifically, and on behalf of Stantec, the report was prepared and reviewed by the following:

Prepared by: Ms. Heather Giddens, MES
Senior Project Manager
Stantec Consulting Ltd.
40 Highfield Park Drive – Suite 102
Dartmouth, NS B3A 0A3
Phone: 902 468-7777 Fax: 902 468-9009
E-mail: heather.giddens@stantec.com

Senior Reviewer: Mr. Robert Federico, MPA
Senior Project Manager
Stantec Consulting Ltd.
40 Highfield Park Drive – Suite 102
Dartmouth, NS B3A 0A3
Phone: 902 468-7777 Fax: 902 468-9009
E-mail: robert.federico@stantec.com

CVs of key technical staff involved in the EA are included in **Appendix A.**

2.0 Project Description

2.1 PROJECT COMPONENTS

The Wedgeport Wind Farm Project will consist of the following components (as shown as Figures 2.1 and 2.2):

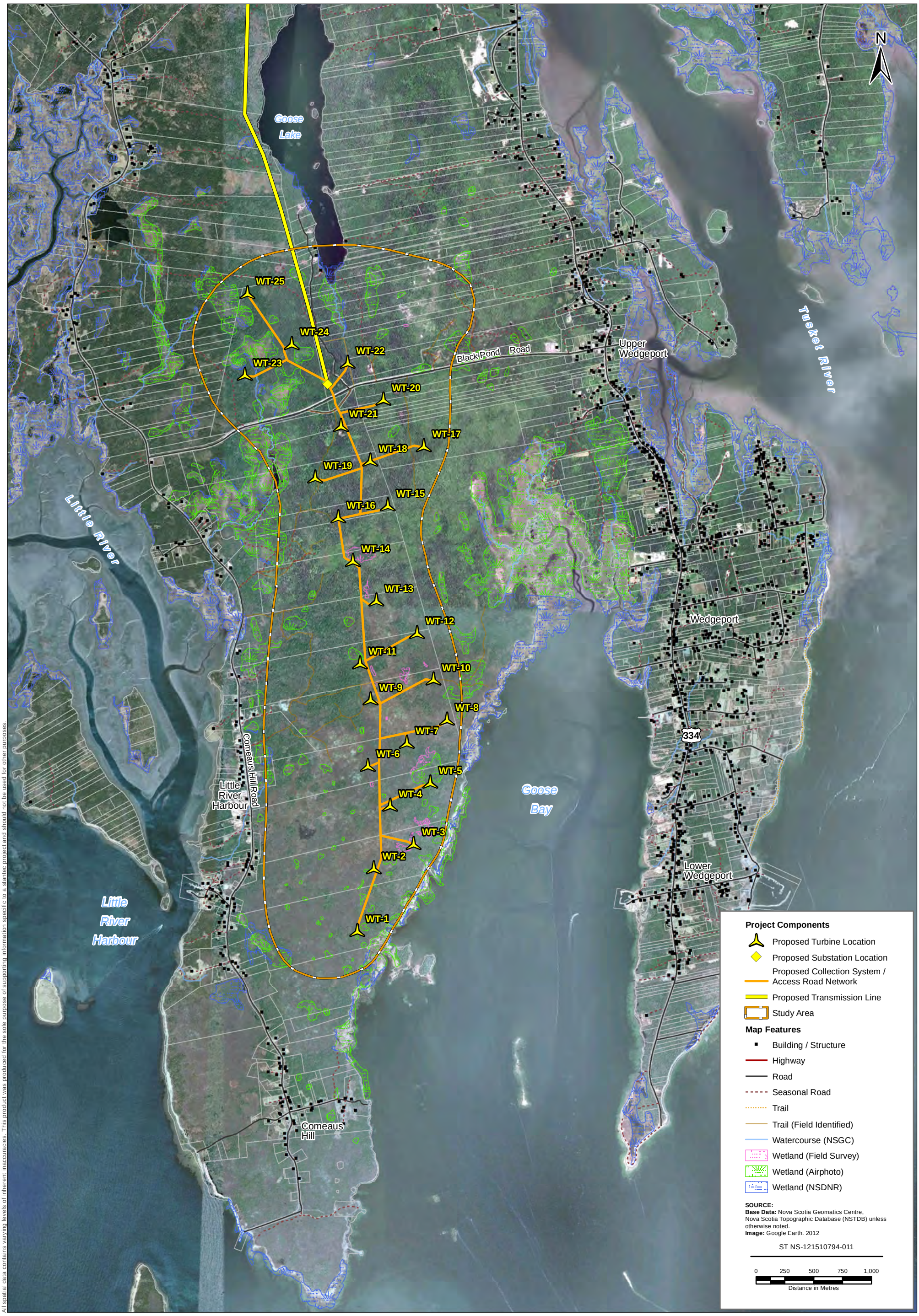
- Up to 25 wind turbine generators;
- 25 kV collection lines (to link the wind turbines to an onsite substation to be constructed);
- 575 V –25 kV range pad transformers located beside each turbine;
- onsite substation (to step up the electric output from 25 kV to 138 kV);
- onsite access roads (approximately 6 km in total length); and
- a 138 kV transmission line to Tusket Falls Power Generating Station (approximately 16 km long).

There will be no maintenance buildings on site and the onsite substation area will be fenced and graveled.

Discussions with turbine manufacturers are ongoing and the Proponent has not yet confirmed the manufacturer and size. For the purpose of environmental assessment, it is assumed that 25 Gamesa G97-2.0 MW turbines will be used. Although an alternate 3.0 MW turbine is being considered, which would require approximately 16 turbines and have a smaller Project Footprint, the worst case scenario has been assessed herein. Any change in turbine type beyond what was considered here would require additional noise and shadow flicker modeling. Technical specifications for the Gamesa G97 – 2.0 MW model are provided in Table 2.1.

Table 2.1 Turbine Technical Specifications Gamesa G97-2.0 MW IIA

Turbine Component	Specifications
Rated capacity	2.0 MW
Rated Sound Power Level	105.8 dBA
Cut-in wind speed	3.0m/sec
Cut-out wind speed	25 m/sec (1 minute)
Number of blades	3
Rotor Diameter	97 m
Swept area	7,390 m^2
Rotor speed (variable)	17.8 rpm
Tower (hub) height	100 m
Gearbox	1 planetary stage; 2 parallel stages
Frequency	50/60Hz
Angle of Blade Tip	pitch control regulation
Turbulence Intensity	10% for all wind speeds
Air density reference	1.225 kg/m^3



All spatial data contains varying levels of inherent inaccuracies. This product was produced for the sole purpose of supporting information specific to a stantec project and should not be used for other purposes.

PREPARED BY: C. Shupe	WEDGEPORT WIND PROJECT	FIGURE NO.: 2.1
REVIEWED BY: M. Huskins-Shupe		DATE: Jun 14, 2012
AnaiaGlobal RENEWABLE ENERGIES www.anaiaenergy.com	**Proposed Site Layout (Wind Farm Site)**	Stantec

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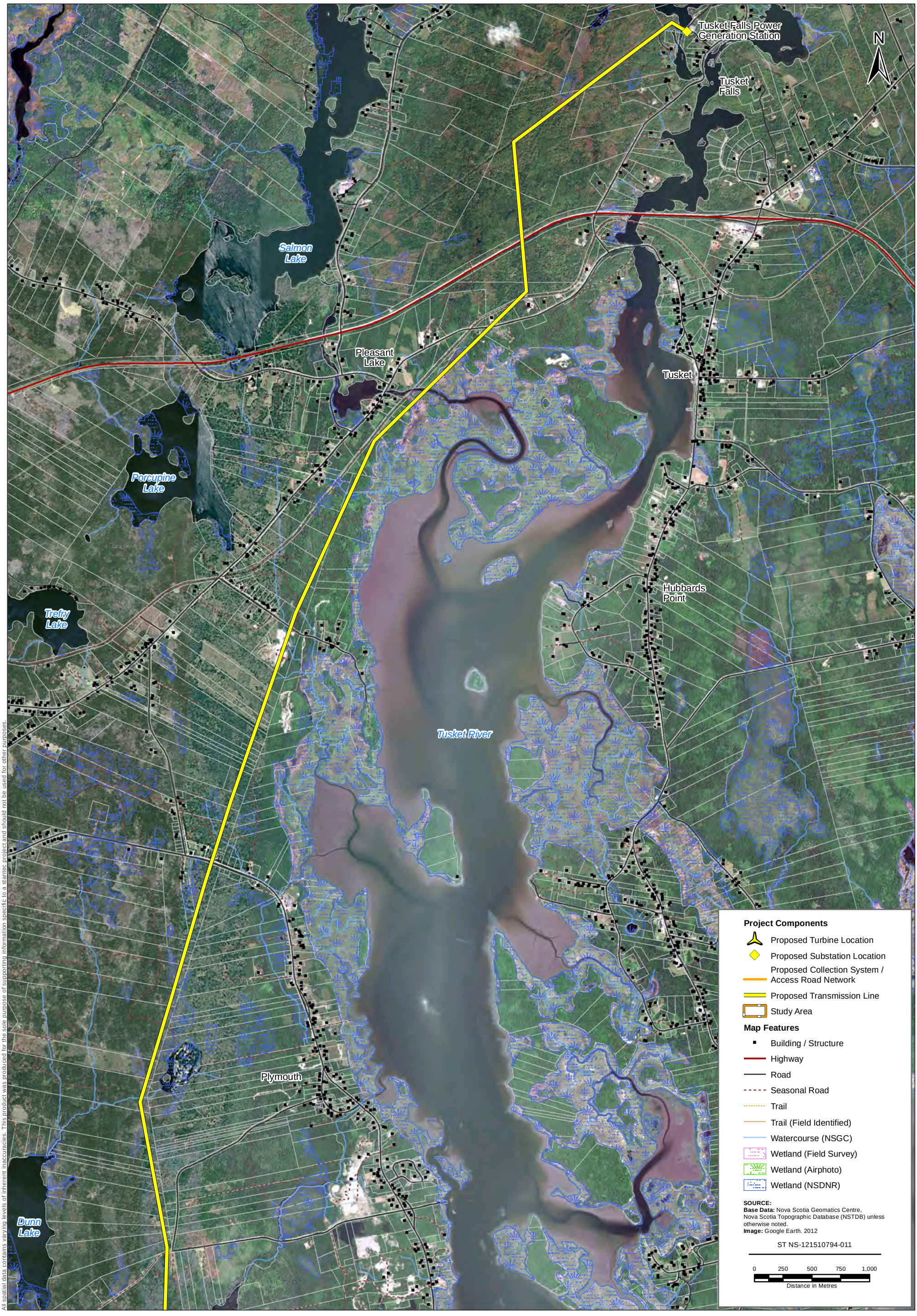

PREPARED BY: C. Shupe	WEDGEPORT WIND PROJECT	FIGURE NO.: 2.2
REVIEWED BY: M. Huskins-Shupe		DATE: Jun 14, 2012
AnaiaGlobal RENEWABLE ENERGIES www.anaiaenergy.com	**Proposed Transmission Line Route**	Stantec

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2.2 SITE SELECTION AND DESIGN

The proposed Project is located in the Municipality of the District of Argyle, Nova Scotia (Figure 1.1). The Proponent focused on the District of Argyle for the proposed wind farm development primarily due to consistent wind and community desire to develop the wind potential. The Nova Scotia Wind Atlas estimates the windspeeds in the vicinity of the Project Area to range between 7.51 m/s and 9.51 m/s. Anaia installed a meteorological station south of Black Pond Road in March 2011 to verify the wind resource in the proposed Project Area.

A proposed site in the Wedgeport/Comeaus Hill area was selected based on a number of factors including:

- preliminary wind resource assessment;
- review of terrain and topography;
- access to power grid interconnection;
- site access;
- existing land use; and
- community support.

The wind energy facility will be constructed on undeveloped land within the Project Study Area approximately 1,012 ha (Refer to Figure 2.1). The Project Study Area is the area within which field studies were undertaken and within which Project infrastructure would be located.

The specific layout of turbines within this Project Study Area was optimized to:

- maximize distance from residences;
- avoid watercourses and wetlands to the extent practical;
- avoid significant habitats and restricted use lands including adjacent Eastern Habitat Joint Venture (EHJV) land;
- maximize use of higher elevations; and
- minimize overall spatial extent along the peninsula to reduce habitat fragmentation and maintain habitat connectivity.

Onsite access roads and collection systems were sited to minimize Project footprint and avoid wetlands and watercourse crossings to the extent practical. Although the current layout is predicted to have minimal interaction with wetlands, micrositing of turbines and access roads will be undertaken during final site design to further minimize interaction and ideally avoid any wetland habitat alteration.

The current layout was also developed in consideration of potential concerns raised by Transport Canada regarding a previous layout which had turbines located southeast of Goose Lake, north of Black Pond Road. The turbines had been situated inside the area protected for aircraft using a Very High Frequency Omni Directional Range (VOR) instrument approach

procedure at the Yarmouth Airport. These turbines were relocated to the southwest of Goose Lake to address this concern.

Prior to registration, the Proponent met with Nova Scotia Department of Natural Resources (NSDNR) to review the Project and potential wildlife issues and concerns. At that meeting in June 2012, NSDNR raised concerns with respect to the current placement of turbines. In particular, turbines located in relative proximity to larger wetland complexes and salt marshes were considered less desirable due to potential interactions with resident and migrating birds. The Proponent has been encouraged to reconsider a different configuration of turbines which would be closer to 16 turbines, rather than the current 25 turbine layout. As a result of this feedback, the Proponent is reconsidering the turbine model of choice and reviewing options to substantially reduce the number and geographic extent of turbines for the Project. Figure 2.3 presents an alternative layout which is currently being evaluated by the Proponent and is believed to address NSDNR's key concerns.

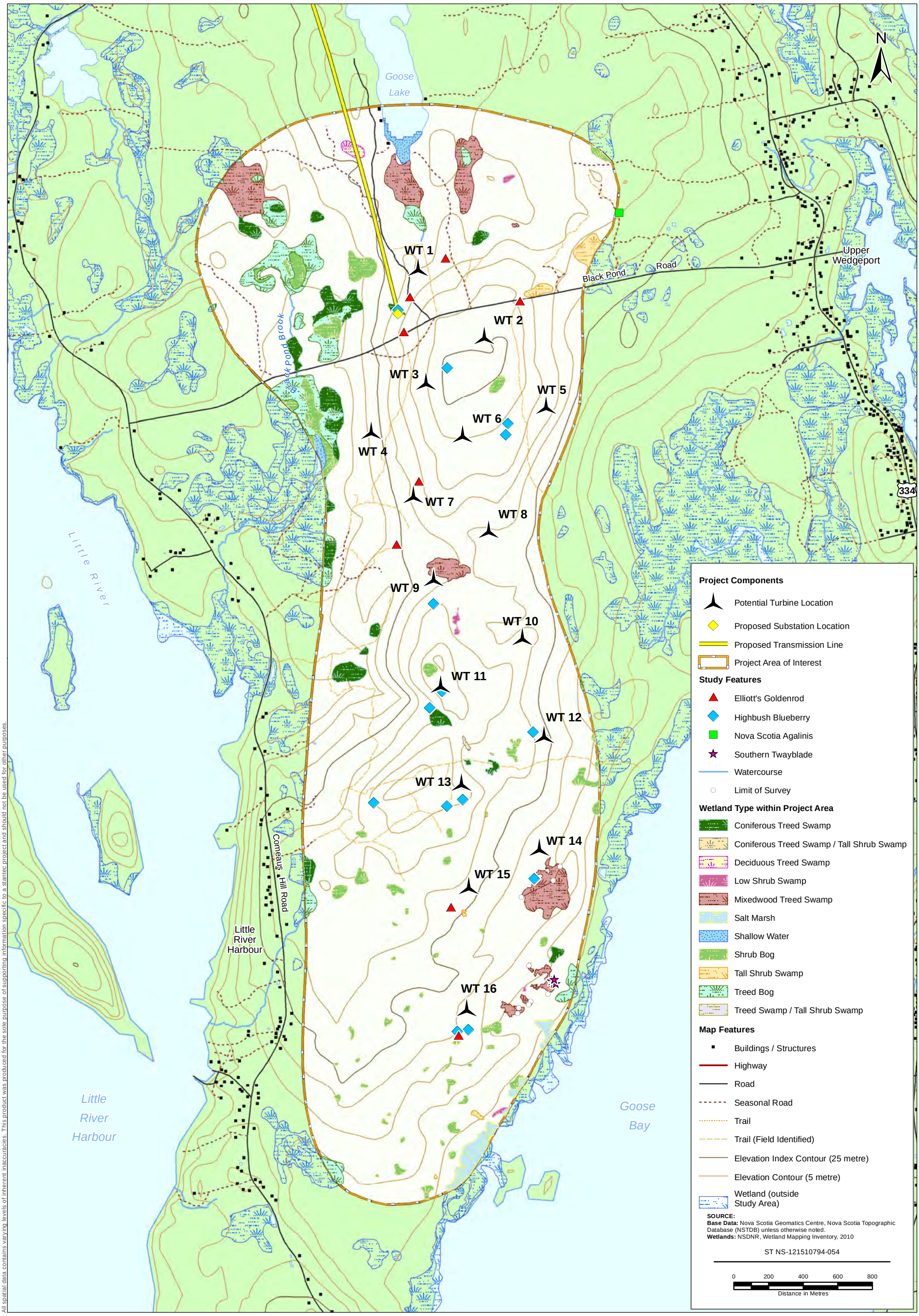
For the purpose of the EA, the 25 turbine layout has been presented as it represents the worst-case scenario from a Project footprint perspective. However, the Proponent is committed to working with NSDNR and NSE to develop an optimized layout which minimizes effects on wildlife while still maintaining acceptable distances from residences. As noted throughout the EA report, options for turbine models are currently being reviewed by the Proponent for this Project which would allow for a substantial reconfiguration and reduction of turbines. Once a viable layout has been selected which addresses NSDNR concerns, various assessment aspects (including noise and shadow flicker modeling) will be revisited and updated as required to confirm acceptability from a land use and public health perspective.

Preliminary transmission line routing has been selected to minimize overall length of transmission line, maximize use of an existing Nova Scotia Power Inc. right-of-way (RoW), avoid residences, and minimize interaction with provincially mapped wetlands and watercourses. The Proponent is currently in the process of negotiating a specific RoW with interested landowners. Once an easement has been secured, it will be transferred to Nova Scotia Power Inc. (NSPI) who will be responsible for detailed design and construction of the transmission line. During surveys and permitting of the line, minor adjustments to the route may be required to avoid sensitive features.

A description of the biophysical and socio-economic features of the Project Area is provided in Section 5.

2.3 PROJECT ACTIVITIES

The following section provides details on the planning, construction, operation, maintenance and decommissioning of the Project. Prior to commencement of construction, the Proponent will prepare an Environmental Protection Plan (EPP) which will include specific protection procedures and contingency plans for Project activities.



PREPARED BY: C. Shupe	WEDGEPORT WIND PROJECT	FIGURE NO.: 2.3
REVIEWED BY: Miranda Huskins-Shupe		DATE: Jun 15, 2012
AnaiaGlobal RENEWABLE ENERGIES www.anaiaenergy.com	**Alternative Layout under Consideration**	Stantec

Path: V:\1215\active\121510xxx\121510794_Wedgeport\geomatics\mapping\mxd\EA_final\ST_NS-121510794-054_wetlands_rareplants_turbine_layout_atlernative.mxd

2.3.1 Construction

2.3.1.1 Clearing and Grubbing

The Project Study Area generally consists of barrens, undeveloped woodlands and immature and mature coniferous mixed forest which will require clearing and grubbing. Land clearing and vegetation removal will be required for the construction of access roads, installation of poles for interconnection cables, turbine foundation construction and the construction of the substation. It is estimated that approximately 1.5 ha would be cleared for each turbine to include turbine foundation and crane pads.

Information and warning signs will be erected adjacent to the wind farm at the start of construction, to provide public information about the facility and to discourage trespassing on private lands. This signage will be maintained and updated as necessary.

Clearing activities will be scheduled outside of the breeding bird season (May to August) to the extent practical. However, in the unlikely event that clearing activities will need to take place during the breeding bird season, an adequately trained specialist will be required to inspect the proposed work area using non-intrusive methods (*e.g.*, point count surveys) for nesting birds prior to any site clearing. In addition, any clearing and disturbance within 50 m of identified nesting or breeding areas will be avoided, if possible.

After construction and installation, much of the cleared area will be allowed to revegetate. All soil will be stockpiled on site during construction so that it can be used in revegetation and reclamation of the site once the turbines are erected. Stockpiled soil will be stored away from watercourses and wetlands and protected from erosion and sedimentation (*e.g.*, covered with a tarp).

2.3.1.2 Access Road Construction

Access roads will be surveyed and staked/flagged. It is estimated that a total length of approximately 6 km of access roads will be required for the wind farm. The roads are based on a proposed layout at this time and may require alterations as Project planning proceeds. Roads on the wind farm site will be approximately 10 m wide to accommodate maintenance vehicles and equipment for repairs/replacements. In special cases if difficult turns are required, roads may be wider than 10 m. Construction roads will be designed to accommodate the crane types that will be required to erect the wind turbine generators and towers. Roads will be constructed by placing a layer of geogrid on the native soil, followed by layers of compacted shale or sandstone with a screened stone topping. Once Project construction is complete, the construction roads will be removed and the topsoil replaced across approximately three-quarters the width, leaving single lane tracks to allow access to the turbines for maintenance purposes.

Temporary improvements in roads may be necessary in some areas to enable access to the site by articulated (multi-axle) trucks carrying the turbine components, the largest component of

which is the nacelle. These improvements may include widening the turning radius of the corners by adding fill to the ditches. None of these modifications are expected to be permanent and the corners will be remediated.

Watercourses and wetlands will be avoided to the extent practical. In the event that a watercourse crossing is required, culverts will be designed and installed in consultation with NSE and Department of Fisheries and Oceans (DFO) and in accordance with applicable regulations and conditions of approval. Wetland alteration, if required, will be in accordance with applicable regulations and conditions of approval including compensation planning.

2.3.1.3 Delivery of Equipment

The Proponent is currently evaluating turbine models and manufacturers. The travel route for equipment delivery will depend, in part, on the source of the equipment. A transportation study will be completed to assess road conditions and recommend routes and procedures for safe and efficient delivery. The turbine components are oversized and a Special Move Permit and associated approvals will be obtained through the Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) for heavy load transport.

The trucks which will be used for heavy loads will have multiple axles, with the potential to add more. They will also have steering capability at the back end, allowing them to turn corners much tighter than trucks without such rear steering capability. A large mobile crane will be required, approximately the size of a standard semi-trailer.

The tower sections, the nacelles, and rotor parts will be moved to each turbine site within the Project Area by flatbed truck and placed into an exact position for picking using cranes. One flatbed truck will be used for each of the three tower sections. In addition, a flatbed truck will be used for the nacelle, and one flatbed truck will be required to transport each of the three rotor blades. An additional three truckloads will be required for the rotor hub, small parts and the erection equipment for each turbine.

2.3.1.4 Turbine Foundation Construction and Turbine Installation

It is estimated that site preparation will require approximately ten people for five days for each turbine. Turbine foundation requirements will be determined by a geotechnical investigation and structural engineering design at each site. Some blasting may be required depending on site conditions, although ripping would be the preferred construction method.

If blasting is required, it is anticipated that effects of blasting on groundwater would be minimal beyond 200 m, although a pre-blast well survey will be conducted for any wells located within 600 m of the blasting site. Measures to minimize effects of blasting will be included in the EPP for the Project and will include compliance with the DFO “Guidelines for the Use of Explosives Near Canadian Fisheries Waters”. The EPP will also include contingency measures to be followed in the event that there are measureable effects to groundwater quality or quantity as a result of blasting.

The foundation footprint would be approximately 15 m in diameter with a depth of approximately 3 m deep (to be determined based on geotechnical investigation). The crane assembly pad at each turbine would be in the range of 5625 m^2.

The tower comes in three sections that will be assembled on site. The rotor blade system, consisting of three blades and a hub, will also be assembled on site, attached to the generator and lifted into place at the top of the tower by a large hydraulic crane. This will require approximately ten people for three days per turbine. An additional 1-2 days will be required to install the remainder of the turbine assembly. Control and switching equipment will be placed on each turbine pad by a crane. A large crawler crane with a hydraulic crane will be used to install each tower section. Each tower section will be lifted and secured with bolts to the section below, followed by the nacelle secured to the top tower section. Finally, the assembled rotor will be lifted and attached to the nacelle.

2.3.1.5 Substation Construction and Installation of Collector Lines

Above-ground 25 kV electrical cables will be installed running from each turbine to the on-site substation, largely following the proposed access road system.

The substation will contain transformers to convert the voltage from 25 kV to 138 kV, which is required for connection to the proposed transmission line. Topsoil excavated from the substation site will be re-distributed to adjacent lands. Substation equipment will be installed within a fenced yard (up to 0.5 ha) that will be surfaced with gravel. Since this will be a high voltage area, similar to all transformer substations, it will be surrounded by a high locked fence to prevent accidental access to the high voltage equipment. High voltage signage will be installed at the substation and elsewhere, as necessary.

2.3.1.6 Transmission Line Construction

A 138 kV transmission line, approximately 16 km long, will be required to connect the Project substation to the Tusket Falls Power Generating Station. The Proponent is in the process of securing an easement for the transmission line. If a PPA is awarded and the Project proceeds, NSPI will construct and operate the line in accordance with internal protocols and environmental protection procedures which will ensure compliance with relevant Acts and Regulations (NSPI 2009).

2.3.2 Operation and Maintenance

During the operation and maintenance phase of the Project, approximately 10 people will be employed (compared with up to 100 workers who would be employed during construction). The wind turbines will be visited approximately once every three months for routine servicing. Furthermore, the facility will include a sophisticated wind energy oriented Supervisory Control and Data Acquisition (SCADA) data analysis program, as well as alarm and notification protocols. With such a system, faults can be instantly detected and addressed, operations can be monitored, equipment performance can be analyzed, trend analyses can be performed and

long-term records maintained. For service-oriented visits the site will be accessed via light trucks.

Aside from normal recovery of lubricants from the gearbox and yaw mechanism, operation activities do not generate waste. Lubricants will not contain any PCBs. New and used lubricants, cleaning supplies and other controlled substances will be delivered, stored, handled and disposed of according to local regulations.

2.3.3 Decommissioning

The Wedgeport Wind Farm is expected to be operational for at least 20 years (length of PPA, if awarded). In the event that decommissioning and abandonment is necessary, the activities associated with the Project include:

- rotor, generator and tower disassembly;
- decommissioning of access roadways;
- removal of concrete foundation;
- removal of distribution and transmission lines;
- removal of pad mount transformers; and
- removal of substation.

Well-designed and constructed wind energy facilities may be operated for decades. Individual wind turbines are expected to perform for up to 35 years without significant repair or replacement. Transformer facilities, underground wiring and substation facilities are designed for at least a 50 year life span. Individual wind turbines may be replaced or repaired as their useful life comes to an end, or if more efficient and cost-effective technology becomes available.

Upon a decision to decommission a single wind turbine or the entire wind farm, all equipment above ground, including towers, nacelles, transformers and controllers will be removed. Wind turbines that are operational and have market value would be carefully removed using a crane, essentially in a reverse process to assembly and installation. The resale value of such equipment would cover the cost of removal in such a case. Other above-ground equipment in the wind farm, including transformers and wiring, has a ready market in either used equipment sales or in salvage. Transformers will be simply removed and sold. Wiring will be removed and sold to metal salvage companies.

As discussed above, wind energy facilities do not use or produce harmful waste products and therefore aside from normal recovery of lubricants from the gearbox and yaw mechanism, there are no requirements for harmful waste handling during decommissioning.

Wind energy facilities removed from undeveloped land will require minimal remediation; native seed mixtures will be used to revegetate the area. Where necessary, topsoil and re-grading of access roads will occur as per the landowner’s preference.

All decommissioning activities will be conducted in accordance with landowner agreements and applicable regulations and agreements at that time. It is not anticipated that watercourse crossings (if necessary) would be removed during decommissioning. Environmental effects associated with decommissioning would be similar to those experienced during construction (*e.g.*, noise, traffic, ground disturbance) albeit on a reduced scale (no additional habitat loss).

2.3.4 Future Phases of Project

At the present time the Proponent does not intend to expand the Wedgeport Wind Farm Project.

2.4 PROJECT SCHEDULE

The proposed construction schedule for the Project is presented in Table 2.2. The lifespan of the proposed Project is expected to be a minimum of 20 years. Decommissioning activities will last roughly the same amount of time as comparable construction activities.

Table 2.2 Project Activity Schedule

Activity	Schedule
Clearing	December 2012-February 2013
Development of access roads	February-June 2013
Delivery of equipment	May-September 2013
Foundation construction	September-November 2013
Wind turbine installation	November-March 2013
Construction of overhead collection system	October-December 2013
Installation of substation equipment	October-December 2013
Installation of transmission line	February-June 2014
Turbine commissioning	June-August 2014
In-service	September 2014

This construction schedule was designed to avoid sensitive periods for wildlife (*e.g.*, bird breeding season) and account for minor delays that could result from delayed equipment arrival and adverse weather conditions.

2.5 ECONOMIC BENEFITS

The Project is expected to generate positive economic benefits for the province, the region, and the Municipality of the District of Argyle. Approximately 100 jobs will be generated during construction which will last about two years. During operation, the Project will employ five to ten people. Participating landowners in the community will benefit from increased land value due to the income generated from the wind turbines. At the municipal level the Project will provide an additional $250,000 to $300,000/year to the tax base and the Province of Nova Scotia stands to benefit by locally sourcing content worth between $10 and $20 million during construction of the Project.

2.6 FUNDING

The Project will be Proponent-funded, supplemented by lendings from financial institutions on a project financing basis.

3.0 Stakeholder Consultation and Mi'kmaq Engagement

3.1 OVERVIEW OF CONSULTATION EFFORT

Public consultation and Mi'kmaq engagement is an integral part of the environmental planning process and plays a key role in addressing potential public concerns identified in early stages of the Project.

Consultation activities have included the initial public announcement of the Project by Anaia, two public Open House meetings (May 2011; June 2012), meetings with stakeholders including local landowners and municipal representatives, and various informal meetings, phone calls and letters. The following sections present further details on those opportunities given to the public and reviewing agencies for comment. Presentation material is provided in **Appendix B**. The public will continue to be consulted in future phases of development. During the EA review process, additional issues may be raised by the public and the public will be invited to submit written comments on the proposed Project and information contained in the EA document during the EA registration phase.

Pending regulatory approval and PPA award, the Proponent will provide access to stakeholders and landowners through a dedicated email address and 1-800 telephone line. Landowners and stakeholders may contact the Proponent directly to ask questions and/or report concerns. The Proponent will also maintain a Project website which will keep the public informed on the status of the Project.

Consultation efforts to date for the Project are summarized in Table 3.1.

Table 3.1 Government and Public Consultation and Mi'kmaq Engagement Conducted in Support of the Wedgeport Wind Farm Project

Association/Contact	Dates	Topic	Comments
Provincial and Federal Government Stakeholders			
NSE	02/01/2011	Wind Farm Consultation	• Meeting with Steve Sanford, Vanessa Margueratt and Helen MacPhail
NSDNR	03/14/2001	Wind Farm Consultation	• Meeting with Mark Elderkin
NSNDR– Land Services Branch	07/15/2011	Leasing Crown Lands for Wind Energy Development	• Identifying steps to request access to Crown Land to develop the Wind Farm Project in Wedgeport • Main Contact: Arlene d'Eon - Director of Land Administration
Canada Wildlife Service (CWS)	07/19/2011	Bird Monitoring Protocol	• Sent proposed bird monitoring protocol for review and comment • Received comments October 24, 2011
Department of National Defence (DND)	05/26/2011	Wind Farm Consultation	• DND has no objections to the proposed project. In their first review (basic analysis) of the project they raised some concerns.

Table 3.1 Government and Public Consultation and Mi'kmaq Engagement Conducted in Support of the Wedgeport Wind Farm Project

Association/Contact	Dates	Topic	Comments
			After a further and more detailed analysis no concerns were found.
Nav Canada	05/26/2011	Wind Farm Consultation	• Nav Canada has submitted some conditions to accept the Project that were already reviewed under the final layout presented in this document
Transport Canada	05/12/2011		• Transport Canada has no objections to the proposed project (**Appendix C**)
Industry Canada	11/18/2011	Wind Farm Consultation	• Industry Canada has no objections to the proposed project (**Appendix C**)
Royal Canadian Mounted Police	11/17/2001	Wind Farm Consultation	• RCMP has no objections to the proposed project.
Canadian Coast Guard	11/18/2011	Wind Farm Consultation	• Canadian Coast Guard has no objections to the proposed project (**Appendix C**)
NSDNR	06/13/2012	Pre-EA Registration Consultation	• Mark Elderkin expressed concern regarding placement of specific turbines in current layout due to potential wildlife and habitat issues • Anaia is committed with working with NSDNR to revise layout to minimize effects on birds and wildlife habitat
NSE	06/15/2012	Pre-EA Registration Consultation	• Discussed NSDNR concerns (see above) and discussed registration approach
Municipal Stakeholders			
Municipality of Argyle	12/06/2010	Land Use By-law and permitting for Wind Farm Development in the Municipality	• Contact: Lorelei Doucette – Development Officer • Contact: Brad Fulton – Senior Planner • Meeting with Senior Planner and Development Officer to understand Municipal By-Laws and requirements to develop a Wind Farm • Ongoing discussions regarding layout accordance with By-Laws. The Municipality requires a final layout with signed properties to issue a development permit
Municipality of Argyle	01/20/2011	Wind Farm Project presentation to Council	• All Council Members • Presentation to Council in order to get their support for developing the Wind Farm by leasing the land to the MET Tower.
Public Stakeholders			
Local community	05/24/2011	Community meeting 1	• Approximately 100 attendants. Vast majority of the attendants positive about the project and wanting to learn more about opportunities for the community
Local community	06/11/2012	Community meeting 2	• Approximately 80 attendants. Generally the community continues to support the Project although there were several questions focused on the transmission line
Mi'kmaq Engagement			
NS Assembly of First Nations (KMKNO)	04/28/2011 and 06/09/2011	Renewable Energy Development and opportunity to First Nations in NS	• General presentation of Anaia and a brief overview of RFP projects and COMFIT projects under development • Presentation of different ways KMKNO

Table 3.1 Government and Public Consultation and Mi'kmaq Engagement Conducted in Support of the Wedgeport Wind Farm Project

Association/Contact	Dates	Topic	Comments
			could participate together with Anaia in renewable energy projects in NS
NS Assembly of First Nations (KMKNO)	03/22/2012	Consultation with KMK	• General presentation of the Project and delivery of MEKS (Mikmaq Ecological Knowledge Study) • Presentation to Eric Christmas and Melissa Nevin
Acadia First Nation	12/12/2011	Wind Farm Consultation	• Ongoing requests by Anaia to formally present the Project to Band Council and/or Development Office.
Native Council of Nova Scotia	05/03/2012	Wind Farm Consultation	• Have requested a formal meeting to present Project and benefits for Nova Scotian communities.

3.2 MI'KMAQ ENGAGEMENT

3.2.1 Engagement Efforts

The Proponent has had several meetings with representatives from the Nova Scotia Assembly of First Nations with respect to potential renewable energy opportunities (including Wedgeport Wind Farm) and also specifically to speak about the Project itself. The Assembly of First Nations comprises Chiefs from each of the 13 First Nation Bands in Nova Scotia. In March 2011, Anaia representatives met with Eric Christmas and Melissa Nevin of the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO) to present the Mi'kmaq Ecological Knowledge Study (MEKS) that had been completed for the Project.

The Acadia First Nation Reserve is located approximately 9.4 km from the Project. Although attempts to meet directly with Chief Deborah Robinson has thus far been unsuccessful, the Acadia First Nation has been informed of the Project through consultations with the Assembly and direct communication with the development office at the Acadia First Nation Band.

The Proponent has also requested a formal meeting to present the Project to the Native Council of Nova Scotia. At the time of writing (June 2012), this meeting had not yet occurred.

No specific concerns have been raised during Mi'kmaq engagement efforts with respect to Project impacts. As reported in the MEKS, there is current use of lands and resources for traditional purposes occurring within a 5 km radius of the Project Study Area although the Project is not anticipated to adversely affect this activity.

3.2.2 Mi'kmaq Ecological Knowledge Study (MEKS)

Anaia commissioned Membertou Geomatics Solutions to complete a Mi'kmaq Ecological Knowledge Study (MEKS) for the Project (refer to **Appendix D**). The MEKS determines Mi'kmaq land and resource use which is of particular importance to the Mi'kmaq people with respect to the Wedgeport Wind Farm Project, and identifies and documents ecological knowledge which may be

significant to the Project. The MEKS was developed in accordance with the "Mi'kmaq Ecological Knowledge Study Protocol" (Assembly of Nova Scotia Mi'kmaq Chiefs 2007). The MEKS is summarized in Section 5.7.7 and a copy of the report is in **Appendix D**.

3.3 REGULATORY CONSULTATION

Various regulatory and other agencies were consulted early in the planning process to provide input into the Project and the process, and advice in terms of likely approvals and considerations for environmental assessment. Table 3.1 summarizes consultation efforts with federal, provincial and municipal representatives. Most recently (June 2012), the Proponent met with representatives from NSDNR and NSE to discuss the EA Report prior to submission. NSDNR has raised concerns with respect to the current placement of turbines. In particular, turbines located in relative proximity to larger wetland complexes and salt marshes were considered less desirable due to potential interactions with resident and migrating birds. The Proponent has been encouraged to reconsider a different configuration of turbines which would be closer to 16 turbines, rather than the current 25 turbine layout. As a result of this feedback, the Proponent is reconsidering the turbine model of choice and reviewing options to substantially reduce the number and geographic extent of turbines for the Project (refer to Section 2.2).

The Proponent will continue to work with regulatory agencies to meet applicable regulatory requirements, including regulatory approval applications and EA conditions of approval (*e.g.*, post-construction monitoring) as applicable.

3.4 PUBLIC AND STAKEHOLDER CONSULTATION

Open House Meeting (May 2011)

The first Open House meeting in the community was held on May 4, 2011 at the Wedgeport Fire Hall on Black Pond Road. This meeting was attended by over 100 people from the local community. Notices of the meeting were mailed to residents in the Comeaus Hill, Little River Harbour, Upper Wedgeport and Wedgeport communities. Invitations were also extended to Chief Deborah Robinson of Acadia First Nation and District of Argyle council members.

The intent of this meeting was to introduce the Project concept to the community and show the proposed area of interest for development. Attendees were given the opportunity to speak with Anaia and Stantec representatives one-on-one about the Project and were invited to fill out comment sheets (refer to Section 3.4 for summary of issues). Overall, the community was fairly positive about the Project and interested in learning more about how the Project would proceed. Some attendees expressed desire for a formal presentation on the Project rather than an open house meeting format. This feedback was taken into consideration for the planning of the second community meeting in June 2012.

Open House and Presentation (June 2012)

A second open house meeting was held on June 11, 2012 at the Wedgeport Fire Hall with approximately 80 people in attendance from the local community. This meeting format included a Powerpoint presentation by Anaia followed by an open house concept meeting with displays. Meeting invitations were mailed to the same recipients as the first open house as well as residents living in the vicinity of the transmission line up to Tusket and some areas of the Municipality of Yarmouth.

The purpose of this meeting was to update the community on the current status of the Project and present key findings from the EA process. As before, attendees were invited to speak with Anaia and Stantec representatives and fill out comment sheets. Key issues of concern raised during the open house were predominantly related to the proposed transmission line and in particular, transmission line access and related health effects of the transmission line. The Proponent is currently in the process of meeting with individual landowners to secure a transmission line easement so not surprisingly the transmission line appeared to be the focus of most conversations at the meeting. Other comments raised included potential health concerns related to wind farm operation, and local economic benefits.

The key issues/concerns and responses from both public meetings are summarized below in Table 3.2.

3.5 KEY ISSUES FROM CONSULTATION AND ENGAGEMENT

Table 3.2 Summary of Issues Raised During Public Stakeholder

Key Issues/Comments	Response
Effect of subterranean vibrations on local homes/lobster	The Project is not expected to interact with the marine benthos. Given the proposed setback distances from houses, there is no anticipated effect of vibration from the wind farm on houses in closest proximity to the wind farm.
Health effects of turbines and transmission lines	Section 6.7 of the EA report considers potential concerns related to public health and safety.
Corona discharge effect from transmission line	Corona discharge is a phenomena in which, under certain conditions, the localized electric field near energized components and conductors can produce a tiny electric discharge (corona) that causes the surrounding air molecules to ionize, or undergo a slight localized change of electric charge. All transmission lines generate corona discharge, although it is more noticeable at higher voltages (*e.g.*, 345 kV; the proposed Project transmission line is 138 kV) and during humid conditions. Corona discharge can result in audible noise, and electromagnetic interference with radio frequencies. Corona discharge can also result in power loss and insulation damage. Transmission lines are therefore designed to minimize corona discharge.

Table 3.2 Summary of Issues Raised During Public Stakeholder

Key Issues/Comments	Response
	Audible noise levels on typical 230 kV lines are very low and are usually not noticeable. For example, the calculated rainy weather audible noise for a 230 kV transmission line at the RoW edge is about 25 dBA (Parmar 2011). As noted above, the proposed transmission line is only 138 kV therefore audible noise from this line beyond the RoW edge is expected to be negligible.
We are one of the closest residences to the proposed area and we have not been approached to ask us about our concerns. Major concerns that our voice does not matter.	Open houses were held in the community in May 2011 and June 2012. The objective of the community open houses was to inform the public of the proposed project and to provide an opportunity to hear comments, support and concerns. This particular comment was made by individual who has had one-on-one dialogue sessions with both Anaia and Stantec. Attempts have been made to address her concerns.
Concerned about property values	Refer to Section 6.5.3.2.
Visual impact of wind turbines on the community	Refer to Section 6.5.3.2.
Concerned about increased traffic on Black Pond Road	Refer to Section 6.7.2.1 A transportation study will be undertaken to identify safe and efficient routes for construction traffic as well as identify potential design and mitigation measures to protect public safety.
Familiar with the Pubnico Point Wind Farm. Supportive of this project.	Your support for the Project is appreciated.
Concerns about proximity to the transmission line and ownership of easement in perpetuity	The Proponent is currently speaking with local landowners about transmission line routing and easement agreements. These concerns are being addressed on a case-by-case basis with prospective landowners.
Lack of local economic benefit	Refer to Section 2.5.

4.0 Environmental Assessment Methods and Scoping

As an energy generating facility that has a production rating of at least 2 MW derived from wind, this Project is a Class I Undertaking as defined in Schedule A of the Nova Scotia Environmental Assessment Regulations and as such requires an EA registration. The Proponent's Guide to Wind Power Projects: Guide for Preparing an Environmental Assessment Registration Document (NSEL 2007, updated 2012) provides guidance on EA approach and issues scoping and was used extensively to guide the EA for this Project.

This EA has been completed using a structured approach that:

- focuses on issues of greatest concern;
- considers the issues raised by the public and stakeholders; and
- integrates engineering design and programs for mitigation and follow-up into a comprehensive environmental planning process.

The EA focuses on specific environmental components called Valued Environmental Components or VECs. VECs are broad components of the biophysical and human environments that, if altered by the Project, may be of concern to regulatory agencies, the Mi'kmaq of Nova Scotia, resource managers, scientists, and/or the general public. It is noted that "environment" is defined to include not only biological systems but also human, social, and economic conditions that are affected by changes in the biological environment, VECs can relate to ecological, social, or economic systems that comprise the environment.

4.1 SCOPE OF THE PROJECT TO BE ASSESSED

The scope of the Project to be assessed includes all activities and physical works associated with the construction, operations and decommissioning of the proposed project. The scope of the Project includes the following activities and components:

- Site clearing and preparation;
- Constructing and upgrading access roads, including installation of culverts as required;
- Turbine foundation construction and turbine installation;
- Substation construction and installation of collector lines (*i.e.,* installation of 25 kV aboveground collection system);
- Installation of a 138 kV transmission line (approximately 16 km);
- Operation and maintenance of the Project; and
- Decommissioning of the turbines and the overall Project.

Since decommissioning activities are not expected to occur before the end of 20 years of operation and will be conducted in accordance with the regulatory requirements at that time, and effects are likely to be similar although reduced in magnitude from those assessed for construction, decommissioning is not assessed as a separate activity for this Project.

4.2 SCOPE OF THE FACTORS TO BE ADDRESSED

The EA is organized and focused according to VECs which are those biophysical and socioeconomic elements that are of particular importance to the Proponent, as well as public and regulatory stakeholders involved in the assessment process.

4.2.1 Selection of Valued Environmental Components

The VECs evaluated for this assessment include:

- **Aquatic Environment** (quality and quantity of freshwater resources, focusing on fish and fish habitat);
- **Vegetation** (focusing on rare vascular plants and uncommon species assemblages);
- **Wetlands** (defined as land commonly referred to as marshes, swamps, fens, bogs, and shallow water areas that are saturated with water long enough to promote wetland or aquatic process and including coastal wetlands);
- **Birds and Other Wildlife** (migratory and non-migratory birds, with a focus on rare or sensitive species and their habitat, potentially feeding, breeding, migrating through the Project Study Area; rare mammals and rare herpetiles and their habitat, and critical habitats such as interior forests);
- **Land Use and Community** (existing and planned land development, settlement areas, recreation, and areas of special community or social value, visual landscape, and current use of lands and resources by the Mi'kmaq for traditional purposes);
- **Archaeological and Heritage Resources** (terrestrial archaeological and heritage resources and sites providing evidence of past use and occupation); and
- **Public Health and Safety** (health and safety of the general public and local residents).

These VECs were selected based on: regulatory guidance; literature and data review; results of field and desktop studies; regulatory and public stakeholder consultation and Mi'kmaq engagement; and professional judgement of the Study Team. The relevance of each of these factors is discussed below. In addition, the scope of the assessment was based on a review of potential interactions of the Project with the biophysical and socio-economic environment (refer to Section 4.2.2).

4.2.2 Scoping Considerations

4.2.2.1 Regulatory Guidance

Additional provincial legislation and policies that influenced this EA include the *Endangered Species Act,* Activities Designation Regulations, and the Nova Scotia *Wetlands Conservation Policy* (NSE 2011a).

Regulatory guidance for this Project was also obtained from several federal documents, including:

- *Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms Under the Canadian Environmental Assessment Act* (NRCan 2003).
- *Wind Turbines and Birds – A Guidance Document for Environmental Assessment* (Environment Canada 2007a).
- *Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds* (Environment Canada 2007b)
- *Cumulative Effects Assessment Practitioners Guide* (Canadian Environmental Assessment Agency 1999)

Based on criteria established by Environment Canada (2007a), the Project is considered to be a Category 4 project as it is a “medium facility” (11-40 turbines) with a “very high” potential sensitivity (given location on shoreline and potential presence of species listed under the *Species at Risk Act*). As such, this guidance was used to scope the field program and analysis for the Project.

In addition to these regulatory guidelines, federal legislation has also been used to guide the EA in terms of issues scoping, effects assessment and mitigation requirements, including, but not limited to the *Species at Risk Act* (*SARA*) and *Migratory Birds Convention Act, 1994*.

4.2.2.2 Literature and Data Review

For this Project, existing information was collected from a number of sources including, but not limited to:

- municipal documentation from the Municipality of the District of Argyle;
- 1:20,000 aerial photos;
- 1:10,000 Nova Scotia Base Mapping;
- NSDNR wetland inventory mapping;
- Atlantic Canada Conservation Data Centre (ACCDC);
- Provincial water well inventory;
- reports, books and other materials on the area’s natural history and geology (see Section 13);

- reports, books and other materials relative to wind turbine developments and environmental effects (see Section 13); and
- information available at selected websites (*e.g.*, Statistics Canada, *Species at Risk Act* registry; see Section 13).

4.2.2.3 Field Studies

Field studies are aimed at characterizing the natural and social-economic environment of the Study Area. This work included:

- summer, fall, winter and spring avian monitoring (2011-2012);
- vegetation and wetland surveys (June and August 2011);
- aquatic surveys (August 2011 and May 2012);
- baseline noise monitoring (May 2012);
- archaeological survey (May 2012); and
- site visit to support the visual impact assessment and characterization of socio-economic environment (May 2012).

In addition, Membertou Geomatics Solutions has conducted an MEKS for the Project (refer to **Appendix D**), which has served to inform Project scoping and assessment.

No additional field studies are required prior to submission of the EA Registration. Additional surveys as noted below may be required in the event that the previously assessed layout is modified:

- wetland surveys and functional analyses (if wetland impacts cannot be avoided); and
- aquatic surveys (*e.g.,* if watercourses not previously surveyed are likely crossed by a road alignment).

4.2.2.4 Consultation and Engagement

Section 3 describes the stakeholder consultation and Mi'kmaq engagement efforts and results, including key issues of concern and/or interest. In addition to feedback obtained specific to this Project, general issues of concern regarding wind farm developments were also considered in scoping.

4.2.2.5 Professional Judgment

Project personnel involved in the completion of this EA are trained, professional biologists, scientists, planners and/or EA practitioners, all of whom have experience on other wind farm environmental assessments. Professional judgment was exercised through the selection of environmental components and in the evaluation of environmental effects in this report. The use of professional judgment in EA practice is widely accepted and complements the aforementioned scoping techniques.

4.2.3 Potential Project-Environment Interactions

Table 4.1 summarizes potential Project interactions with the selected VECs for assessment.

Table 4.1 Potential Project-Environment Interactions

Project Activities	Valued Environmental Components						
	Aquatic Environment	Vegetation	Wetlands	Birds and Other Wildlife	Land Use	Archaeology and Heritage Resources	Public Heath and Safety
Construction		X	X	X	X	X	
Access Road Construction	X	X	X	X	X	X	X
Delivery of Equipment				X	X		X
Turbine Foundation Construction and Turbine Installation	X	X	X	X	X	X	
Substation Construction and Installation of Collector Lines	X	X	X	X	X	X	X
Installation of Transmission Line (to Power Grid)	X	x	X	X	X	X	X
Operation & Maintenance				X	X		X
Decommissioning and Reclamation	X	X		X	X	X	X

4.3 TEMPORAL AND SPATIAL BOUNDARIES

An important aspect of the EA process is the determination of assessment boundaries because they focus the scope of environmental assessment, allowing for a meaningful analysis of potential environmental effects associated with the Project. The setting of boundaries also aids in determining the most effective use of available proponent resources.

Temporal and spatial boundaries encompass those periods and areas during, and within which, the VECs are likely to interact with, or be affected by, the Project. These boundaries may extend well beyond physical Project footprint and Project Study Area, particularly in the case of migratory species, or regional or national socio-cultural and economic systems.

The Project Study Area (refer to Figure 2.1) refers to the area of interest for wind farm development within which field and desktop studies focused.

The Project Footprint refers to the specific area within which direct physical effects on the existing habitat are realized. This would include, but not necessarily be limited to turbine foundations, crane pads, access roads, etc.

Cumulative effects assessment (refer to Section 7) considers a larger regional study area influenced by other developments in the municipality and/or range of species of conservation interest.

The temporal scope of this assessment covers the construction and operation of the Project, which is expected to extend over the next 20-25 years.

4.4 DETERMINING SIGNIFICANCE OF RESIDUAL EFFECTS

Environmental effects are characterized in terms of geographical extent, magnitude, duration, frequency, reversibility, and ecological context. Significance criteria for VECs take these descriptors into account but may also consider regulatory standards in terms of acceptance.

Table 4.2 defines significance criteria for each VEC.

Table 4.2 Residual Effects Significance Criteria Definitions

Valued Environmental Component	Significance Criteria Definition
Aquatic Environment	A significant adverse residual environmental effect is, after mitigation and compensation measures are taken into consideration, defined as a change in water quality that would permanently affect the ability of the freshwater environment to support fish and/or a permanent loss or alteration of freshwater habitat that is likely to result in a meaningful effect on the productive capacity of the habitat to support fish.
Vegetation	A significant residual adverse environmental effect is defined as one that results in: a non-permitted contravention of *SARA* or the *Endangered Species Act*; or one that affects plants or their habitat in such a way as to cause a decline in abundance or change in distribution of populations of vascular plant populations such that the likelihood of the long-term survival of these species may be reduced and natural recruitment may not re-establish the population(s) to its former level.
Wetlands	A significant adverse residual environmental effect on wetlands is defined as any adverse environmental effect that results in an uncompensated, permanent net loss of wetland area and/or associated functions.
Birds and other Wildlife	A significant residual adverse environmental effect is defined as one that results in: a non-permitted contravention of *SARA* or the *Endangered Species Act*; or one that affects wildlife (*e.g.*, direct mortality, change in migratory patterns, habitat avoidance) in such a way to cause a decline in abundance or change in distribution of populations of species such that the likelihood of the long-term survival of these species may be reduced and natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its former level within several generations.
Land Use and Communities	A significant adverse residual environmental effect is one where the proposed use of land for the Project is not compatible with adjacent land use activities as designated through a regulatory land use process, and/or the proposed use of the land will create a change or disruption that widely restricts or degrades present land uses to a point where the activities cannot continue at current levels and for which the environmental effects are not mitigated or compensated. In terms of noise and visual effects, standards proposed by NSE as acceptable limits includes a received sound level of 40 dBA and shadow flicker effect of 30 hours/year. Continued exceedance of these limits without mitigation would contribute to a significant effect rating for Land Use and Communities.
Archaeology and Heritage Resources	A significant adverse residual environmental effect is defined as any unmitigated Project-related disturbance to, or destruction of, archaeological or heritage resources considered by the affected First Nations, communities, or provincial heritage regulators to be of major importance due to factors such as

Table 4.2 Residual Effects Significance Criteria Definitions

Valued Environmental Component	Significance Criteria Definition
	rarity, condition, spiritual importance, or research importance.
Public Health and Safety	A significant adverse residual environmental effect on public health and safety is defined as one in which the Project directly and substantially endangers the safety of the public to such an extent that an immediate and imminent danger exists to the life and /or health of the public and for which planned design features, mitigation, or environmental management measures are unsuccessful at minimizing or eliminating the risks to public safety.

5.0 Description of the Existing Environment

5.1 ATMOSPHERIC ENVIRONMENT

5.1.1 Climate

Weather data was acquired from the Yarmouth meteorological station, which is located approximately 12 km north west of the Project site. Based on Environment Canada climate normal or averages for the period of 1971-2000, the average annual temperature in the region is 7°C, with the average daily maximum and minimum being 10.9°C and 3°C respectively (Environment Canada 2012). The warmest period during the year is typically from June to August (daily mean of 15.7°C), while the coldest period is between December and February (daily mean of -2.1°C) (Environment Canada 2012). According to 1971-2000 precipitation data at the Yarmouth station, precipitation occurs approximately 164.9 days per year and averages approximately 1,274 mm of precipitation throughout the year, where 78% is rain and the remainder is snow (Environment Canada 2012). According to historic visibility data for Yarmouth there is an average of 790 hours per year for which visibility is less than 1 km. Months with greatest fog are June, July and August (The Weather Network 2012).

5.1.2 Air Quality

A network of ambient air monitoring stations is established throughout the province to measure ambient concentrations of various air contaminants. The closest air quality monitoring station to the Project Study Area is located in Yarmouth. However, only ozone is monitored at this location. The next closest ambient air quality monitoring station to the Project Study Area is the Kentville monitoring stations. A list of the contaminants monitored at both of these locations, their distance to the Project Study Area, and annual averages is presented in Table 5.1.

Table 5.1 Various Ambient Air Monitoring Stations Located Near the Project Study Area

Monitoring Station	Contaminant	Approximate Distance from Project (km)	Annual Averages	
			2005	2006
Yarmouth	O_3(ppb)	12	27	27
Kentville	NO_2 (ppb)	190	2.6* (8 months)	0
	NO (ppb)		2.4*(8 months)	2
	O_3(ppb)		27* (11 months)	31
	$PM_{2.5}$ (µg/m^3) (BAM)		9.9* (8 months)	8.7*(10 months)

* - Annual mean calculated over the number of months indicated.
NA - Data Not Available
Reference: Environment Canada, 2008

Based on monitoring results from the most recently published National Air Pollution Surveillance (NAPS) Network ambient air quality monitoring reports for 2005 and 2006 (Environment Canada 2008), the following general conclusions can be made:

- The monitored concentrations of particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) at the Kentville monitoring station have generally been low.
- None of the monitored concentrations of nitrogen dioxide exceeded the 1-hour or Annual objectives (400 µg/m^3 and 100 µg/m^3, respectively).
- In 2005 and 2006 the ambient air quality 1-hour objective for ozone of 82 ppb was not exceeded at any of the monitoring stations.

Given the fact that there is no ambient air monitoring station located on or in the immediate vicinity of the Project Study Area, that there is limited data available from the ambient air monitoring station in Yarmouth, and that the Kentville ambient air monitoring station did not demonstrate harmful concentrations of the contaminants measured, it can be reasonably estimated that the Project Study Area is representative of a rural environment where all contaminant concentrations would meet the Ambient Air Quality Objectives.

5.1.3 Baseline Sound Levels

Baseline noise monitoring was conducted by Stantec at four locations, representing the nearest residential receptors to the Project. In rural areas such as that which constitute the majority of the Project Area, the acoustic environment is likely dominated by:

- the sound of wind in the trees and vegetation;
- the sound of running water in the vicinity of streams or rivers; and
- animal sounds and bird calls.

The results of the baseline noise monitoring are provided in **Appendix E.** Baseline measurements were indicative of typical rural sound levels.

5.2 GEOPHYSICAL ENVIRONMENT

The following sections outline the geophysical environment of the proposed Wedgeport Wind Farm Study Area, including the physiography and topography, surficial geology, bedrock geology, and hydrogeology of the area. These observations are based solely on a review of publically-available regional resource mapping. A site reconnaissance is required to confirm proximity to sensitive receptors (*e.g.*, residences) and to identify specific issues at the individual turbine sites.

5.2.1 Physiography and Topography

The Project is located on a peninsula approximately 2.4 km west of the rural community of Wedgeport, and immediately north of the rural community of Little River Harbor (Figure 1.1). The Project Study Area extends approximately 6 km north from Little River Harbor along the watershed divide between Little River Harbor on the west and Goose Bay on the east. The Project Study Area is bounded on the north by Black Pond Road and Goose Lake, on the east by Goose Bay, on the west by Comeaus Hill Road, and on the south by Little River Harbor and Comeaus Hill.

This area is characterized by rolling hills ranging in elevation from 45 m near Black Pond Road, to sea level, averaging about 15 m elevation along the center of the land package. Drainage is radial to the west, south and east from the center of the peninsula. The land use is a mixture of forest, wetland and exposed bedrock. The closest residences are distributed along Comeaus Hill Road on the west, Highway 334 near Wedgeport to the east (across Goose Bay), and a few sites along Black Pond Road and Goose Lake access Road to the north.

5.2.2 Surficial Geology

The Study Area is overlain by thin deposits of sandy glacial till, with areas of exposed bedrock, and recent alluvial and organic deposits in local depressions. The granite till facies of the Beaver River Till sheet (Stea and Grant 1981) is described as grayish-orange to yellowish brown, loose, sandy glacial till with angular, cobble-sized locally-derived (granite) clasts. The overburden thickness is expected to range from nil over upland bedrock features (*e.g.*, exposed bedrock and residuum), to a few meters in bedrock depression areas (refer to Figure 5.1).

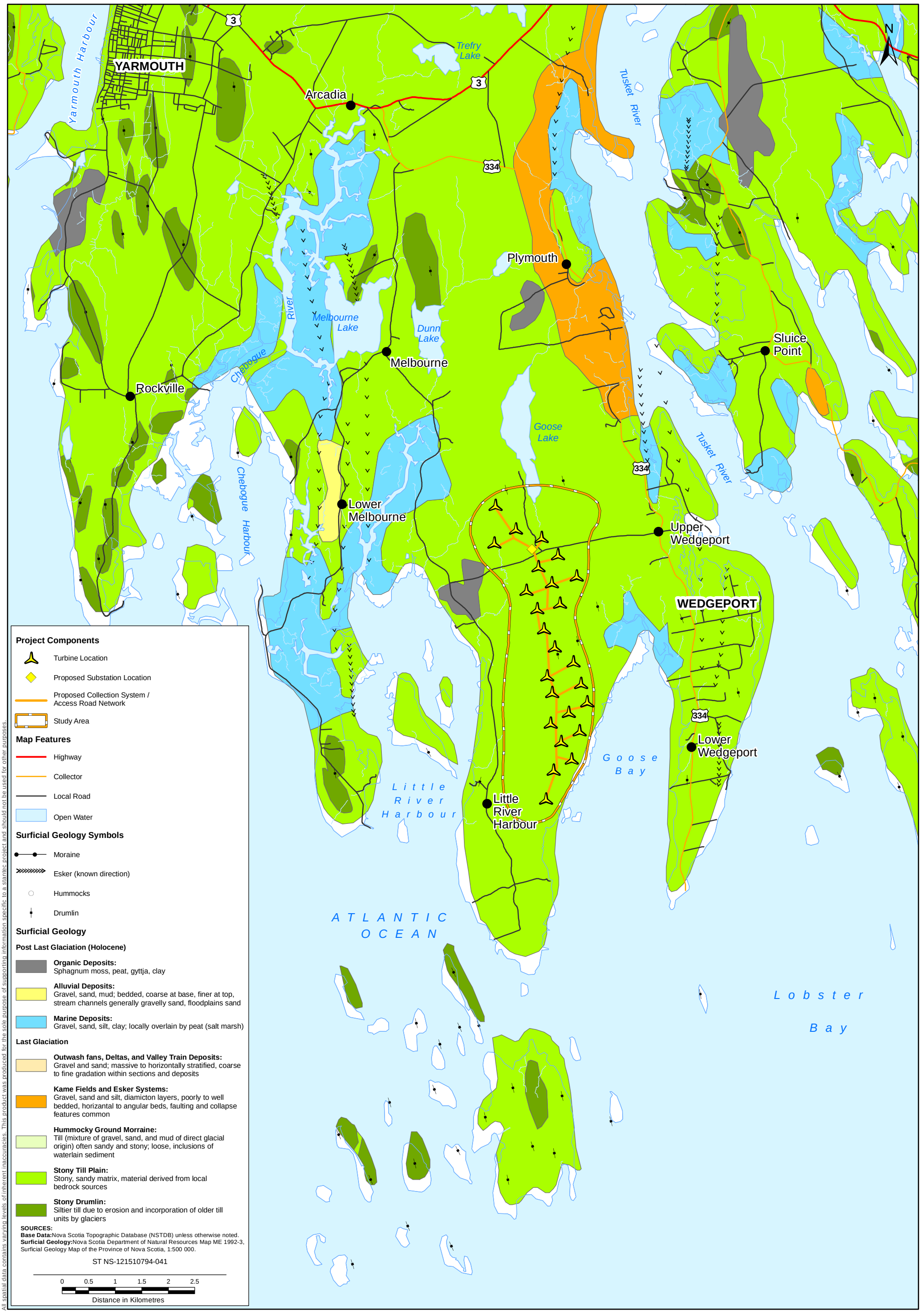
5.2.3 Bedrock Geology

The glaciated bedrock surface controls the topography in the Project Study Area. The entire Study Area is underlain by Lower Carboniferous aged monzonite granite (Keppie 2000). Graywacke and minor slate of the older Cambro-Ordivician aged Goldenville formation is located north of Black Pond Road and east of Goose Bay in the vicinity of Wedgeport (refer to Figure 5.2).

5.2.4 Hydrogeology

Based on the overburden and bedrock lithology descriptions, the Project Study Area could be subdivided into two aquifer types:

- Permeable, relatively thin sand and silt glacial till ground moraine; and
- Fractured crystalline bedrock (predominantly granite).



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PREPARED BY: M. Huskins-Shupe	WEDGEPORT WIND PROJECT	FIGURE NO.: 5.1
REVIEWED BY: C. Shupe		DATE: Jun 14, 2012
AnaiaGlobal RENEWABLE ENERGIES www.anaiaenergy.com	**Surficial Geology**	Stantec

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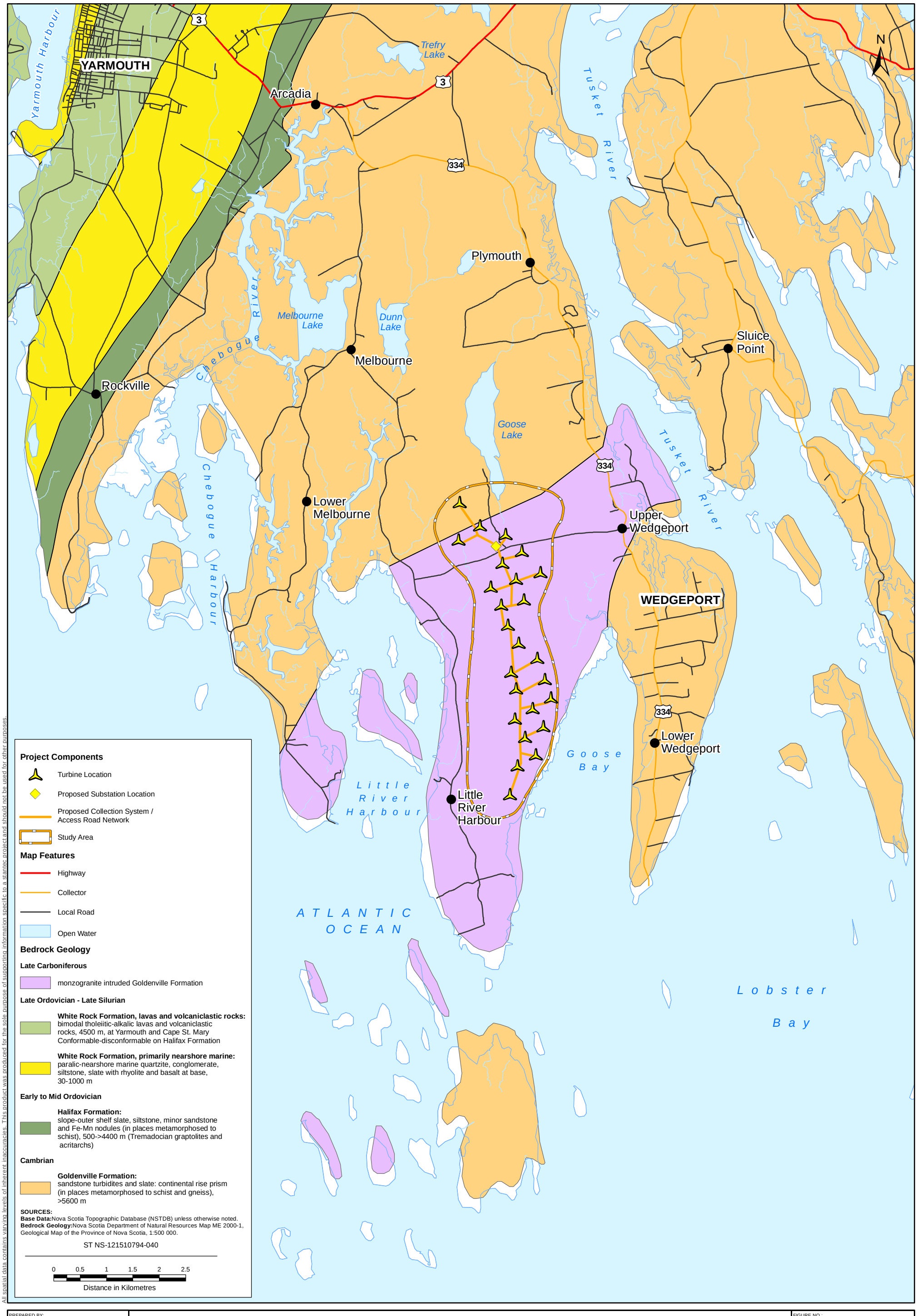

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REVIEWED BY: C. Shupe		DATE: Jun 14, 2012
AnaiaGlobal RENEWABLE ENERGIES www.anaiaenergy.com	**Bedrock Geology**	Stantec

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Overburden

The glacial tills are generally considered to be poor aquifers. Where sufficient saturated thickness occurs, the sandy glacial tills can provide sufficient yield to dug wells for single family domestic uses. A review of 98 dug wells in the general area indicates yields of 18.2 to 1,136.5 L/min, median 468.2 L/min. These reported yields are dominated by large in-well storage, and do not represent sustainable yields, which would be in the order of a few igpm in most cases.

Due to their apparent permeability, the local overburden units are considered to be highly vulnerable to pollution from overlying land uses. The water quality from dug wells is usually good, with a tendency for iron and manganese in excess of aesthetic guidelines, especially in proximity to wetland areas, and detectable coliform bacteria, usually in warmer weather.

Bedrock

The fractured crystalline bedrock comprising the area of interest is considered to be a poor to moderate aquifer, with generally low yields (< 25 L/min) of generally good quality groundwater from drilled water supply wells. A review of 98 drilled wells in the study area completed in granite and quartzite bedrock indicates drilled well yields ranging from 0.1 to 909 L/min, median 22.7 L/min (5 igpm) from wells ranging in depth from 15.2 to 154.8 m, median 38.9 m, with an average 10.3 m of 152 mm diameter casing. It is noted that wells with yields in excess of 136 L/min are typically associated with commercial supply wells for fish plants in the Wedgeport area. Water levels tend to range from 0.3 m to 12.2 m, median 6.1 m below ground; which is lower than overburden wells (range 0.6 m to 6.1 m, median 2.4 m below ground), implying downward vertical hydraulic gradient from overburden to bedrock in upland areas.

A review of 104 water supply well logs with lithology data in surrounding communities suggests overburden thickness ranging from nil to 29 m, average 6.2 m, median 4.6 m (Table 5.2). Similar median overburden cover is noted in the Wedgeport, Upper Wedgeport, Lower Wedgeport , Little River Harbour and Comeaus Hill areas (median 4.9 m, 4.6 m, 5.5 m, 6.2 m and 5.5 m respectively). Water levels in overburden range from 0.6 m to 6.1 m, median 2.4 m below ground (Table 5.2).

Table 5.2 Summary of Domestic Well Construction Data – Wegeport, Upper Wedgeport, Lower Wedgeport, Comeaus Hill and Little River Harbour, NS

	Depth (m)	Casing (m)	Till (m)	WL (m)	Q (L/min)
Dug Wells:					
Minimum	3.4	0.9	0.3	0.6	18.2
Maximum	11.9	11.9	5.5	6.1	1136.5
Mean	5.5	5.5	2.3	2.5	390.3
Median	5.5	5.5	2.3	2.4	468.2
N	98	66	12	49	21
Drilled Wells:					
Minimum	15.2	4.3	0.0	0.3	0.1
Maximum	154.8	30.5	29.0	12.2	909.2
Mean	48.1	10.3	6.2	5.6	50.9
Median	38.9	7.6	4.6	6.1	22.7
N	98	91	104	26	94

Source: On-Line NS Well Logs Database (NSE 2012)

A series of five pumping tests performed by the Project Implementation Group in Comeaus Hill in 1978 indicated apparent well transmissivity of 1.0 to 3.2, mean 2.1 m^2/day, specific capacities of 0.7 to 1.6, mean 1.1 m^2/day, and sustainable yields of 3.5 to 17.1, mean 10.1 igpm (NSE 2012). These five wells were completed in granite bedrock, ranged in depth from 57.9 to 76.2, mean 72.5 m, with 6.1 to 12.2 m of casing. The water table ranged from of 3.0 to 14.4 m (mean 6.7 m), and overburden thickness ranged from 2.1 to 4.6 m. Six chemistry analysis from this testing program indicates groundwater chemistry described as a soft (mean hardness 64.3 mg/L), naturally acidic to neutral (mean pH 6.9), sodium-chloride to calcium bicarbonate water type of moderate dissolved solids (mean TDS 127.8 mg/L). Iron (mean 333 µg/L) and manganese (mean 463 µg/L) exceed respective drinking water guidelines. These well tests are considered to be representative of the granite underlying the Project Study Area.

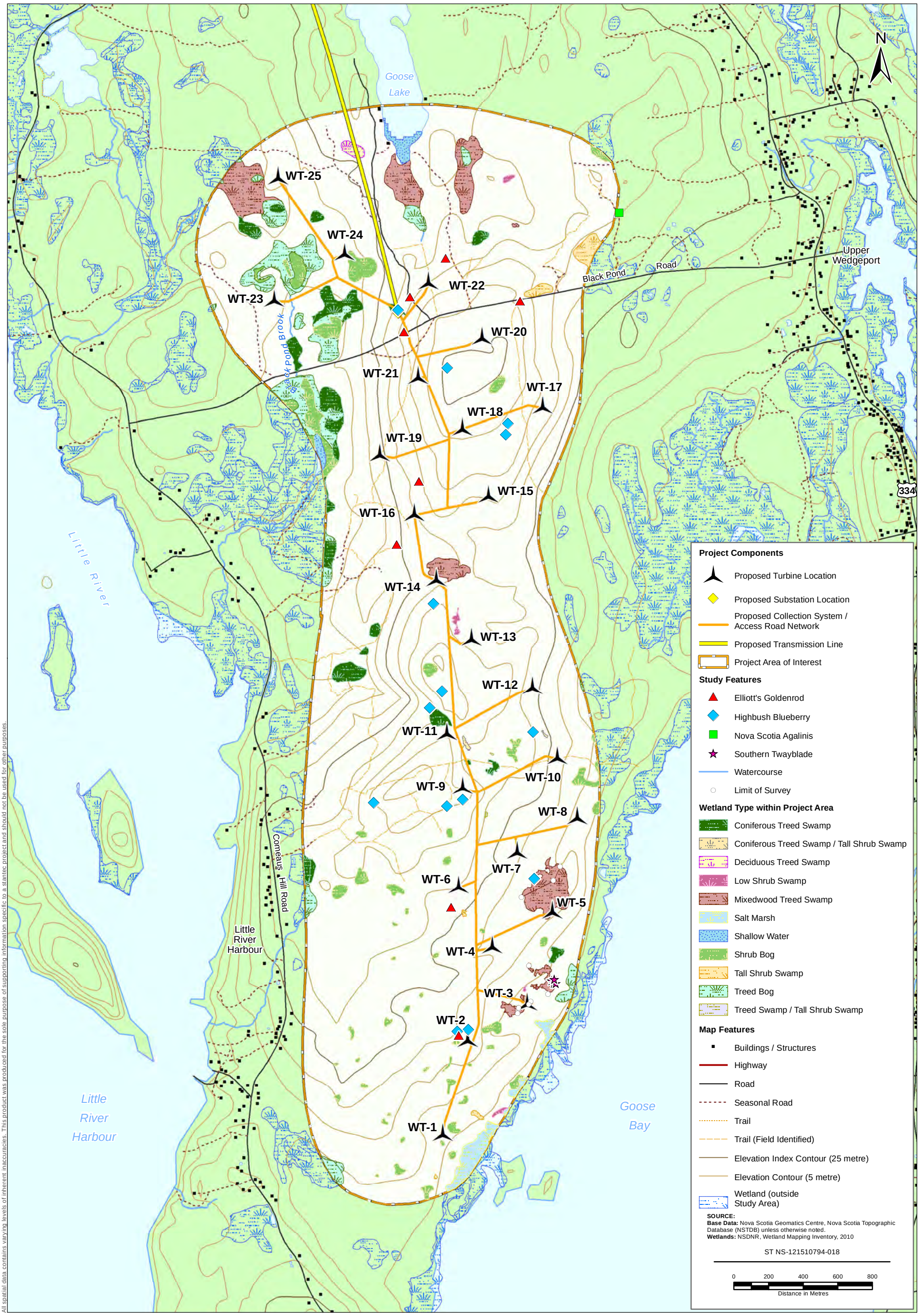
The dominant directions of groundwater flow would be expected to follow local topography radially to the east, west and south from the ridge area towards local wetlands, streams and the sea coast.

Proximity to Well Users

All residential and commercial water supplies in the Study Area are expected to be from on-site drilled or dug wells or springs. Domestic wells are distributed along existing roads such as Black Pond Road and Goose Lake Road on the North, Highway 334 on the east, Comeaus Hill Road on the west and Little River Harbor and Comeaus Hill to the south (Figure 1.1). Based on a Google Earth (2010 mapping) overview, there are approximately 45 to 50 residences or businesses distributed along Comeaus Hill Road between the intersection with Black Pond Road and Little River Harbour to the west. About five cottages/camps are identified on the west shore of Goose Lake to the north, and more than 50 potential well users located along Highway No. 334 to the east in Upper Wedgeport and Wedgeport. The nearest well appears to be associated with a seasonal camp/cottage on Goose Lake, approximately 659 m from the nearest turbine.

5.3 AQUATIC ENVIRONMENT

The Aquatic Environment section summarizes the results of aquatic field surveys conducted by Stantec aquatic specialists in August 2011 and May 2012 within the proposed Project Study Area (Figure 5.3). This work was undertaken, in part, to identify potential triggers under *CEAA* associated with the proposed wind farm development as well as to provide baseline information for the fish and fish habitat existing conditions. Field investigations also evaluated the potential for any water crossings to require Authorization under the *Navigable Waters Protection Act (NWPA).*



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PREPARED BY: C. Shupe	WEDGEPORT WIND PROJECT	FIGURE NO.: 5.3
REVIEWED BY: Miranda Huskins-Shupe	**Wetlands, Watercourses and Plants of Conservation Concern within the Project Study Area**	DATE: Jun 14, 2012
AnaiaGlobal RENEWABLE ENERGIES www.anaiaenergy.com		Stantec

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Watercourses with the potential to interact with the Project were identified through a review of existing 1:10,000 scale maps in relation to the proposed Project Study Area at the time of the survey in May, 2012. Two potential watercourse crossings (Black Pond Brook and Heath Brook) were identified from the existing mapping and the proposed turbine layout; these watercourses are illustrated in Figure 5.3. A detailed fish habitat assessment was completed for both of the identified watercourses. The habitat assessment extended the entire length of each watercourse limited upstream and downstream by the previously delineated wetlands within the Project Study Area. Additional areas of high potential were identified in the south eastern portion of the Project through depth- to-water mapping. The field surveys included these areas of high potential; no unmapped watercourses were identified.

The detailed habitat assessment was carried out at each identified watercourse using internal Stantec sampling protocol. The sampling protocol used is based on multiple existing protocols including the Environment Canada CABIN protocol (Canadian Aquatic Biomonitoring Network) (Reynoldson *et al*. 2007), the Ontario Benthos Biomonitoring Network (OBBN) protocol (Jones *et al.* 2005), and the modified New Brunswick Department of Natural Resources (NBDNR) and Fisheries and Oceans Stream Assessment Protocol (Hooper *et al*. 1995). The stream habitat assessment included the identification of physical units (*i.e.*, run, riffle, or pool), designation of substrate type, and description of the riparian zone. The presence or absence of macrophytes, algae, over-head cover, and woody debris was also recorded since all of these habitat features affect the ability of the watercourse to support fish communities. The depth and width (wetted and bankfull) of streams and rivers were recorded as well.

One *in-situ* water quality sample was taken within each identified watercourse. The water quality measurement was taken within 10 m of the downstream end of the access road centerline. The flow state at the time of the water quality sampling was also recorded. Measurements were collected using a handheld water quality meter (Yellow Springs International (YSI) 556 MPS unit) and included pH, water temperature and specific conductivity.

The results of the field assessment are presented to characterize the aquatic environment in the Project Study Area. These results allow the identification of fish habitat and potential species associated with this habitat. In addition the field assessments aided in differentiating watercourses from ephemeral or anthropogenic drainage channels. Watercourses as defined under the *Activities Designation Regulations* are protected from alteration through authorization governed by NSE. The field investigations also evaluated the potential for any water crossings to require authorization under the *NWPA.*

5.3.1 Surface Water

The entire Project Study Area is situated within the primary watershed 1EA (Tusket River). As the site is located primarily on a peninsula, both assessed streams drain directly into Little River, west of the Project Study Area, and then into Goose Bay. There are no Protected Water Areas or municipal water withdrawals within the Tusket River watershed downstream of the Project Study Area.

As the Project is unlikely to result in an interaction with surface water levels or result in an alteration of surface water regimes within the Project Study Area or watershed, existing water withdrawal permits in the watershed were not addressed.

Water quality within the Project Study Area can be described as temperate and acidic with low conductivity, based on conditions observed during the field assessments and discussed further in Section 5.3.2; these conditions are typical for Nova Scotia.

5.3.2 Aquatic Environment Survey Results

The results of the field-based fish habitat surveys confirmed that the Project Study Area contains one watercourse (Black Pond Brook) and one wetland drainage channel (Heath Brook). This drainage channel designation was based on channel morphology, water quality and quantity, habitat characteristics and substrate composition.

Black Pond Brook is a primarily soft-bottomed, slow-moving wetland stream that is unlikely to support salmonid spawning and rearing habitat. The substrate is composed primarily of organic fines with the occasional protruding boulder or large cobble. At an average depth of 0.25 m and an average width of 3.09 m Black Pond Brook is a relatively typical wetland watercourse. Accordingly, the stream also has the stable banks and minimal banks slopes common to wetland watercourses. Riparian habitat for the stream is primarily wetland system changing to more mixed forest in the upstream portion of the reach surveyed.

Heath Brook, as a wetland drainage channel, is also soft-bottomed with no visible flow and lacks the connectivity and characteristics to support fish spawning and rearing habitat as well. The substrate is composed primarily of organic fines and is dominated by grasses. Heath Brook has an average depth of 0.09 m and an average width of 1.0 m. Typical of a wetland drainage channel the stream has the stable banks and minimal banks slopes. Riparian habitat for the stream is primarily wetland with the entire system resembling a relatively dry wetland swath approximately 50 m across for its length. The physical habitat features and water quality data collected at the Heath Brook wetland drainage channel are included in summary tables below since these data contributed to the decision to designate it as a drainage channel instead of a watercourse.

Within the proposed transmission line corridor five watercourses were identified from topographic maps. All but one of these watercourses drain directly into the Tusket River. The singular watercourse drains into Dunn Lake and subsequently into the Little River. All five of these streams have the potential to bear fish and fish habitat. NSPI will conduct further investigations into the fish and fish habitat within these streams to collect the data required for a provincial watercourse alteration application to be submitted to NSE as applicable.

5.3.2.1 Physical Habitat

A summary of the physical habitat characteristics observed in the Black Pond Brook and Heath Brook is provided in Table 5.3. The gradient provided for each stream and drainage channel are

desktop calculations that were determined using available mapping and coordinates collected during the field assessments. The status of fish presence or absence, the identification of barriers to fish passage, and the potential need for new crossing structures is summarized for each watercourse and drainage channel in Table 5.3.

Table 5.3 Fish Habitat Assessment Summary (May 2011) for the Wedgeport Wind Farm Study Area

Project	Water-course	Name	Watercourse Coordinates (NAD 83)		Watercourse on 1:10000 NSGC maps	Nature of Watercourse	Watercourse Crossing Structure	Fish Presence Within Study Area	Fish species confirmed (common name)	Rationale for Fish Habitat Determination	Average Bank Channel Width (m)	Average Depth	Gradient along Survey Area	Bank Slope		Stability		Are There Known Fish Passage Obstructions in Assessment Area?	New Crossing Structure Required for Fish Passage?
	ID		Easting	Northing								(cm)	(%)	Left (º)	Right (º)	Left	Right		
Wedgeport Wind Farm	Black Pond Brook	Black Pond Brook	739494	4848499	Yes	Clear, soft-bottomed stream between two wetlands	None	None Anticipated	-	Watercourse between two wetlands; insufficient connection to larger fish-bearing waters.	3.09	25	1.1	1	1			Multiple wetlands providing at least partial barriers to fish passage	No (No crossing anticipated)
Wedgeport Wind Farm	Heath Brook	Wetland drainage channel	740027	4849358	Yes	Soft-bottomed, grass dominated short drainage channel (<100m) between two wetlands	None	None Anticipated	-	Wetland drainage channel; insufficient connection to larger fish-bearing waters.	1	9	0.8	1	1			No connection to fish-bearing waters	No (No crossing anticipated)

Stable and vegetated
Bare Stable
Eroding

5.3.2.2 Water Quality

Water quality was measured *in situ* at a representative area of the proposed watercourse or drainage channel during the May 2012 field survey. Water quality was measured at one location, at one point in time for each watercourse. The water quality data is summarized in Table 5.4. Natural variation in the water quality parameters measured *in situ* is expected seasonally and annually within lotic systems. The water quality measurements were collected in run flow types whenever possible.

Table 5.4 *In Situ* Water Quality Assessment Summary (May 2012) and CCME FAL (2007) Exceedances, Wedgeport Wind Farm Study Area

Stantec Field Reference Number	Water Temperature (°C)	pH	Specific Conductivity (µs/cm)	Total Dissolved Solids (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)
Heath Brook (DC [1])	8.42	**4.18**	95	0.061	N/A	N/A
Black Pond Brook	7.6	**4.53**	76	0.048	N/A	N/A

Exceedances of the CCME FAL Guidelines are highlighted in **bold font**
N/A = Equipment post-calibration failure
[1] DC=Drainage Channel

Water quality data was compared to the 2007 *Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life* (FAL) from the Canadian Council of Ministers of the Environment (CCME). This document provides guidelines specific to Canada in relation to the water quality parameters required for the growth and development of eggs and juvenile fish into mature spawning adults. FAL guidelines (CCME 2007) for pH suggest that a pH of 6.5 units is the minimum level observed before stress is induced on fish and eggs. Both streams fell below this threshold value. Within Nova Scotia, pH levels below 6.5 are common and fish recruitment and development are continuing in streams supporting these low pH levels. Acidification can be caused by a variety of factors including influences from wetlands, naturally occurring organic acids and geological sources (CCME 2007), as well as anthropogenic effects. Natural soil composition conditions such as higher sulfur content affect pH because, once oxidized and in contact with water, sulfuric acid is created which leaches into the ground and surface water, lowering pH.

The atmosphere and photosynthesis of aquatic plants are the major sources of dissolved oxygen in water and the balance between the input of oxygen and consumptive metabolism of organisms and oxidizable matter received controls the dissolved oxygen content in the water (CCME 1999). The concentration of dissolved oxygen in a watercourse also depends on a number of independent variables that include surface and interstitial water velocity/discharge, hydraulic gradient, sediment texture and porosity, bottom morphology, daily water temperature fluctuation, and the consumptive oxygen demand of the substrate (CCME 1999). CCME and FAL guidelines for dissolved oxygen look at the effects on warm water fish and cold water fish species respectively. Due to equipment malfunction on site, in-situ levels for dissolved oxygen

were unobtainable for Heath Brook and Black Pond Brook, both of which are not considered to be fish habitat.

Guidelines for conductivity and temperature are not available from the CCME. Specific conductivity in the two freshwater streams surveyed within the Project Study Area ranged from 76 - 95 µS/cm. Both are well within the range observed in Nova Scotia waters known to support aquatic life. Temperatures within the streams were representative of spring conditions in wetland streams, falling between 7.60 and 8.42°C at the time of the survey.

5.3.3 Navigable Waters

The Navigable Waters Protection Program (NWPP) ensures the public's right to navigate Canada's waters without obstruction. This is accomplished through the administration of the *NWPA*. The *NWPA* is a federal law designed to protect the public right of navigation. In order to minimize the impact to navigation, the NWPP ensures that works constructed in navigable waterways are reviewed and regulated.

Black Pond Brook, the only confirmed watercourse within the Project Study Area, fails to meet the minimum depth requirements to be defined as a navigable watercourse (Transport Canada 2010). Therefore, no Authorization is required under the *NWPA*.

5.3.4 Species of Conservation Interest

5.3.4.1 Species at Risk

There is only one freshwater fish species in the vicinity of the Project Study Area with special conservation status as designated by *SARA*. The Atlantic whitefish (*Coregonus huntsmani*) has been historically found within the Tusket watershed therefore potential Atlantic Whitefish presence has been evaluated. Historically Atlantic whitefish have been captured within the Tusket River upstream of the Hebbville Dam as well as in saltwater off the coast of Wedgeport (COSEWIC 2010); this pair of observations indicates it's an anadromous species. Surveys in the Tusket watershed were made between 2001 and 2004 in twelve lakes using gillnets and no Atlantic whitefish were observed (COSEWIC 2010). Based on the gillnet surveys and lack of recorded observations since 1982 the Tusket River population is now considered extirpated (COSEWIC 2010). As Atlantic whitefish are considered extirpated from the Tusket watershed it is unlikely to be found within the Project Study Area.

5.3.4.2 COSEWIC Fish Species of Conservation Concern

The Nova Scotia Southern Upland population of Atlantic Salmon (*Salmo salar*) is designated as Endangered by the Committee of the Status of Endangered Wildlife in Canada (COSEWIC). This population is not currently designated under *SARA* but could potentially be listed by the Act in the future. The Southern Upland population of Atlantic Salmon breeds in rivers from northeastern mainland Nova Scotia, along the Atlantic coast and into the Bay of Fundy as far as Cape Split. In 2010, a net decline of 61% of mature individuals in the population was measured

to have occurred over the previous three generations (COSEWIC 2010). Acidification of freshwater habitats caused by acidic precipitation is a major, ongoing threat for the population (COSEWIC 2010). While the Project Study Area is located within their breeding range, the soft, organic bottom of the one confirmed watercourse within the Study Area does not present ideal spawning conditions for the species although they could potentially be present downstream.

American eel (*Anguilla rostrata*) was recently assessed as Threatened by COSEWIC. While similar to the Southern Upland population of Atlantic salmon, this species is not currently afforded the additional protection of a *SARA* designation, there is potential in the future for the species to be listed by the Act. American eel are widespread within Nova Scotia waters and inhabit a range of habitat types and have the potential to inhabit watercourses within the Project Study Area.

5.3.4.3 Provincial Fish Species of Conservation Concern

There is one species of freshwater fish listed under the Nova Scotia *Endangered Species Act*. That species is the Atlantic whitefish, which is also listed under *SARA*. As discussed above, Atlantic whitefish are unlikely to be found within or downstream of the Project Study Area.

There are 10 species of freshwater fish listed by NSDNR as either “red”, indicating that it is known to be or thought to be at risk, or “yellow”, indicating that it is sensitive to human activities or natural events. Of these, two species could potentially be found downstream of the Project Study Area: Atlantic salmon (*Salmo salar*) listed as “red” and brook trout (*Salvelinus fontinalis*) listed as “yellow”. The Atlantic Canada Conservation Data Centre (ACCDC) considers Atlantic salmon to be globally widespread and abundant but locally rare with the potential to be vulnerable to extirpation due to rarity or other factors. Salmonids are generally considered a sensitive family of fish, indicative of good water quality in relation to pH, dissolved oxygen, and metals (or other contaminant) levels. Brook trout are also salmonids and as such are similarly sensitive to several environmental conditions. Brook trout is not listed on federal or provincial lists of conservation concern. ACCDC considers brook trout it to be globally widespread and abundant and locally widespread, fairly common, and apparently secure with many occurrences, but of long term concern (ACCDC 2011a).

5.4 VEGETATION

The terrestrial environment section details the flora and fauna, including any species of special conservation concern, which may be present within the Project Study Area.

5.4.1 Vegetation Types

The Project Study Area is located within the Southwest Shore Ecodistrict, as identified by NSDNR’s Ecological Land Classification (Neily *et al.* 2003). This ecodistrict is characterized by mild winters and cool summers. This ecodistrict has the mildest winters in the province due to the moderating effect of the Gulf of Maine. The frost free period lasts for over half of the year. However, summers are cool and fog is very common.

The Southwest Shore Ecodistrict is underlain mainly by shale and quartzite; however, in the Wedgeport area there are intrusions of granite. Soils are derived largely from glacial drift and have a moderately course texture. The ecoregion has a submerged coastline with tidal rivers and extensive salt marshes.

Forests in the Southwest Shore Ecodistrict have been heavily altered by human activity. Dominant tree species include black spruce (Picea mariana), white spruce (Picea glauca) and balsam fir (Abies balsamea). In sheltered areas red spruce (*Picea rubens*), white pine (*Pinus strobus*) and red oak (*Quercus borealis*) as well as tolerant hardwoods can occur. Well drained sites with moderately course soils support forests dominated by red spruce and white pine. The climax forest on hills and drumlins with well drained course textured soils is red oak and white pine.

Table 5.5 lists the areas of each of the vegetation types present in the general region (Regional Assessment Area, 53,614 ha), and the Project Study Area where field surveys were conducted (1012 ha). Figures 5.4 and 5.5 present the distribution of vegetation types and interior forest habitat in the Project Study Area and the Regional Assessment Area.

The Regional Assessment Area is composed mainly of mature softwood forest, coastal mud flats (listed as coastal habitat areas in Table 5.5), wetlands, immature forest, and mature mixedwood in descending order of abundance. Together these habitat types account for 66.3% of the Regional Assessment Area.

The Project Study Area consists largely of a mosaic of forest, woodland and barrens. The most abundant vegetation types in descending order of abundance include immature forest, barrens, mature softwood, shrub thicket (woodland), wetland, and mature mixedwood forest. Together these vegetation types account for 96.8% of the Project Study Area. The Project Study Area differs from the Regional Assessment Area in several ways. Most notably, there is no mud flat (coastal habitat area) in the Project Study Area since its boundaries do not extend into the intertidal zone. In addition, the barrens and woodland (shrub thicket) vegetation types are more abundant in the Project Study Area than in the Regional Assessment Area. This is probably attributable to several factors including the presence of poor, extremely stony soils, exposure to high winds and salt spray due to close proximity to the ocean and a history of frequent fires in the Project Study Area. The proportion of wetland habitat in the Project Study Area is lower than in the Regional Assessment Area largely due to the presence of large areas of coastal salt marsh in the Regional Assessment Area which are largely avoided in the Project Study Area.

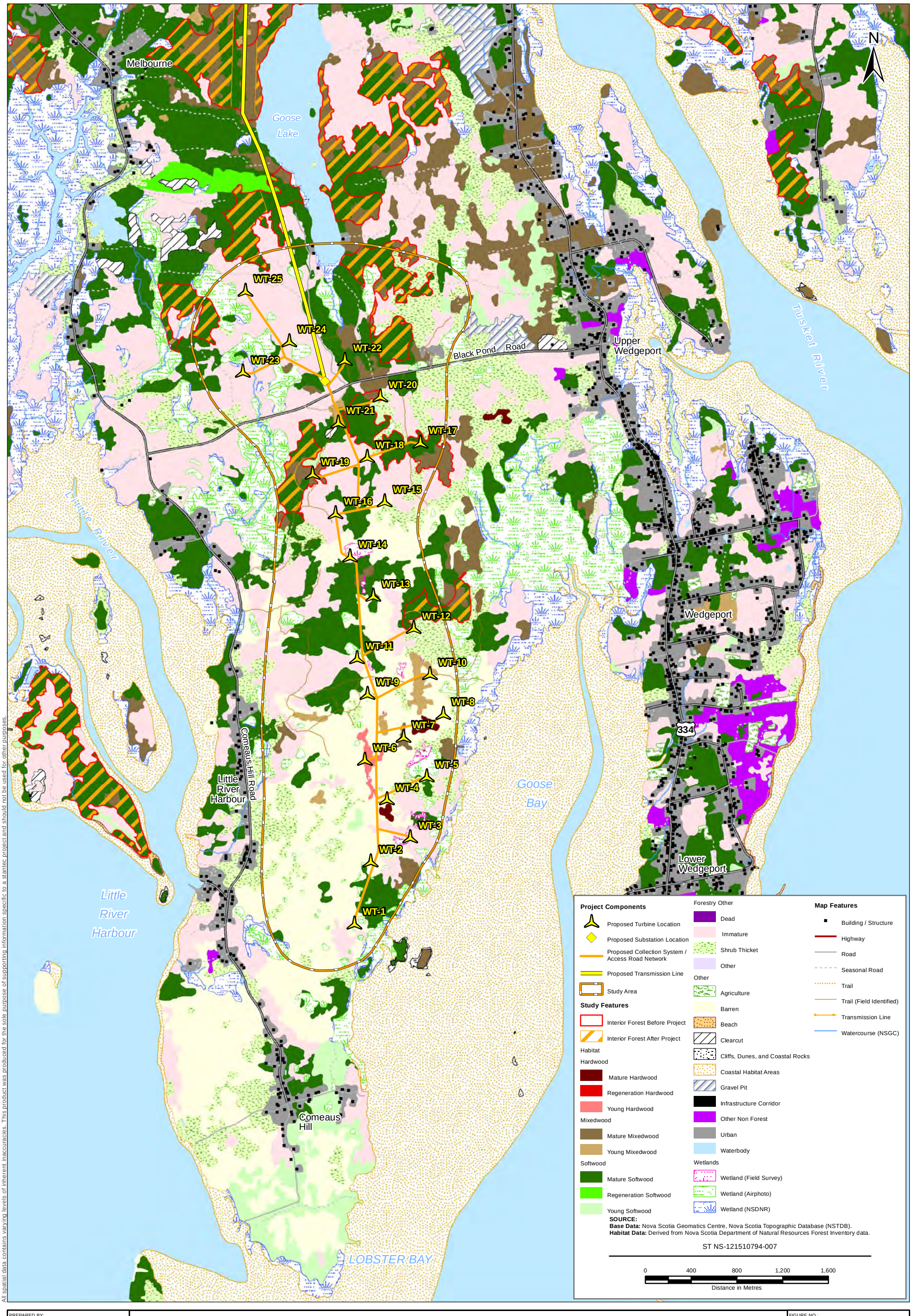
Table 5.5 Vegetation Types found in the Project Study Area and Surrounding Areas

Vegetation Type	Surrounding Regional Assessment Area (all habitats on Figure 5.2)		Study Area	
	Area (ha)	%	Area (ha)	%
Mature Hardwood Forest	964	1.80	2.97	0.29
Young Hardwood	116	0.22	3.96	0.39
Regeneration Hardwood	25.6	0.05	0	0
Mature Softwood Forest	8,255	15.4	221	22.0
Young Softwood	1,431	2.67	6.69	0.66

Table 5.5 Vegetation Types found in the Project Study Area and Surrounding Areas

Vegetation Type	Surrounding Regional Assessment Area (all habitats on Figure 5.2)		Study Area	
	Area (ha)	%	Area (ha)	%
Regeneration Softwood	887	1.65	0	0
Mature Mixedwood Forest	4,505	8.40	39.1	3.88
Young Mixedwood	228	0.42	11.8	1.17
Immature Forest Other	7,123	13.3	262	26.0
Forestry Other	60.3	0.11	0	0
Clear-cut	999	1.86	0.65	0.06
Wetlands	7,496	14.0	90.9	9.01
Agriculture	1,868	3.48	0	0
Other non-forested Areas	324	0.60	0	0
Shrub Thicket	3,755	7.00	111	11
Dead	31.0	0.06	0	0
Barrens	1,552	2.9	251	24.9
Cliff, Dunes and Coastal Rocks	74.6	0.14	0	0
Coastal Habitat Areas	8,157	15.2	0.02	0.01
Beach	137	0.25	0	0
Gravel Pits	231	0.43	0.27	0.03
Urban	4,110	7.67	2.65	0.26
Corridor	1,282	2.39	3.84	0.38
Total	53,614		1012	

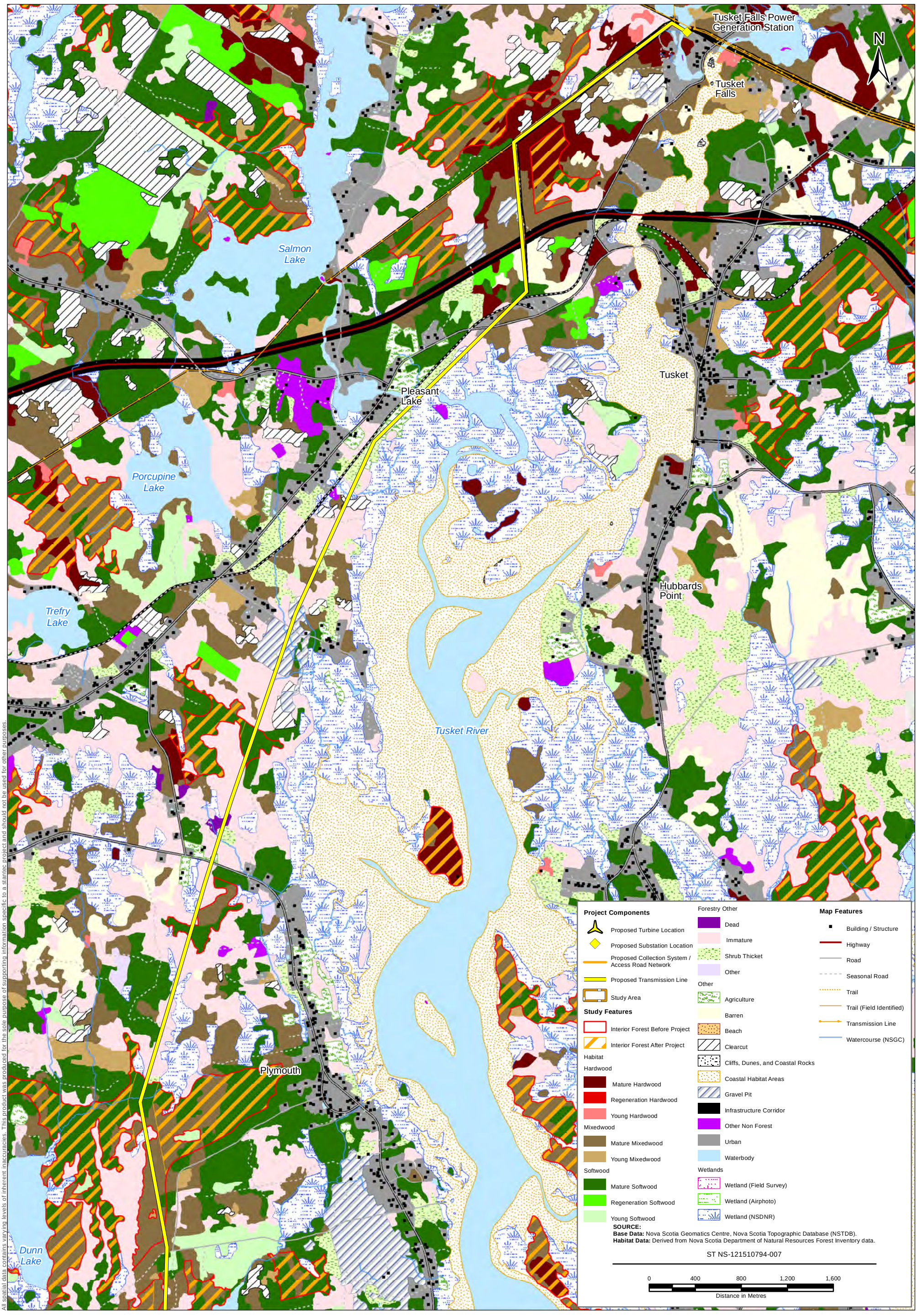
*Analysis based on NSDNR Forest Inventory Mapping.



All spatial data contains varying levels of inherent inaccuracies. This product was produced for the sole purpose of supporting information specific to a stantec project and should not be used for other purposes.

PREPARED BY: R Sutcliffe	WEDGEPORT WIND PROJECT	FIGURE NO.: 5.4
REVIEWED BY: C. Shupe	**Habitat and Interior Forest Mapping Wind Farm Site**	DATE: Jun 07, 2012
AnaiaGlobal RENEWABLE ENERGIES www.anaiaenergy.com		Stantec

Path: V:\1215\active\121510xxx\121510794_Wedgeport\geomatics\mapping\mxd\EA_final\ST_NS-121510794-007_Wedgeport_habitat_mapbook_aoi.mxd



All spatial data contains varying levels of inherent inaccuracies. This product was produced for the sole purpose of supporting information specific to a stantec project and should not be used for other purposes.

PREPARED BY: R Sutcliffe	WEDGEPORT WIND PROJECT	FIGURE NO.: 5.5
REVIEWED BY: C. Shupe	**Habitat and Interior Forest Mapping Transmission Route**	DATE: Jun 07, 2012
AnaiaGlobal RENEWABLE ENERGIES www.anaiaenergy.com		Stantec

Path: V:\1215\active\121510xxx\121510794_Wedgeport\geomatics\mapping\mxd\EA_final\ST_NS-121510794-007_Wedgeport_habitat_mapbook_aoi.mxd

Habitat descriptions were conducted in a variety of vegetation types in the Project Study Area. Forest cover in the Project Study Area is patchy and interspersed with large areas of woodland and barrens. Forest cover is most concentrated in the northern and central portions of the Project Study Area where the least stony soils are found (Figure 5.4). Mature softwood forest is the most abundant forest vegetation type in the Project Study Area occupying 221 ha (22.0 %) of the Project Study Area. These stands are characterized by a tree canopy dominated by black spruce, white spruce and balsam fir. Sheep laurel (*Kalmia angustifolia*) is the most abundant species of the shrub layer. Other common species of the shrub layer include mountain holly (*Nemopanthus mucronata*), highbush blueberry (*Vaccinium corymbosum*) and advanced regeneration of balsam fir and black spruce. The ground vegetation layer is dominated by a mixture of feathermoss (*Pleurozium schreberi*), bunchberry (*Cornus canadensis*) and bracken fern (*Pteridium aquilinum*). The mature softwood vegetation type found in the Project Study Area corresponds to the black spruce-balsam fir/foxberry/plume moss vegetation type described by (Neily *et al.* 2011).

Mature mixedwood forest is typically found in the same general areas where the mature softwood forest stands are found. These stands are characterized by the presence of a moderately dense tree canopy dominated by a mixture of red maple (*Acer rubrum*), black spruce and white spruce. Other tree species found in lesser abundance in these stands include paper birch (*Betula papyrifera*), balsam fir, red spruce and American larch (*Larix laricina*). The shrub layer is also moderately dense with sheep laurel the most abundant species. Other species that are common in the shrub layer of this vegetation type include highbush blueberry, black huckleberry (*Gaylussacia bacacta*), mountain holly as well as advanced regeneration of black spruce and balsam fir. The ground vegetation layer is dominated by bunchberry, feathermoss and bracken fern. The mature mixedwood forest vegetation type corresponds fairly well with the red maple-birch/bunchberry-sarsaparilla vegetation type (Neily *et al.* 2011). This vegetation type is typically found on relatively well drained upper and middle slopes of gentle terrain along the Atlantic coastline. The stands found in the Project Study Area differ from the vegetation type as described by Neily *et al.* (2011) in that the cover of conifers is higher in the stands in the Project Study Area than in the stands described by Neily *et al.* Mature mixedwood forest stands cover 39.1 ha (3.88%) of the Project Study Area.

Both mature and immature mixedwood forest stands are present in the Project Study Area. They are similar in species composition but differ in several respects. The tree layer of the immature stands typically contains more paper birch than the mature stands and the shrub layer of the immature stands supports a much higher abundance of black huckleberry. In addition, the ground vegetation layer of the immature stands contains less bunchberry and feathermoss and more bracken fern.

Mature hardwood forest typically occurs in association with barrens. The hardwood stands are typically found in sheltered depressions that contain more soil and available water than the adjacent barrens. Red maple is the dominant tree species along with lesser amounts of large-tooth aspen (*Populus grandidentata*) and white spruce. The shrub layer is dominated by sheep laurel as well as lesser amounts of mountain holly, northern wild raisin (*Viburnum nudum*) and

advanced regeneration of balsam fir. The ground vegetation layer is poorly developed and is composed largely of bracken fern, bunchberry, and wild sarsaparilla (*Aralia nudicaulis*). This vegetation type fits best into the red maple-birch/bunchberry-sarsaparilla vegetation type (Neily *et al.* 2011). A total of 2.97 ha of mature hardwood forest is present in the Project Study Area which accounts for 0.29% of the total area of the Project Study Area.

Immature hardwood stands are also present in the Project Study Area. The tree layer of these stands is also dominated by red maple; however, largetooth aspen is absent and is replaced by paper birch. In addition, white spruce is replaced by black spruce. The shrub layer is quite different in the immature hardwood stands. In these stands, black huckleberry is the dominant species of the shrub layer, followed by American mountain ash (*Sorbus americana*), northern wild raisin, highbush blueberry, and advanced regeneration of red maple. The species composition of the ground vegetation layer is similar to that of the mature hardwood stands except that wild sarsaparilla is absent and is replaced by northern starflower (*Trientalis borealis*).

Woodland habitat is distributed throughout the Project Study Area but is most widespread in the central and southern portions of the Project Study Area. On Figure 5.4, the distribution of woodland habitat corresponds fairly well to the shrub thicket category in the legend. Some stands identified as immature forest on the vegetation type mapping are actually woodland. Woodland is transitional between forest and barrens. It is typically found on extremely stony sites or on bedrock outcropping and are characterized by a sparse tree canopy and a dense shrub layer composed mainly of ericaceous shrubs. The tree layer is composed mainly of stunted black spruce although a variety of tree species occur sporadically in this vegetation type. The shrub layer is composed of a wide variety of low and tall shrub species, the most abundant of which are black huckleberry and sheep laurel. Other shrub species that are regularly encountered in this vegetation type include highbush blueberry and mountain holly. The ground vegetation layer is dominated by a mixture of bunchberry, bracken fern and wild sarsaparilla that is characteristic of most of the vegetation types in the Project Study Area. The woodland vegetation type in the Project Study Area does not correspond well to any of the woodland vegetation types described in Nova Scotia by Neily *et al.* (2011). The closest match is the black spruce/lambkill/reindeer lichen vegetation type (Neily *et al.* 2011). Woodlands in the Project Study Area differ from the black spruce/lambkill/reindeer lichen vegetation type in that they contain very little lichen and bryophyte cover. The presence of reindeer lichen and to a lesser extent feathermoss, is diagnostic for the black spruce/lambkill/reindeer lichen vegetation type. Woodlands (shrub thicket) cover 111 ha (11%) of the Project Study Area.

Barrens are present throughout the Project Study Area but are most prevalent in the southern half (Figure 5.4). Barrens in the Project Study Area are typically found in extremely stony areas with very little soil. Tree cover in these barrens consists of a few scattered black spruce. The shrub cover is very dense and composed mainly of black huckleberry, sheep laurel and inkberry (*Ilex glabra*). Other shrub species regularly encountered in this vegetation type include northern bayberry (*Morella pensylvanica*), mountain holly, and northern wild raisin. The ground vegetation layer is very sparse and consists largely of bracken fern, eastern teaberry

(*Gaultheria procumbens*) and cinnamon fern (*Osmunda cinnamomea*). Barrens cover 251 ha (24.9%) of the Project Study Area.

Heavily disturbed habitat is present at the northern end of the Project Study Area where an abandoned landfill site is present along the Black Pond Road. This area is now well vegetated with a dense cover of speckled alder (*Alnus incana*), downy alder (*Alnus viride*) and white meadowsweet (*Spiraea alba*). There are also some areas of the landfill that have revegetated with a cover of grasses and forbs including Kentucky bluegrass (*Poa pratense*), red fescue (*Festuca rubra*), Timothy (*Phleum pretense*), poverty grass (*Danthonia spicata*), rough goldenrod (*Solidago rugosa*), New Belgium American aster (*Aster novi-blegii*), and hawkweed (*Hieracium* spp.) These heavily disturbed areas are captured within the Urban category (Figure 5.4, Table 1) which occupies 2.65 ha (0.26%) of the Project Study Area. None of this vegetation type will be affected by wind energy development.

Wetlands are not particularly abundant in the overall Project Study Area owing to the rolling topography and course texture of the soils. A total of 90.9 ha of wetland are present in the Project Study Area and comprise 9.01% of the Project Study Area. Most wetlands located within the Project Study Area are small but a few larger wetlands are present in the northwestern tip of the Project Study Area where the topography is flatter. Most wetlands in the Project Study Area are tall shrub dominated swamps dominated by speckled alder (*Alnus incana*) or mixedwood treed swamps characterized by a cover of red maple, white ash (*Fraxinus americana*), balsam fir and black spruce (*Picea mariana*). Some bog habitat is present in the central and northwestern portions of the Study Area and small fresh marshes are scattered throughout the Project Study Area in heavily disturbed areas such as roadsides and clear-cuts. A small area of salt marsh is present near the southern tip of the Project Study Area. Fens and low shrub dominated swamps are present in a few locations along sluggish watercourses (refer to Section 5.5 for more information on wetlands).

5.4.2 Rare Plants and Species Richness

Rare plants and floral species richness in the Project Study Area was described using a combination of desktop and field surveys. Prior to conducting field surveys, aerial photography of the site was reviewed to determine the types and distribution of various habitats within the area. The air photo interpretation exercise was used to assist in a rare plant modeling exercise.

A rare plant modeling exercise was performed to determine the likelihood of presence of rare or sensitive plants within the Project Study Area. As part of the modeling exercise, all records of plant species listed by the NSDNR (2011) to be At Risk, May be at Risk, Sensitive to human activities or natural events, or ranked as S1, S2, or S3 by the Atlantic Canada Conservation Data Centre (ACCDC) (2011b) within a radius of 100 km from the center of the Project Study Area were compiled by means of an ACCDC data search. The habitat requirements of those species that had been recorded within 100 km from the center of the proposed development were then compared to the range of environmental conditions within the Project Study Area to determine if suitable habitat was present for these taxa. In instances where appropriate habitat

was present for a particular species, that taxon was considered to be potentially present in the Project Study Area, and the habitat was identified as a target for field surveys. The phenology and ease of identification of each of the species potentially present in the Project Study Area was also incorporated into the model in order to determine when the rare or sensitive taxa would be best identified.

A total of 176 rare or sensitive vascular plant species have been recorded within 100 km of the center of the Study Area. Based on the results of the habitat model, there is potential for 80 of these species to be found within the Project Study Area. Table 1 in **Appendix F** lists these species, their preferred habitats and their phenology.

The results of the habitat modeling exercise indicated that all of the habitat types present in the Project Study Area could potentially harbor rare species. Although many of the vascular plant species highlighted by the model have restricted flowering periods, most are readily identified by their seeds, fruit and/or general morphological characteristics, such as leaf shape, throughout the growing season. Field surveys were conducted during June and August 2011 and are considered sufficient for the identification of all of the species identified by the model with the exception of orchids of the genus *Spiranthes*. Flowers are required to identify these species and most of the Spiranthes species in Nova Scotia flower in September. Fortunately, identification of *Spiranthes* to genus is relatively easy. No unidentified *Spiranthes* were encountered during the field surveys and as such no rare *Spiranthes* species were present.

During the field surveys, a total of 17 proposed turbine sites were visited. Each of these sites consisted of a 100 m diameter circular plot representing the footprint of the turbine. Each plot was surveyed by an experienced botanist, once in June and once in August. During each survey, the botanist traveled through the plot visiting all vegetation types present in it. Each turbine site was approached along the proposed access road and/or collector system route leading to it. Vegetation information for the access roads and collector system was collected along these routes. A vascular plant inventory for the Project Study Area was compiled using a Trimble Nomad. These units were also loaded with Project site mapping and were used as the primary navigation aid during the field surveys. The location of the first occurrence of each species was recorded using the Nomad's onboard GPS. Species having ACCDC general status ranks of S3 or below were recorded each time a population was encountered to provide a map of the distribution of these species. Highbush blueberry was an exception to this procedure. This species was widespread and common in the Project Study Area. It was recorded the first time it was encountered at each turbine site but not all occurrences were documented.

Wherever possible, the abundance of these uncommon and rare species was recorded at each of the locations where they were found to provide an indication of their abundance. The way in which abundance was recorded varied with species. For most species, the number of shoots present at a particular location was counted. In instances where large numbers of shoots were present, the numbers of shoots were estimated. In instances where large, dense patches of a particular species were present, the size of the patch was estimated. Other information collected at each turbine site included descriptions of the vegetation types present.

A total of 186 vascular plant taxa were recorded within the Project Study Area during the surveys. These species are listed in Table 2 of **Appendix F** along with information regarding their population status in Nova Scotia. Figure 5.3 shows the locations of rare species identified during the vegetation surveys.

Species richness in the Project Study Area is relatively low. This is attributable mainly to the poor growing conditions in the Project Study Area (stony infertile soils and cool summers) as well as the small amount of heavily disturbed habitat in the Project Study Area which reduces the opportunity for weedy species characteristic of disturbed habitats to become established. Many of these weedy species are non-native plant species that have become established in Nova Scotia following European settlement of the area. Twelve percent of the species recorded in the Project Study Area are non-native species. This proportion of non-native species richness is lower than levels observed in other areas of Nova Scotia that have a history of European occupation.

The plant species composition of the Project Study Area suggests an infertile area with low productivity. Ericaceous shrubs such as sheep laurel, blueberries and black huckleberry which are indicators of infertile sites are abundant throughout the Project Study Area. The most productive area in the Project Study Area is situated near the northern end of the Study Area on either side of the Black Pond Road. This area is characterized by less stony soils and is located in a relatively sheltered area compared to the southern portion of the Project Study Area.

Five vascular plant species of conservation interest were encountered in the Project Study Area during the 2011 field surveys. Four of the species identified as potentially present in the Project Study Area by the rare plant modeling exercise were found in or near it. These included southern twayblade (*Listera australis*), Elliott's goldenrod (*Solidago latissimifolia*), highbush blueberry (*Vaccinium corymbosum*), and eastern skunk cabbage (*Symplocarpus foetidus*). One other species of conservation interest, Nova Scotia agalinus (*Agalinis neoscotica*) was recorded near the Project Study Area but was not predicted by the rare plant modeling exercise.

Southern twayblade is a small orchid that is typically associated with the shaded sphagnum moss of bogs or treed swamps (Zinck 1998). It is considered "May Be At Risk" by NSDNR and is given a ranking of "S2" by the ACCDC. This species is only visible above ground for several weeks during early summer (mostly in June) and then it senesces. According to ACCDC records, the nearest population of this species is approximately 50 km away from the center of the Project Study Area and at least four other populations are present within 100 km. Due to the short period within which it may be observed and its small stature, southern twayblade may occur more frequently than current sources indicate. Within the current Project Study Area, this species was encountered in a mixedwood treed swamp located near the southern end of the Study Area (Figure 5.3). This swamp was characterized by a tree canopy composed largely of a mixture of red maple and black spruce. The shrub layer was dominated by common winterberry (*Ilex verticillata*) and northern wild raisin (*Viburnum nudum*). The ground vegetation layer consisted of a carpet of sphagnum moss (*Sphagnum* spp.) punctuated by patches of three-leaved false Solomon's-seal (*Maianthemum trifolium*), three-seed sedge (*Carex trisperma*), and a hybrid white panicled American Aster (*Oclemena* X *blakei*). Twelve southern

twayblade shoots were observed at four locations within the wetland. This species is considered to be vulnerable to local changes in hydrology, nutrient status, and land use in other parts of its range (Hoy 2003) and it is expected that this would also be true of Nova Scotian populations.

The remaining species are listed as Secure in Nova Scotia by NSDNR. Elliott's goldenrod, highbush blueberry and Nova Scotia agalinus are all listed as uncommon (S3) by ACCDC. Eastern skunk cabbage is listed as S3S4 by ACCDC indicating that there is some uncertainty regarding the population status of this species which ranges from uncommon to fairly common. Highbush blueberry, Elliott's goldenrod and eastern skunk cabbage were widely distributed throughout the Project Study Area (Figure 5.3). Elliott's goldenrod was typically found in barrens and woodland habitats as well as in disturbed areas such as roadsides. Highbush blueberry was most frequently encountered in woodlands, mature coniferous, mature mixedwood and immature hardwood forests in upland areas. Eastern skunk cabbage was associated with poorly drained sites including mixedwood treed swamps, seepage tracks and along wet portions of woods roads and ATV trails. Nova Scotia agalinus was recorded at one location just outside of the Project Study Area along a little used road to the north of the old landfill site. Several hundred plants were recorded at this location.

5.4.3 Interior Forest

Forest interior birds are particularly sensitive to habitat loss since they are affected both by direct habitat loss and through the adverse effects of habitat edge. Forest interior habitat for the purpose of this report is defined as mature forest that is free of edge and is greater than 10 ha in size. The distribution of mature forest habitat in the forest interior assessment area was determined using NSDNR forest inventory mapping. The area used for the forest interior assessment included a rectangular area encompassing the Project Study Area and surrounding Regional Assessment Area, depicted as the map extents in Figures 5.4 and 5.5. The amount of forest interior habitat in the forest interior assessment area was determined by establishing 100 m buffers around edge producing features such as existing highways and streets, electrical transmission lines, railroads, heavily disturbed non-forested habitat, borrow pits, quarries, woods roads, and recent clear-cuts. Areas remaining after buffering these features were classed as forest interior habitat if they were mature forest 10 ha or greater in size. Seven patches of forest interior habitat are wholly or partially found within the Project Study Area. The total area of forest interior habitat within the Study Area is 100 ha or 9.89% of the Project Study Area. The average size of these patches is 14.3 ha.

5.5 WETLANDS

The distribution and abundance of wetlands in the Project Study Area was determined by a combination of desktop review and field surveys. Field identification and delineation of wetlands was conducted concurrently with late vegetation surveys, which occurred in August of 2011. During field surveys, 17 proposed turbine sites were visited, which were represented by a circular plot with a 100 m diameter representing the footprint of the turbine. Field staff searched for wetlands within each proposed turbine site as they existed at the time of survey. When

encountered, wetlands were delineated to the edge of the 100 m diameter plot. Wetlands were also delineated along proposed access roads connecting turbine sites. Because turbine locations were adjusted following the field surveys, not all wetlands within the most current proposed turbine sites were field delineated. The technical approach used for wetland identification and delineation during the surveys was based on principles prescribed in the US Army Corps of Engineers Wetlands Delineation Manual (1987) and the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (2009) using vegetation, soil, and hydrology as wetland indicators. Data were collected using Trimble Nomad and ProXT devices.

The extent of wetlands within the Project Study Area was determined with reference to the Nova Scotia provincial wetland inventory (NSDNR 2007) and additional air photo interpretation. Aerial photo interpretation was completed for wetlands within the Project Area using stereo pairs of 1:10,000 photos taken in 2000. Aerial photo interpretation was completed by an ecologist experienced in delineating wetlands. Wetlands were identified using topographic location and physiognomy of the plant communities. Wetland boundaries were interpreted conservatively in order to capture transitional wetland habitat such as treed swamps that are often present at the edges of more open wetlands. This approach increases the probability of misclassifying upland habitat as wetland, but reduces the likelihood of missing or underestimating the size of wetlands in the Project Study Area.

Wetlands were classified according to the Canadian Wetland Classification System (NWWG 1997) to class and type. The Canadian Wetland Classification System is a hierarchical system that incorporates the identities of three general levels of wetland features – class, form, and type. Wetland classes are based on the properties of the wetland that reflect their origin and the nature of the wetland environment. This level may be used to group wetlands at their most general scale, and include bog, fen, swamp, marsh, and shallow water designations. Wetland forms and subforms are subdivisions of each wetland class and are based on their morphology, surface pattern, water type, and the morphological characteristics of the underlying soil. Many wetland forms apply to more than one wetland class whereas others are more specific. Wetland types are based on the physiognomic characteristics of their vegetation communities, and include such designations as “graminoid”, “shrub”, and “treed” (NWWG 1997). Whenever possible, different class and type combinations within the same wetland (*i.e.,* in a wetland complex) were interpreted separately.

A general assessment of key wetland functions and values within the Project Study Area was performed following guidelines outlined in NovaWET (Tiner 2009; NSE 2011b). Functions and values considered in the assessment include surface water detention and water flow moderation, water flow maintenance, groundwater recharge, shoreline erosion protection, water quality treatment, carbon sequestration and storage, socioeconomic value, and habitat for fish, waterfowl/waterbirds, and species of conservation interest. Evaluations are based on wetland classification data and other information obtained during field and desktop surveys.

5.5.1 Distribution and Description of Wetlands within the Project Area

A total of 89 wetlands were identified within the Project Study Area through a combination of desktop and field surveys, accounting for an area of approximately 92 ha (Table 5.6), or nine percent of its area. This figure is somewhat increased from the 90.9 ha of wetland habitat reported in Section 5.4 as this area has been calculated in consideration of additional wetlands delineated in the field and/or through aerial photographs which would not have been captured in the NSDNR mapping (upon which the analysis presented in Table 5.6 is based). Four wetland classes have been recognized within the Project Study Area: swamp, bog, marsh and shallow water. Swamps and bogs are the most prominent wetland classes, accounting for approximately 44 and 41 ha within the Project Study Area, respectively. Salt marshes are a relatively minor component of the Project Study Area and confined to its southeast boundary, but are common in the surrounding landscape. Shallow water wetlands are uncommon, being found in association with Goose Lake and a large complex located along the western edge of the Project Study Area. **Appendix G** provides additional information on wetlands in the Project Study Area.

Table 5.6 Number of Occurrences and Area of Wetland Classes and Vegetation Types within the Project Study Area

Wetland Class	Vegetation Type	Number of occurrences (wetlands or portion of a wetland)	Area (ha)
Bog	Shrub	48	18.87
	Treed	12	21.70
Marsh	Graminoid (Salt Marsh)	1	4.98
Shallow Water	Non-vegetated	2	2.41
Swamp	Coniferous Treed	17	15.97
	Deciduous Treed	1	0.92
	Low Shrub	4	0.73
	Mixedwood Treed	10	23.36
	Tall Shrub	5	2.77
	Tall Shrub / Coniferous Treed	2	0.19
	Tall Shrub / Treed	1	0.03
All Wetlands		89	91.91

5.5.1.1 Swamps

Of the 89 wetlands identified within the Project Study Area, 40 (*i.e.*, ~45 percent) were found to contain swamp habitat, accounting for approximately 44 ha or almost 48 percent of the total wetland area. Swamps are wetlands dominated by woody plants, and can be either peatlands or mineral wetlands (NWWG 1997). The water table is generally at or near the surface of the wetland and is rich in dissolved nutrients. If peat is present, it can consist of well-decomposed wood, sphagnum, and/or sedges. Five vegetation types were recognized within swamps of the Project Study Area and include (in decreasing order of abundance): mixedwood treed, coniferous treed, tall shrub, deciduous treed, and low shrub physiognomic groups.

Treed swamps are dominated by woody vegetation that is more than 5 m in height and are the most abundant wetland vegetative community within the Project Study Area, with mixedwood and coniferous treed types being particularly abundant. Although the overstory cover of these swamp vegetation types is comprised of differing proportions of coniferous and deciduous trees, the identities of their constituents are rather consistent. Black spruce (*Picea mariana*) is the dominant conifer, with balsam fir (*Abies balsamea*) and American larch (*Larix laricina*) also being common. Red maple (*Acer rubrum*) provides the large majority of hardwood cover. Shrub cover is varied and primarily comprised of the aforementioned tree species in addition to common winterberry (*Ilex verticillata*), mountain holly (*Nemopanthus mucronatus*), highbush blueberry (*Vaccinium corymbosum*), speckled alder (*Alnus incana*), sheep-laurel (*Kalmia angustifolia*), and possum-haw viburnum (*Viburnum nudum*). Dominant herbaceous species are typically three-seed sedge (*Carex trisperma*), cinnamon fern (*Osmunda cinnamomea*), dwarf dogwood (*Cornus canadensis*), and northern starflower (*Trientalis borealis*) whereas peatmoss (*Sphagnum spp.*) typically forms a prominent ground layer.

Shrub swamps are much less common within the Project Study Area and include both tall shrub and low shrub designations. Tall shrub swamps are dominated by woody species that are greater than 1.5 m in height and often occurred within the Project Study Area as an early seral stage following fire disturbance. Dominant shrubs of these habitats included regenerating tree species as well as possum-haw viburnum, common winterberry, mountain holly, highbush blueberry, and speckled alder. Common herbaceous species include cinnamon fern and manna-grass (Glyceria sp.). Low shrub swamps are dominated by woody vegetation that is less than 0.5 m in height. They are typically dominated by a number of ericaceous shrubs, including leatherleaf (*Chamaedaphne calyculata*) and sheep laurel.

5.5.1.2 Bogs

Bogs were represented within 60 of the 89 wetlands identified within the Project Study Area (~67 percent) and accounting for over 40 ha, or approximately 44 percent of the wetland area. Bogs are peatlands (organic wetlands containing 40 cm or more of peat accumulation) which primarily receive their water from precipitation (NWWG 1997). Because the rooting zone of bogs typically does not receive nutrient rich groundwater they tend to be acidic and nutrient poor, which promotes the growth of peatmoss. Sphagnum further acidifies the wetland by efficiently taking up cation nutrients and replacing them with hydrogen ions. This acidity reduces decomposition rates within bogs, which increases the accumulation of peat. Although the largest occurrences of bog within the Project Study Area were found in its northern extent, a large number of small bogs were identified in its southern end.

Both shrub and tree-dominated bogs were identified within the Project Study Area. Treed bogs are typically characterized by an open tree canopy composed of stunted black spruce and tamarack (*Larix laricina*) with occasional red maple. Common shrubs include ericaceous species such as sheep laurel, leatherleaf, common Labrador tea (*Ledum groenlandicum*) and rhodora (*Rhododendrum canadense*), as well as common winterberry and northern wild raison (*Viburnum nudum*). The understory is typically composed of sphagnum mosses, three-leaf

Solomon's-plume (*Maianthemum trifolium*) and scattered sedges (*Carex* spp.). Shrub bogs are typically similar in species composition but contain a more diffuse tree layer and a greater relative prominence of shrubs.

5.5.1.3 Shallow Water Wetlands

Shallow water wetlands are mineral wetlands characterized by the near year-round presence of standing water less than 2 m deep (NWWG 1997). Only two occurrences of shallow water wetland types were identified within the extent of the Project Study Area: one in association with the southern end of Goose Lake (identified by NSDNR as a "water wetland type") and another in association with a relatively large complex at the western end of the Project Study Area that was primarily formed of bog. Cumulatively, shallow water wetlands account for approximately 2.4 ha within the Project Study Area.

Shallow water wetlands are often dominated by submerged or floating aquatic plants, with lesser amounts of woody or standing emergent plants present. However, those within the Project Study Area would be best classified as being "non-vegetated" because plant cover typically covers less than five percent of their area (NWWG 1997). Characteristic species of these wetlands would include variegated pond-lily (*Nuphar lutea*) and fragrant water-lily (*Nymphaea odorata*).

5.5.1.4 Salt Marshes

Marshes are mineral wetlands that are periodically or persistently inundated by standing or slow flowing water (NWWG 1997). A large salt marsh occurs along the southeastern periphery of the Project Study Area, accounting for approximately five hectares. Although salt marsh comprises a small portion of the wetland area within the Project Study Area they are they are common within the greater landscape and occur on both sides of the peninsula on which the Project is located. Water levels within salt marshes fluctuate daily due to tides and they experience water level drawdowns which will result in portions drying up and exposing the sediments.

Salt marshes may be differentiated into two prominent zones: the low and mid-high marsh. The low marsh is subject to frequent tidal flooding and is relatively exposed which results in substantial amounts of vegetation being removed throughout the year. The low marsh is also subject to scouring from ice during the winter. Vegetation within this zone is dominated almost exclusively by smooth cord grass (*Spartina alterniflora*). Inundation of the mid-high marsh is much less frequent, occurring in response to tidal cycles and surges as the result of storms. Vegetation within this zone is dominated by saltmeadow cord grass (*Spartina patens*), but a number of other halophytic plants are also prevalent, including seaside goldenrod (*Solidago sempervirens*), sea lavender (*Limonium carolinianum*), black-grass rush (*Juncus gerardii*), seaside arrowgrass (*Triglochin maritima*), and prairie cord grass (*Spartina pectinata*).

5.5.2 Distribution of Wetlands along the Transmission Line

The Nova Scotia Wetland Inventory Database (NSDNR 2007) indicates that there are at least 12 wetlands that occur within 100 m of the transmission line, accounting for an area of approximately 22 ha (Table 5.7). Swamps are represented within eleven of these wetlands and comprise approximately half of the wetland area identified by NSDNR (11.5 ha). A large salt marsh is present and comprises approximately 10.1 ha of the area within 100 m of the transmission line. A single occurrence of bog/fen and freshwater marsh are present in close proximity to the transmission line, having areas of <0.1 and approximately 0.2 ha, respectively.

Table 5.7 Number of Occurrences and Area of Wetland Classes within 100 M of the Transmission Line

Wetland Class	Number of occurrences (wetlands or portion of a wetland)	Area (ha)
Bog / Fen	1	<0.01
Freshwater Marsh	1	0.17
Salt Marsh	2	10.13
Swamp	11	11.50
All wetlands	12	21.81

5.5.3 Wetland Functions

Wetlands are important environmental features that provide a number of ecological functions and valued services, including: surface water detention and water flow moderation, water flow maintenance, groundwater recharge, shoreline erosion protection, water quality treatment, carbon sequestration and storage, habitat for fish, waterfowl/waterbirds, and species of conservation interest, and socioeconomic benefits. These functions/values are discussed below with respect to wetlands within the Project Study Area.

5.5.3.1 Surface Water Detention and Water Flow Moderation

Wetlands in the Project Study Area have potential to regulate stream and overland flow by slowing and temporarily detaining surface water. Many of the wetlands in the Project Study Area are located in depressions or basins and would intercept runoff from their surrounding slopes. Others, particularly those in the northwestern end of the Project Study Area, are located along watercourses and would moderate stream flow by reducing the potential for flooding in areas downstream of the Project Study Area. Residential properties located along Comeaus Hill Road are downstream of the Project Study Area and would benefit from this function.

5.5.3.2 Water Flow Maintenance

Wetlands have potential to moderate stream flow by slowing the flow of water and by temporarily storing surface water. Headwater wetlands (those along first and second order streams) that are not ditched are generally considered to have high potential for providing streamflow maintenance (Tiner 2009; NSE 2011b). Wetlands within the northern and western portions of the Project Study Area are in headwater positions and may therefore be considered

to have relatively high importance for maintaining streamflow. However, the value of wetlands within the Project Study Area for providing this function is lessened by their close proximity to the coastline because the watercourses along which they are located quickly empty into the Atlantic Ocean, thereby limiting their potential to provide this function. Other wetlands that function to moderate water flow (discussed above) contribute to maintaining base flow by temporarily storing surface water and slowly releasing it.

5.5.3.3 Groundwater Recharge

Depending on landscape position, substrate distribution, and morphology, wetlands may have the potential to capture surface flow and precipitation and discharge all or a portion to the groundwater table. Wetlands that provide this function are considered recharge sites, whereas those that primarily receive their hydrology from groundwater inputs are considered discharge sites (Tiner 2009; NSE 2011b). Due to implications relating to water quality and quantity, wetlands which act as groundwater recharge are generally regarded as proving important ecological functions. Although this function cannot be determined directly without long-term monitoring, it is possible that small basin wetlands found at higher elevations towards the center of the Project Study Area could contribute to groundwater recharge.

5.5.3.4 Shoreline Erosion Protection

Wetlands bordering large watercourses or bodies of water can provide protection from shoreline erosion by absorbing energy from waves, tides and flowing water without experiencing extensive damage to vegetation or wetland substrates. The salt marshes that are located along the southeastern boundary of the Project Study Area would be valuable for performing this function by absorbing erosive forces from the Atlantic Ocean, including waves, daily tide fluctuations, and storm surges. Additionally, the wetland complex found at the southern end of Goose Lake would also contribute to this function.

5.5.3.5 Water Quality Treatment

Many wetlands improve water quality of associated surface water through a variety of processes. These processes can include degradation of organic chemicals, decreasing water energy (by way of vegetation density) to allow suspended materials to settle, uptake of nutrients by plants and microbes, and conversion of soluble metals to insoluble forms. When contaminant degradation is mediated by microbes, highly productive wetlands such as marshes and swamps often perform better than bogs and other unproductive wetlands. Various factors influence the ability of a wetland to improve water quality, including the degree of water flow through substrate, the degree of channelization of flow through the wetland, the amount of oxygen in the water, and water temperature. Wetlands within the Project Study Area have qualities that would allow them to improve water quality (*e.g.,* many wetlands have dense vegetation); however, the location of the Project Study Area is such that it is unlikely to receive water of poor quality, as it is located in a relatively uncontaminated area. Activities associated with ATV usage or forest management initiatives within or adjacent to the Project Study Area

have potential to cause erosion and sedimentation, and wetlands downstream of these activities would have the greatest potential to improve water quality.

5.5.3.6 Carbon Sequestration and Storage

Wetlands can be important sinks for greenhouse gases. Peatlands, such as the bogs, have slow rates of decomposition and are therefore typically important carbon sinks by storing large volumes of organic material in the form of peat. Marshes and swamps that remain saturated throughout most of the year also tend to accumulate peat and act as carbon sinks. In addition, swamps sequester carbon in wood produced by trees and shrubs, which is typically slow to decompose after the vegetation has died. Bogs and treed swamps were the most common types of wetlands within the Project Study Area and are expected to function highly in terms of carbon sequestration both through peat accumulation and storage in dead and live woody matter. Salt marshes are also known to be relatively important for sequestration carbon.

5.5.3.7 Fish Habitat

The value of wetlands for providing fish habitat is generally related to their connectivity with deepwater habitats. As such, wetlands are generally considered to have high value for fish if they provide spawning/nursery habitat or refuge for native fish species in adjacent estuaries, lakes, rivers or streams (Tiner 2009; NSE 2011b). Additionally, wetlands may intermittently support populations of certain fish species as a result of colonization during flood events and some isolated, but permanently flooded, wetlands can support native populations of species such as minnows. Additionally, those that do not directly support fish may still be important for maintaining their habitat by improving the quality of downstream water - for example, by providing shade to maintain water temperature in adjacent water bodies or watercourses. Wetlands that are isolated and are not permanently flooded do not generally support fish populations. The majority of wetlands within the Project Study Area are isolated from waterbodies or watercourses and would therefore have low value with regards to fish habitat. However, salt marshes and those wetlands located along permanent watercourses and waterbodies may be expected to support fish populations by providing potential spawning/nursery habitat by directly helping to maintain water quality.

5.5.3.8 Habitat for Waterfowl and Waterbirds

The ability of wetlands to provide habitat for waterfowl and other waterbirds varies according to their position relative to waterbodies and watercourses, the presence and character of open water, and the availability of appropriate vegetation for foraging and nesting opportunities. Because of relationships to certain habitat features, certain wetland types (*e.g.*, salt marshes and freshwater marshes located along lakes and rivers) are generally considered important for waterfowl and other waterbird habitat whereas others have little or no capacity to provide this function (Tiner 2009; NSE 2011b). Many of smaller wetlands of the Project Study Area have minimal potential to provide habitat for waterfowl and other waterbird habitat but others are expected to be important contributors to this function. In particular, salt marshes located along the southeastern boundary of the Project Study Area would be important, as would those which

contain or are located adjacent to open waters, such as associated with Goose Lake and the open water habitats of the large complex in the northeastern portion of the Project Study Area.

5.5.3.9 Other Wildlife Habitat

In addition to those wildlife functions previously discussed (*i.e.*, fish, waterfowl, and waterbird habitat), wetlands provide important habitat for a variety of species; including those whose populations are considered either at risk or of conservation concern. A number of uncommon and/or sensitive species of plants and birds were found within wetlands of the Project Study Area during field surveys. A mixedwood treed swamp northeast of turbine 3 (WT-3) was found to support a population of southern twayblade (*Listera australis*), a species which is considered to “May be at Risk” within the province by NSDNR (2011) and which has been ranked as “S2” by the ACCDC (2011b) indicating that current records indicate that it is rare. Furthermore, although they were generally more frequent and abundant in upland habitats, both Elliott's goldenrod (*Solidago latissimifolia*) and highbush blueberry (*Vaccinium corymbosum*) were encountered within wetlands of the Project Study Area and are considered uncommon (*i.e.*, S3) within the province as a result of being confined to its southwestern portion. Birds which are regarded as “Sensitive” within the province by NSDNR and were encountered within wetlands of the Project Study Area include Yellow-bellied Flycatcher (*Empidonax flaviventris*), Wilson's Snipe (*Gallinago delicata*), Gray Jay (*Perisoreus canadensis*), and others. Olive-sided Flycatcher (Contopus cooperi), a species which is listed as “Threatened” at the federal level was also heard in the northern portion of the Project Study Area and is suspected of being associated with wetland habitats associated with Goose Lake. More information on plant and wildlife species of conservation concern which are known or suspected of utilizing wetlands of the Project Area is available in Section 5.4 (Vegetation) and Section 5.6 (Birds and Other Wildlife).

5.5.3.10 Socioeconomic Value

Wetlands can provide a variety of social benefits, including those relating to educational, scientific, recreational, and economic opportunities. Evidence of human use of wetlands within the Project Study Area does not suggest that they are regularly used for socioeconomic purposes, with the exception of ATV travel and recreational hunting. None of the wetlands are part of any protected area such as a national or provincial park, national wildlife area, federal migratory bird sanctuary, ecological reserve, provincial wildlife management area, wildlife refuge, or game sanctuary.

5.6 BIRDS AND OTHER WILDLIFE

5.6.1 Birds

Information on the distribution and abundance of birds in the Project Study Area was derived from field surveys, publicly available data and documents and other sources. The results of desktop and field studies conducted in support of the Project are summarized in the following sections. Details on the field program can be found in the Bird Report in Appendix H. Table 5.8 summarizes the results of all referenced data and fieldwork.

Table 5.8 Summary of Bird Species Recorded in or Near the Project Study Area

					Maritimes Breeding Bird Atlas (2006-2010)		Breeding Season (2011)	Fall Migration (2011)			Winter Surveys (2011-2012)		Owl Surveys (2012)	Spring Migration (2012)	
Bird Group	**Common name**	**Latin Name**	**General Status Rank**	**AC CDC S-Rank**	**Breeding evidence**	**Point Count**	**Point Counts**	**Transect Count**	**Watch Count**	**Raptor Watch**	**Transect Count**	**Watch Count**	**Stations**	**Transect Count**	**Watch Count**
Gamebird	Northern Bobwhite	*Colinus virginianus*	-	-	POSS										
	Ring-necked Pheasant	*Phasianus colchicus*	Exotic	SNA	CONF		X								
	Ruffed Grouse	*Bonasa umbellus*	Secure	S4S5	CONF		X	X			X			X	
Landbird	Mourning Dove	*Zenaida macroura*	Secure	S5	PROB	X	X	X						X	
	Whip-poor-will	*Caprimulgus vociferus*	At Risk	S1?B	PROB		X								
	Ruby-throated Hummingbird	*Archilochus colubris*	Secure	S5B	PROB		X		X						
	Downy Woodpecker	*Picoides pubescens*	Secure	S5	PROB		X	X						X	
	Hairy Woodpecker	*Picoides villosus*	Secure	S5	PROB		X	X			X			X	X
	Northern Flicker	*Colaptes auratus*	Secure	S5B	PROB		X	X	X					X	
	Pileated Woodpecker	*Dryocopus pileatus*	Secure	S5										X	
	Olive-sided Flycatcher	*Contopus cooperi*	At Risk	S3B			X	X							
	Eastern Wood-Pewee	*Contopus virens*	Sensitive	S3S4B			X	X							
	Yellow-bellied Flycatcher	*Empidonax flaviventris*	Sensitive	S3S4B			X	X						X	
	Alder Flycatcher	*Empidonax alnorum*	Secure	S5B	PROB	X	X	X						X	
	Eastern Phoebe	*Sayornis phoebe*	Sensitive	S3S4B										X	
	Eastern Kingbird	*Tyrannus tyrannus*	Sensitive	S3S4B	PROB										
	Blue-headed Vireo	*Vireo solitarius*	Secure	S5B	PROB	X	X	X						X	
	Red-eyed Vireo	*Vireo olivaceus*	Secure	S5B	PROB	X	X	X						X	
	Gray Jay	*Perisoreus canadensis*	Sensitive	S3S4	CONF		X	X						X	
	Blue Jay	*Cyanocitta cristata*	Secure	S5	CONF		X	X	X	X				X	
	American Crow	*Corvus brachyrhynchos*	Secure	S5	CONF	X	X	X	X	X	X	X		X	X
	Common Raven	*Corvus corax*	Secure	S5	PROB		X	X	X		X	X		X	X
	Tree Swallow	*Tachycineta bicolor*	Sensitive	S4B	CONF										
	Barn Swallow	*Hirundo rustica*	Sensitive	S3B	POSS										
	Black-capped Chickadee	*Poecile atricapillus*	Secure	S5	CONF	X	X	X			X			X	
	Boreal Chickadee	*Poecile hudsonica*	Sensitive	S3	CONF		X	X			X			X	
	Red-breasted Nuthatch	*Sitta canadensis*	Secure	S4S5	PROB		X	X			X			X	
	White-breasted Nuthatch	*Sitta carolinensis*	Secure	S4				X							
	Brown Creeper	*Certhia americana*	Secure	S5	PROB		X	X						X	
	Winter Wren	*Troglodytes troglodytes*	Secure	S5B	POSS		X	X						X	
	Golden-crowned Kinglet	*Regulus satrapa*	Sensitive	S4	PROB		X	X			X			X	
	Ruby-crowned Kinglet	*Regulus calendula*	Sensitive	S4B			X	X							
	Veery	*Catharus fuscescens*	Secure	S4B				X							
	Swainson's Thrush	*Catharus ustulatus*	Secure	S4S5B	PROB		X	X						X	
	Hermit Thrush	*Catharus guttatus*	Secure	S5B	CONF	X	X	X						X	
	American Robin	*Turdus migratorius*	Secure	S5B	CONF	X	X	X	X		X			X	X
	Gray Catbird	*Dumetella carolinensis*	May Be At Risk	S3B	CONF	X								X	
	European Starling	*Sturnus vulgaris*	Exotic	SNA	CONF	X									
	Cedar Waxwing	*Bombycilla cedrorum*	Secure	S5B	CONF	X	X	X	X		X			X	X
	Tennessee Warbler	*Vermivora peregrina*	Sensitive	S3S4B				X							
	Nashville Warbler	*Vermivora ruficapilla*	Secure	S5B			X	X							
	Northern Parula	*Parula americana*	Secure	S5B	PROB		X	X						X	

Table 5.8 Summary of Bird Species Recorded in or Near the Project Study Area

					Maritimes Breeding Bird Atlas (2006-2010)		Breeding Season (2011)	Fall Migration (2011)			Winter Surveys (2011-2012)		Owl Surveys (2012)	Spring Migration (2012)	
Bird Group	**Common name**	**Latin Name**	**General Status Rank**	**AC CDC S-Rank**	**Breeding evidence**	**Point Count**	**Point Counts**	**Transect Count**	**Watch Count**	**Raptor Watch**	**Transect Count**	**Watch Count**	**Stations**	**Transect Count**	**Watch Count**
Landbird	Yellow Warbler	*Dendroica petechia*	Secure	S5B	CONF	X	X	X						X	
	Chestnut-sided Warbler	*Dendroica pensylvanica*	Secure	S5B	CONF		X							X	
	Magnolia Warbler	*Dendroica magnolia*	Secure	S5B	CONF		X	X						X	
	Black-throated Blue Warbler	*Dendroica caerulescens*	Secure	S5B				X							
	Yellow-rumped Warbler	*Dendroica coronata*	Secure	S5B	CONF		X	X	X					X	
	Black-throated Green Warble	*Dendroica virens*	Secure	S4S5B	CONF	X	X	X						X	
	Blackburnian Warbler	*Dendroica fusca*	Secure	S4B			X	X							
	Palm Warbler	*Dendroica palmarum*	Secure	S5B	CONF		X	X						X	
	Bay-breasted Warbler	*Dendroica castanea*	Sensitive	S3S4B				X							
	Black-and-white Warbler	*Mniotilta varia*	Secure	S4S5B	PROB		X	X						X	
	American Redstart	*Setophaga ruticilla*	Secure	S5B	PROB		X	X						X	
	Ovenbird	*Seiurus aurocapilla*	Secure	S5B	CONF	X	X	X						X	
	Common Yellowthroat	*Geothlypis trichas*	Secure	S5B	CONF	X	X	X	X					X	
	Wilson's Warbler	*Wilsonia pusilla*	Sensitive	S3S4B				X							
	American Tree Sparrow	*Spizella arborea*	Secure	S5N										X	
	Chipping Sparrow	*Spizella passerina*	Secure	S4S5B	POSS										
	Savannah Sparrow	*Passerculus sandwichen*	Secure	S4B	PROB										
	Nelson's Sparrow	*Ammodramus nelsoni*	Secure	S4B	PROB										
	Song Sparrow	*Melospiza melodia*	Secure	S5B	CONF	X		X						X	
	Swamp Sparrow	*Melospiza georgiana*	Secure	S5B	PROB			X						X	
	White-throated Sparrow	*Zonotrichia albicollis*	Secure	S5B	CONF	X	X	X						X	
	Dark-eyed Junco	*Junco hyemalis*	Secure	S4S5	CONF		X	X						X	
	Northern Cardinal	*Cardinalis cardinalis*	Secure	S3S4	PROB									X	
	Indigo Bunting	*Passerina cyanea*	Undetermined	S1S2B	PROB										
	Red-winged Blackbird	*Agelaius phoeniceus*	Secure	S4S5B	PROB			X	X						
	Common Grackle	*Quiscalus quiscula*	Secure	S5B	CONF	X	X	X	X					X	X
	Brown-headed Cowbird	*Molothrus ater*	May Be At Risk	S2S3B	PROB										
	Baltimore Oriole	*Icterus galbula*	May Be At Risk	S2S3B										X	
	Pine Grosbeak	*Pinicola enucleator*	May Be At Risk	S3?B,S5N				X							
	Purple Finch	*Carpodacus purpureus*	Secure	S4S5	CONF		X	X						X	
	House Finch	*Carpodacus mexicanus*	Exotic	SNA	PROB										
	American Goldfinch	*Carduelis tristis*	Secure	S5	CONF	X	X	X	X	X				X	
Owl	Great Horned Owl	*Bubo virginianus*	Secure	S5	CONF								X	X	
	Northern Saw-whet Owl	*Aegolius acadicus*	Secure	S4									X		
Raptor	Turkey Vulture	*Cathartes aura*	Sensitive	S2S3B			X	X	X	X	X	X		X	X
	Osprey	*Pandion haliaetus*	Secure	S5B	POSS										
	Bald Eagle	*Haliaeetus leucocephalu*	Secure	S4							X				
	Northern Harrier	*Circus cyaneus*	Secure	S5B	CONF				X	X	X				
	Sharp-shinned Hawk	*Accipiter striatus*	Secure	S4S5B				X	X	X					
	Broad-winged Hawk	*Buteo platypterus*	Secure	S4S5B				X	X						
	Red-tailed Hawk	*Buteo jamaicensis*	Secure	S5				X	X					X	X
	American Kestrel	*Falco sparverius*	Secure	S5B				X	X						

Table 5.8 Summary of Bird Species Recorded in or Near the Project Study Area

					Maritimes Breeding Bird Atlas (2006-2010)		Breeding Season (2011)	Fall Migration (2011)			Winter Surveys (2011-2012)		Owl Surveys (2012)	Spring Migration (2012)	
Bird Group	**Common name**	**Latin Name**	**General Status Rank**	**AC CDC S-Rank**	**Breeding evidence**	**Point Count**	**Point Counts**	**Transect Count**	**Watch Count**	**Raptor Watch**	**Transect Count**	**Watch Count**	**Stations**	**Transect Count**	**Watch Count**
Shorebird	Black-bellied Plover	*Pluvialis squatarola*	Secure	S4M				X							
	Killdeer	*Charadrius vociferus*	Sensitive	S3S4B	CONF										
	Willet	*Tringa semipalmata*	May Be At Risk	S2S3B	CONF	X	X							X	X
	Wilson's Snipe	*Gallinago delicata*	Sensitive	S3S4B	POSS		X								
	American Woodcock	*Scolopax minor*	Secure	S4S5B	POSS								X		
Waterbird	Common Loon	*Gavia immer*	May Be At Risk	S3B,S4N	CONF		X						X	X	X
	Double-crested Cormorant	*Phalacrocorax auritus*	Secure	S5B	CONF				X					X	X
	Great Blue Heron	*Ardea herodias*	Secure	S4B	CONF		X	X	X					X	X
	Herring Gull	*Larus argentatus*	Secure	S4S5	CONF		X	X	X	X	X	X		X	X
	Great Black-backed Gull	*Larus marinus*	Secure	S4	CONF		X	X	X	X		X		X	X
	Common Tern	*Sterna hirundo*	Sensitive	S3B	PROB										
	Razorbill	*Alca torda*	Sensitive	S1B,S4N	CONF										
	Atlantic Puffin	*Fratercula arctica*	Sensitive	S1B,S4S5N	POSS										
Waterfowl	Canada Goose	*Branta canadensis*	Secure	SNAB,S4N	CONF				X			X			
	American Black Duck	*Anas rubripes*	Secure	S5	CONF				X		X	X		X	
	Mallard	*Anas platyrhynchos*	Secure	S5	CONF										
	Blue-winged Teal	*Anas discors*	May Be At Risk	S3B	PROB										
	Common Eider	*Somateria mollissima*	Secure	S4	CONF										
				Count of Species	**77**	**20**	**54**	**62**	**24**	**8**	**15**	**7**	**4**	**57**	**14**

5.6.1.1 Managed Areas

There are two bird-related managed areas in the vicinity of the project. The Wedgeport Eastern Habitat Joint Ventures Lands are located immediately east of proposed turbines, and includes forested land and coastal salt marsh habitats. The site is managed by NSDNR in cooperation with Ducks Unlimited Canada.

The nearest Important Bird Area (IBA) in the vicinity of the Project is The Brothers IBA, located 1 km off the coast of Lower West Pubnico, approximately 16 km from the Project Study Area. The Brothers are two islets that have supported one of Canada's largest Roseate Tern populations, a Threatened species. Arctic and Common Terns also nest on the islets. The Brothers are located less than 3 km from the West Pubnico Point Wind Farm.

5.6.1.2 Desktop Studies

An important source of bird information is the Maritimes Breeding Bird Atlas (MBBA) database (Naturecounts 2012), which contains a summary of bird distribution and abundance across the Maritime Provinces of Canada. The MBBA data was used to provide a general inventory of breeding birds in the vicinity of the Project Study Area. The MBBA also provides a list of bird Species of Conservation Concern which may be present in the Project Study Area, and also the locations of recent (2006-2010) records of species. The Project Study Area includes parts of two MBBA map squares: 19GJ34 and 19GJ44. MBBA square 20KP54 is a partial square located just east of the Project Study Area, and was also included. In the most recent breeding bird atlas (2006-2010), there was good coverage/effort of atlassing in each of the squares, with 24.9 hrs, 18.3 hrs, and 51.5 hrs effort, respectively (Naturecounts 2012).

In the second atlas there were 77 bird species possibly, probably, or confirmed breeding in one or more of the three squares, with 8 possible breeders, 28 probable breeders, and 41 confirmed breeders.

Species observed or heard singing in suitable nesting habitat are classified as possible breeders. Species exhibiting the following behaviours are classed as probable breeders:

- courtship behaviour between a male and female;
- birds visiting a probable nest site;
- birds displaying agitated behaviour; and
- male and female observed together in suitable nesting habitat.

Species are confirmed as breeding if any of the following items or activities were observed:

- nest building or adults carrying nesting material;
- distraction display or injury feigning;
- recently fledged young;

- occupied nest located; and
- adult observed carrying food or fecal sac for young.

A review of the bird data collected during the second MBBA identifies 18 bird species (23%) listed as federally threatened, provincially rare or sensitive recorded within the three relevant atlas squares. Of those species with available location information from the MBBA rare and colonial species data, none are located within the Project Study Area. The nearest species of conservation concern (SOCC) with known locations are Indigo Bunting record from a backyard in Lower Wedgeport, and Common Tern records on Green Island in Lobster Bay. However, as the MBBA Square 19GJ44 is a partial square made up largely of the Project Study Area, the species listed in the square were likely noted close to the Study Area, including: Willet (*Tringa semipalmata*), Gray Catbird (*Dumetella carolinensis*), Gray Jay (*Perisoreus canadensis*), Tree Swallow (*Tachycineta bicolor*) and Boreal Chickadee (*Poecile hudsonica*).

Also included in the available MBBA data are 5 minute point count survey results for the squares including six in proximity to or within the Study Area. A total of 20 species and 70 individuals were recorded, including two species ranked May Be At RIsk. Gray Catbird was recorded near the tip of the peninsula in Comeau's Hill, and Willet was recorded in two point counts along Black Pond Road. Both species were recorded in all three MBBA squares. MBBA point count results are included in Table 5.8.

5.6.1.3 Field Surveys

A pre-construction bird monitoring program was conducted between June 2011 and May 2012. Bird surveys conducted included breeding bird point counts in June 2011, fall migration monitoring from August to November 2011, winter surveys December 2011 to February 2012, and spring migration surveys from April through May 2012. A separate report detailing the methodology and results of the pre-construction bird monitoring program is presented in Appendix H, and results are summarized below.

Breeding Birds

A total of 40 point counts (25 forested and 15 open habitat) were each surveyed twice for breeding birds, as 10-minute point counts (early and late June 2011). Early surveys were conducted between June 13 and 17, and late surveys were conducted June 22 to 24. A total of 54 bird species were recorded, including 48 with potential for breeding within the Study Area, however only 41 were recorded within 100 m of a point count. The most common and abundant species recorded during breeding bird surveys included White-throated Sparrow, Magnolia Warbler, Common Yellowthroat, and Black-and-white Warbler. The most abundant species observed overall was White-throated Sparrow, with an estimated 55.7 pairs per 100 Ha. The most abundant species in forested habitats was Magnolia Warbler, with an estimated 62.4 pairs per 100 Ha, and the most abundant species in open habitats was Common Yellowthroat, with an estimated 76.4 pairs per 100 ha.

Two At Risk species were recorded, though only incidentally and singly: Olive-sided Flycatcher and Whip-poor-will, both listed as Threatened under *SARA*. Species of Conservation Concern (SOCC) included Common Loon (May Be At Risk; single flyover), Willet (May Be at Risk; regularly at both forested and open habitats), Turkey Vulture (Sensitive; single incidental flyover), Wilson's Snipe (Sensitive; single flyover outside point circle), and six passerines considered Sensitive (Eastern Wood-Pewee, Yellow-bellied Flycatcher, Gray Jay, Boreal Chickadee, Golden-crowned Kinglet, and Ruby-crowned Kinglet).

One Whip-poor-will was recorded incidentally west of the southern end of the Study Area, off of Comeau's Hill Road. Follow-up evening surveys in this location yielded no further recorded instances of this species.

One Olive-sided flycatcher was recorded on June 22, 2011, during the second point count survey of point 11, located along Black Pond Road. The area in which it was expected to be singing is the wetland at the southern end of Goose Lake, north of Turbine 3 and point count 20. In an attempt to get further information on its activity in the area, Surveyors went to the southern end of Goose Lake and performed some play-backs, with no response. As Olive-sided Flycatchers will travel considerable distances to feed, it was not surprising that the bird was not re-encountered in the same area in which it had been heard. The bird was not heard during surveys of points 3, 4, or 20, which are even closer to where the bird was heard singing.

Fall Migration

Fall migration surveys included 16 visits to each of seven 500 m transects (which each include a single 10-minute watch count conducted mornings) between mid-August and mid-November, as well as a 2-hour mid-day raptor watch survey on September 22, 2011, for a total of 99 hours of surveys. A total of 62 species within six bird group categories were recorded during transect surveys: gamebirds, waterbirds, raptors, shorebirds, waterfowl, and landbirds. The majority of transect records were of landbirds at or below tree level. Of the birds observed flying, most (90%) were landbirds, of which less than 1% were observed flying within the blade sweep of a turbine (way above trees; WAT).

Two additional species not detected during the transect counts but detected during the watch counts were Ruby-throated Hummingbird and Northern Harrier. As with the 2011 transect counts, landbirds were the most prominent bird group during watch counts. Less than one percent (six individual birds) of landbirds were observed flying in the WAT and H (high, above sweep of the blade) flight heights. Raptors were recorded regularly during watch counts, with a high proportion of raptors recorded at WAT height; 70 % of individuals. The highest numbers at this height were Turkey Vultures, including a flock of 5 in September and 12 in November.

While the majority of flocks recorded during fall watch counts were relatively small, a number of observations included flocks of between 25 and an estimated 100 individuals. With the exception of a flock of 30 unidentified shorebirds flying high (H) south over the site in early September, the remaining large flocks were recorded in late October and in early November. An estimated 100 Canada geese were seen flying west, High over Watch Count 2 on October

22. The remaining large flocks were all landbirds, including 5 large flocks of American Robin (between 30 and 100 individuals per flock), observed at AT height. Other landbird observed in large flocks included Yellow-rumped Warbler, Red-winged Blackbird, Common Grackle, and American Goldfinch, all observed at AT height or less.

The 2-hour mid-day raptor watch on September 20 produced 11 raptors of three species (Northern Harrier, Sharp-shinned Hawk and Turkey Vulture), including 5 flying at WAT height. Of note however were frequent movements of waterbirds (gulls) observed during the survey, largely to the south of the observation point (near Transect 1, the southern-most transect). While flock size was general small, with 1 to 6 birds, there was a single flock of an estimated 300 gulls flying from east to west, approximately 200 m south of the observation points, between 40 and 70 m height (WAT). The rate of flocks of gulls observed per hour was 24.5 , compared to an average of 7 flocks of gulls per hour at watch count 1, or 3.6 flocks per hour for all watch counts, over the fall migration period.

One *SARA*-listed Threatened species (Olive-sided Flycatcher) was encountered during fall surveys. Two individuals were observed, one on transect 2, and one on transect 5. The birds were observed foraging.

Eight Species of Conservation Concern were encountered during the 2011 fall migration surveys (Table 5.9).

Table 5.9 Species of Conservation Concern Detected during 2011 Fall Surveys

Common Name	Latin Name	Bird Group	NS DNR Rank	AC CDC Rank
Bay-breasted Warbler	*Dendroica castanea*	Landbird	Sensitive	S3S4B
Boreal Chickadee	*Poecile hudsonica*	Landbird	Sensitive	S3
Golden-crowned Kinglet	*Regulus satrapa*	Landbird	Sensitive	S4
Gray Jay	*Perisoreus canadensis*	Landbird	Sensitive	S3S4
Ruby-crowned Kinglet	*Regulus calendula*	Landbird	Sensitive	S4B
Pine Grosbeak	*Pinicola enucleator*	Landbird	May Be At Risk	S3?B,S5N
Tennessee Warbler	*Vermivora peregrina*	Landbird	Sensitive	S3S4B
Turkey Vulture	*Cathartes aura*	Raptor	Sensitive	S2S3B
Wilson's Warbler	*Wilsonia pusilla*	Landbird	Sensitive	S3S4B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Landbird	Sensitive	S3S4B

All species except Turkey Vulture were only detected during transect (stopover) surveys. SOCC that were frequently encountered in fall include Boreal Chickadee and Golden-crowned Kinglet, whereas the other SOCC were detected on 5 or fewer surveys/locations. Most observations were of foraging or vocalizing birds, with only single observations of three landbird SOCC, and the Turkey Vultures, observed flying, all at AT height or below.

Winter Surveys

Winter surveys were conducted at each transect and watch count location once in each month of December (2011), January and February (2012). The 15 species identified during the winter transect surveys fall within five bird group categories: waterfowl (1), gamebird (1), waterbird (1), raptor (3) and landbird (9). A total of 198 individual birds in 74 flocks were recorded. The largest flocks observed included two flocks of American Black Duck (27 and 12), and 25 Cedar Waxwings, making up nearly a third of the individuals recorded. Winter watch counts totaling 3.5 hours of observations for overhead flying birds saw no more than 2 flocks in any one watch count survey, with no birds observed during 43% of the counts. The largest flocks observed included 8 gulls and 8 American Black Ducks in January, and 25 Canada Goose in February, which was 65% of the individuals recorded.

Three SOCC ranked Sensitive recorded in the winter included Turkey Vulture, Boreal Chickadee and Golden-crowned Kinglet.

Owl Surveys

Owl surveys were conducted in early April and early May at each of 11 stops along main roads at the northern end of the Study Area and to the west along Comeau's Hill Road, following the protocols of the Atlantic Nocturnal Owl Survey. The early April survey yielded only a single Saw-whet Owl, which was also recorded in the early May survey, along with three more Saw-whet Owls, and a Great Horned Owl near Goose Lake. Non-owl species recorded during the May survey included three American Woodcock and a Common Loon (near Goose Lake).

Spring Migration

Spring migration surveys were conducted during mornings between mid-April and late-May 2012 at the same transect and watch count locations as the fall survey, for a total of 68.6 total hours over 27 days, totaling 11 visits to each survey location. Transect surveys yielded 57 species of seven bird group categories, though only single species were recorded for gamebird (Ruffed Grouse), owl (Great Horned Owl), shorebird (Willet) and waterfowl (American Black Duck). The majority of birds identified during spring transect counts were landbirds observed within the local habitat, with only 5% of flocks and individuals observed flying through the site or soaring. Overall, few birds were observed flying through the Study Area within the WAT height.

Watch count results indicate relatively low numbers of birds flying through the Study Area. Waterbirds, mostly gulls, were the most prevalent bird observed flying through the site, with 18% of flocks and 10% of individuals flying at WAT height, amounting to 12 individual birds, predominantly Herring Gull, spread out among all the watch counts. While 50% of raptors and 20% of shorebirds (Willet) were at WAT height, numbers were very low, with only 8 raptors and 5 willets in total. The willets were all recorded at WC3 and WC4, at the northern end of the Study Area. All landbirds were observed flying at AT height or less. While most landbirds were recorded as single birds, 40 of the 53 individuals were of a single flock of Cedar Waxwings.

No *SARA*-listed species were encountered during spring surveys; however three species of Conservation Concern were encountered during transect and watch count surveys. These included the May Be At Risk species Willet and Common Loon, and the Sensitive species Turkey Vulture.

Willet were detected in low numbers regularly near Transect 4 in May, at the northern end of the Study area, but were also noted at three other transects, including Transects 6 and 7 at the southern end.

Turkey Vultures were also detected in low numbers (1 or 2 birds per flock) through the spring monitoring period, but rarely at WAT height.

There were three records of Common Loon in May, generally flying from the south, in a northerly direction.

Summary

A total of 83 species were identified within the Project Study Area through all of the bird surveys conducted between June 2011 and May 2012. Species that were detected in six or more of the nine different surveys conducted over the year include American Crow, American Robin, Cedar Waxwing, Common Raven, Turkey Vulture, Great Black-backed Gull and Herring Gull.

There were few waterfowl recorded, with only American Black Duck and Canada Goose reported on a few surveys. There were single records of three of the shorebirds, with only Willet noted during three of the survey programs (breeding, spring transects and spring watch counts). However, there were a few records of flocks of unidentified shorebirds in the fall. Waterbird records were typically dominated by gulls, however there also were occasional records of Common Loon, Double-crested Cormorant, and Great Blue Heron. There was no evidence of breeding of waterbirds in the Study Area.

A variety of raptors were recorded over the year, with Bald Eagles only recorded in the winter, Broad-winged Hawks and Sharp-shinned Hawks only recorded in Fall, Red-tailed Hawks noted in both Fall and Spring, and Northern Harrier noted in fall and late winter. Turkey Vulture was the exception, regularly recorded through most of the year, though no raptors were recorded during breeding bird surveys. Raptor numbers were generally low.

Owl surveys identified two owl species (Great Horned Owl and Northern Saw-whet Owl), with Northern Saw-whet Owl recorded at 4 of 11 stations. Owl surveys also yielded the only records of American Woodcock.

Landbirds were the most numerous species recorded, though they were rarely recorded as large flocks during transect or watch counts. The largest flocks included between 30 and 100 American Robins, as well as several large flocks of Red-winged Blackbirds and Common Grackles in mid- to late-fall. Breeding bird point counts generated the expected common species for the area and habitats, with few SAR or SOCC recorded in the Study Area. The only

At Risk species recorded were single records of the Threatened species Olive-sided Flycatcher near Goose Lake, and Whip-Poor-Will along Comeau's Hill Road near Little River Harbour.

Comparing the three seasons of watch counts, fall had the highest rate of flocks and numbers of birds, at 10 flocks per hour and 72.6 birds per hour. Winter watch count surveys recorded 4.9 flocks per hour and 18 birds per hour, while spring watch counts were similar to winter, yielding 6.8 flocks per hour and 15 birds per hour.

5.6.2 Bats

All bat species native to Nova Scotia are considered to be sensitive to anthropogenic disturbance. However, the risk of bat collision with wind turbines is generally greater for migrating bats than for resident breeding, commuting or foraging bats, which generally forage between 1-10 m above ground level and seldom above 25 m, thus avoiding turbine blades (Erickson *et al.* 2002). Migratory bat species such as the hoary bat (*Lasiurus cinereus*), the red bat (*Lasiurus borealis*), and silver haired bat (*Lasionycteris noctivagans*) may be present in low numbers in the Study Area. These migratory bats are found across North America, but there have been few accounts of these species in the province, which represents their northern range limit.

Bats are cryptic, nocturnal animals that are difficult to study, and the technology that allows researchers to effectively study bats is relatively new. In the Maritimes, intensive research into bats and bat populations has only begun within the last 15 years. In that time, studies employing a broad range of techniques and tools including acoustic monitoring, netting, radio-tracking, DNA analysis, stable isotopes, and transponder (PIT) tags, have been undertaken. Seven species are known to occur in Nova Scotia including hoary bats (*Lasiurus cinereus)*, silver-haired bats (*Asionycteris noctivagans*), eastern red bats (*Lasiurus borealis*), big brown bats (*Eptesicus fuscus*), tri-colored bat (*Perimyotis subflavus*), northern long-eared (*Myotis septentrionalis*) and little brown myotis (*Myotis lucifugus*) (Broders *et al.* 2003; Van Zyll de Jong 1985), although only the latter three species have confirmed populations within Nova Scotia (Broders *et al.* 2003; Burns and Broders 2010; Randall 2011). None of these three are considered migratory species or are typically at high risk of interaction with wind farms, with the possible exception of the tri-colored bat, which comprised 24% of bat mortality at a small wind development at Buffalo Mountain in eastern Tennessee where tri-colored bats are the most common local species. However, the distribution of tri-colored bats in Nova Scotia appears to be limited to an inland area encompassed within Queens, Annapolis and Lunenburg Counties (Farrow and Broders 2010).

To date, there have been few records of migratory bat species in Nova Scotia. The Nova Scotia Natural History Collections contain eight records of hoary bats and two records of silver-haired bats, although there are multiple records from ships and Cape Cod that suggest these species do migrate north across the Gulf of Maine (Brown 1953; Miller 1897; Norton 1930; Peterson 1970). However, in the course of more recent systematic surveys of bats in Nova Scotia suggest that these species rarely occur (Farrow 2007; Rockwell 2005).

Likewise, there are very few records of big brown bats in Nova Scotia. They are known to occur in low numbers in New Brunswick, likely associated with human occupied buildings (McAlpine *et al.* 2002). In Nova Scotia, Taylor (1997) found three hibernating big brown bats, suggesting that there may be year round residents in the Province, although subsequent work at Nova Scotia hibernacula has provided no additional evidence of their overwintering presence (Randall 2011).

Species Status of Local Bats and White-nose Syndrome

Since the presence of the fungus *Geomyces destructans*, the pathogen that causes the fatal White-nose Syndrome (WNS) was discovered in the Maritimes in 2011, overwintering bat populations at certain hibernacula have already been devastated (Forbes 2012a). The very survival of what were once some of the most common species in North America is now uncertain and the spread of WNS is anticipated to continue to spread across Canada in the near future. COSEWIC undertook emergency assessment of the status of little brown myotis, northern long-eared myotis, and tri-colored bats in 2012 and has determined that they are endangered (Forbes 2012a, 2012b, and 2012c). While the threat to these populations from WNS now eclipses other known threats, the current status of these species and their now tenuous outlook for survival warrants measures to minimize potential for interaction with these species when undertaking projects that have the potential to affect breeding, hibernating, or foraging bats.

In 2006, the first case of WNS was recorded in North America, in Albany, New York. The causal fungus (*Geomyces destructans*) grows in cold, humid environments, which tend to be the same environments where cave-dwelling bats are known to hibernate. WNS is thought to cause hibernating bats to become dehydrated and malnourished, which in turn causes bats to become active at a time when they are unable to survive winter conditions and food resources are non-existent (Forbes 2012a, 2012b,and 2012c). White nose Syndrome has spread at an average rate of approximately 200-400 km each year, and has now been recorded in Canada, in Ontario, New Brunswick, and Nova Scotia. In these three provinces, many sites are averaging mortality rates above 90% (Forbes 2012a). The fungus responsible for White-nose Syndrome is believed to have originated in Europe, and is spread both by bats that have been infected, and people visiting caves (Forbes 2012a).

The fungus has been recorded in Nova Scotia, as of fall 2011, and it is anticipated that the effects throughout Nova Scotia will be similar to that recently seen in northeastern United States and adjacent New Brunswick, where mortality rates in a single cave were over 94% over two years (Forbes 2012a,b). In order to reduce the risk of spreading the White-nose Syndrome, permission to enter caves and conduct surveys has been restricted throughout Nova Scotia (Forbes 2012a).

Based on current knowledge, it should still be anticipated that the two sympatric *Myotis* species are present around the Project Study Area, as they are still likely distributed throughout the Maritimes and have been recorded nearby. It is unlikely that tri-colored bats occur in substantial numbers or breed in the area as the site is outside their known range in Nova Scotia (Farrow and Broders 2010). While direct interactions between these three species are anticipated to be

minimal, consideration must be given to the siting of turbines and associated infrastructure to avoid hibernacula and maternity colonies. Table 5.10 shows the ACCDC rarity rankings, provincial statuses, and COSEWIC status for bat species occurring in Nova Scotia. The ACCDC and provincial rankings have not been reevaluated since the discovery of WNS in the province.

Table 5.10 Bats Species Occurring in Nova Scotia

Species	Common Name	ACCDC Rank	NS Provincial Status	COSEWIC Status
Myotis lucifugus	Little Brown Myotis (Little Brown Bat)	S4	Sensitive	Endangered
Myotis septentrionalis	Northern Long-eared Bat (Northern Myotis)	S2	Sensitive	Endangered
Lasionycteris noctivagans	Silver-haired Bat	S1?	Sensitive	
Perimyotis subflavus	Eastern Pipistrelle (Tri-colored Bat)	S1?	Sensitive	Endangered
Eptesicus fuscus	Big Brown Bat	SNR		
Lasiurus borealis	Red Bat	S2?	Sensitive	
Lasiurus cinereus	Hoary Bat	S2?	Sensitive	

AC CDC Rankings (AC CDC 2011)
S1 – Extremely rare: May be especially vulnerable to extirpation (typically 5 or fewer occurrences or very few remaining individuals).
S2 – Rare: May be vulnerable to extirpation due to rarity or other factors (6 to 20 occurrences or few remaining individuals).
S3 – Uncommon: or found only in a restricted range, even if abundant at some locations (21 to 100 occurrences).
S4 – Unusually widespread, fairly common: and apparently secure with many occurrences, but of longer-term concern (*e.g.*, watch list) (100+ occurrences).
S5 – Widespread, abundant, and secure, under present conditions.
SNR – Unranked**:** Provincial conservation status not yet assessed

5.6.3 Terrestrial Mammals

Nova Scotia is home to 57 species of terrestrial mammals (Davis and Browne 1996). The mammal fauna of Nova Scotia has been altered dramatically since the arrival of Europeans. A number of species have been extirpated, such as the caribou (*Rangifer tarandus*) and the wolf (*Canis lupus*), due to habitat destruction, human encroachment and hunting (Davis and Browne 1996; Banfield 1974). Others species, such as the white-tailed deer *(Odocoileus virginianus)* and eastern coyote *(Canis latrans)*, appear to have benefited from human disturbance and are relatively recent arrivals to the province (Davis and Browne 1996). Those mammals that are currently abundant in the province are generally mobile and widespread but a number of native species have restricted ranges and exist in disjunct populations.

Information regarding the presence of mammals, including rare species, and sensitive mammal habitat within the Project Study Area was derived from existing data sources, including a review of data for the area obtained from ACCDC and field surveys which were conducted concomitantly with other site visits during June – August of 2011.

Habitat types in the Project Study Area are described in Section 5.4 (Vegetation). The Project Study Area is relatively undisturbed by human activities, being predominantly comprised of

immature – mature forests and more open barrens and semi-barren habitats, the extent of which reflects the influence of recent fire disturbance. Given the types of habitats present in the Project Study Area, it can be expected to support a variety of mammal species characteristic of forested and open habitats.

Evidence of the presence of mammals was collected during field surveys, including visual sightings, distinctive calls, tracks, scat, dens, lodges and other distinctive spoor. A total of 8 mammal species were detected during the field surveys including black bear (*Ursus americanus*), white-tailed deer (*Odocoileus virginianus*), masked shrew (*Sorex cinereus*), red squirrel (*Tamiasciurus hudsonicus*), eastern coyote (*Canis latrans*), northern raccoon (*Procyon lotor*), North American porcupine (*Erethizon dorsatum*), and snowshoe hare (*Lepus americanus*). All of these species are considered to have “Secure” populations in the province by NSDNR.

Mammal Species of Conservation Concern

Data (ACCDC 2011a) indicate that there are four terrestrial mammals of conservation concern that have been recorded within 100 km of the Project Study Area: American marten (*Martes americana*), Canada lynx (*Lynx canadensis*), mainland moose (*Alces americanus*), and southern flying squirrel (*Glaucomys volans*) (refer to Table 5.11). However, none of these species are considered to have high potential to utilize the Project Study Area.

American marten prefer habitat containing large contiguous patches of mature softwood or mixedwood forest, although mature hardwood forest is used as winter habitat in some portions of their range. Two distinct populations of American marten have been identified in Nova Scotia - one in the Cape Breton Highlands and one in southwestern Nova Scotia. It is believed that the mainland population is derived from New Brunswick individuals that were released in Kejimkujik National Park. Although the Cape Breton population is considered “Endangered” within the province, the status of the mainland population is considered “data deficient” (Nova Scotia American Marten Recovery Team 2006). The nearest known sighting of this species was made 37 ±10 km from the Project Study Area. The Project Study Area provides poor quality habitat for American marten as a result of extensive loss of mature forest cover due to fire.

Within Nova Scotia, Canada lynx live deep in coniferous forests near rocky areas, bogs and swamps. Although the lynx may have historically occupied southern parts of the Nova Scotia, it is now restricted to the Cape Breton Highlands and to areas of higher elevation in central and eastern Cape Breton (Parker 2001), where populations are considered to be “Endangered” in the province. The single ACCDC record of Canada lynx was made 49 ±1 km from the Project area and was made in 1978. Due to the absence of this species from southwestern Nova Scotia, it would be unlikely to utilize the Project area.

Moose are commonly associated with wilderness boreal and mixedwood habitats and populations on mainland Nova Scotia are listed as “Endangered” by the province. Their preferred food are the twigs, stems and foliage of young deciduous trees and shrubs, as may be found within forest landscapes recently disturbed by fire, wind, disease or timber harvesting

activities. In summer, moose prefer habitats interspersed with wetlands that allow access to submergent and emergent aquatic vegetation. Landscapes which support recently disturbed mixed forests for food and adjacent mature conifer cover for escape and shelter are preferred in winter. The Project area is located approximately 15-20 km from the Pubnico core moose distribution area which has been estimated to contain approximately 20 individuals and is approximately 30-40 km away for the core distribution of the relatively large Tobeatic population, which consists of approximately 150 individuals (Parker 2003). ACCDC records indicate that the closest observation of moose is 19 ±10 km away from the Project Study Area. Due to its proximity to core moose populations, there is some potential for the Project Study Area to be occasionally visited by moose. Although the immature forests that dominate the area would provide limited shelter for moose which may stray from the core distribution areas, the early successional communities could offer some suitable browsing habitat. However, no evidence of moose activity was observed during the field surveys and it is unlikely that the Project area is regularly visited by this species.

Southern flying squirrels are considered “Sensitive” within Nova Scotia (NSDNR 2011) and are ranked as “S2S3” by the ACCDC (2011b) indicating that they are rare to uncommon throughout the province. Within Nova Scotia, they are restricted to southwestern counties where they are typically associated with pine and hardwood stands that provide suitable foraging and nesting habitat. The closest observation of this species to the Project Study Area is 80 ±10 kms away. Due to the absence of suitable forest stands within the Project Study Area, it would not provide important habitat for the southern flying squirrel.

5.6.4 Reptiles and Amphibians

Amphibians and reptiles are normally treated together as herpetiles. There are 22 terrestrial and freshwater herpetile species recorded from Nova Scotia. The herpetofauna of Nova Scotia is relatively sparse when compared to adjacent mainland areas of the continent, mostly because of the difficulty of post-glacial colonization of this peninsula and a relatively harsh climate.

Information regarding the presence of herpetofauna, including rare species, within the Project Study Area was derived from existing data sources including a review of data for the area obtained from ACCDC and field surveys which were conducted concomitantly with other site visits during June – August of 2011. Five herpetile species were encountered during the field surveys, including maritime garter snake (*Thamnophis sirtalis pallidulus*), green frog (*Rana clamitans*), smooth green snake (*Liochlorophis vernalis*), spring peeper (*Hyla crucifer*), and redbelly snake (*Storeria occipitomaculata*). None of these species is considered to be rare or sensitive to human activities in Nova Scotia.

Herpetile Species of Conservation Concern

Data (ACCDC 2011a) indicate that there are four herpetile species of conservation concern that have been recorded within a 100 km radius of the Project Study Area: Blanding's turtle (*Emydoidea blandingii*), eastern ribbon snake (*Thamnophis sauritus*), four-toed salamander

(*Hemidactylium scutatum*), and wood turtle (*Glyptemys insculpta*) (refer to Table 5.11). However, only one of these species (four-toed salamander) is likely to occupy the Project Study Area.

Blanding's turtle is listed as "Endangered" under both *SARA* and the Nova Scotia *Endangered Species Act*. In addition, it is considered to be "At Risk" by NSDNR (2011) and ranked as "S1" by the ACCDC (2011b) indicating that they are extremely rare within the province. This species is typically found in still-water streams, swamps, marshes and bogs in south central Nova Scotia. Blanding's turtles prefer water bodies with slow flowing water and muddy bottoms that support dense aquatic vegetation. Between early June and early July female Blanding's turtles move to gravelly or sandy lake shores to lay their eggs. In the fall, Blanding's turtles move to aquatic habitats where they hibernate underwater. The nearest known record of Blanding's turtle is approximately 65 km from the Project Study Area. Although the Project Study Area encompasses wetlands and streams, these are located outside of the known range of Blanding's turtle in the province, which is restricted to the Mersey and Medway watersheds (The Blanding's Turtle Recovery Team 2003). As such, it is unlikely that this species would be found within the Project Study Area.

Wood turtles are considered threatened under *SARA*, vulnerable under the Nova Scotia *Endangered Species Act*, are ranked as "S3" (uncommon) by the ACCDC, and are regarded as "Sensitive" by NSDNR. The nearest known record of wood turtle is 58 ±10 km from the Project area. Wood turtles are typically associated with watercourses and the riparian habitats associated with them. They nest on sandy or gravelly river banks but will also make use of features such as sand pits and road embankments near water courses that provide a sandy or gravelly substrate. Deep pools in larger rivers are often used as hibernaculum sites during the winter. Riparian habitats along watercourses are typically used as feeding sites. Despite the presence of watercourses, wood turtles are not likely to inhabit to be present because they not been recorded within the Tusket River Watershed (MacGregor and Elderkin 2003), within which the Project Study Area is located.

The eastern ribbon snake is listed as "Threatened" under *SARA* and the Nova Scotia *Endangered Species Act*. In addition, it is regarded as "Sensitive" by NSDNR and is assigned a ranking of "S2S3" by the ACCDC indicating that it is rare to uncommon within the province. This species is associated with sluggish streams, marshes, swamps, bogs and lake shores and are typically found within 30 m of open water. They prefer areas that have a heavy cover of aquatic vegetation that provides cover for them and the amphibians and small fish that they feed on. The nearest known record of eastern ribbon snake is approximately 47 km from the Project area. Some potential northern ribbon snake habitat is present within the wetlands of the Project Study Area through which the watercourses flow (*i.e.*, in the northern portion of the Study Area). However, the Project Study Area is located outside of the known range of eastern ribbon snake in Nova Scotia (*i.e.*, the Mersey River, Medway River and Pleasant River Watersheds) (Smith 2002) and is therefore unlikely to support this species.

The four-toed salamander is not listed under *SARA* or the Nova Scotia *Endangered Species Act* but is considered to be "Sensitive" in the province by NSDNR and has been assigned a rank of "S3" by the ACCDC, indicating that it is uncommon. Four-toed salamanders are highly fossorial (live underground) and are difficult to detect. They nest in sphagnum moss hummocks at the

edges of small pools in swamps and bogs (Gilhen 1984). The adults forage in forested areas surrounding these wetlands. This species can only be reliably detected during the breeding season which encompasses May and June. Four-toed salamanders have been recorded approximately 23 km away from the Project Study Area and have potential to inhabit wetland habitats which contain small pools and sphagnum moss hummocks that are required by this species for reproduction.

Table 5.11 Terrestrial Mammals and Herpetiles Recorded within 100 km of the Project Study Area (ACCDC 2011a) and Information on their Preferred Habitat, Population Status, and Distance from the Proposed Wedgeport Wind Farm

Group	Common Name	Scientific Name	Preferred Habitat	Likely Onsite?	*COSEWIC*	*SARA*	NS *ESA*	ACCDC Rank	NSDNR Rank	Distance (km)
Herpetiles	Blanding's Turtle	*Emydoidea blandingii*	Lakes, ponds, fens, marshes, low fields, ditches, creeks, river sloughs, and bogs. Within these habitats, they tend to frequent shallow water containing submergent or emergent vegetation, often with deep, organic sediments.	Unlikely	Endangered	Endangered	Endangered	S1	At Risk	65 ±0
	Eastern Ribbon Snake	*Thamnophis sauritus*	Wetlands and the edges of ponds and streams.	Unlikely	Threatened	Threatened	Threatened	S2S3	Sensitive	47 ±0
	Four-toed Salamander	*Hemidactylium scutatum*	Swamps and bogs with pools surrounded by sphagnum moss.	Possible	Not At Risk			S3	Sensitive	23 ±0.1
	Wood Turtle	*Glyptemys insculpta*	Found along streams and wetlands. Gravel bars, tall shrub swamps, deep pools in wetlands.	Unlikely	Threatened	Threatened	Vulnerable	S3	Sensitive	58 ±10
Mammals	American Marten	*Martes americana*	Large contiguous patches of mature softwood or mixedwood forest.	Unlikely			Endangered	S1	At Risk	37 ±10
	Canada Lynx	*Lynx canadensis*	Live deep in coniferous forests near rocky areas, bogs and swamps.	Unlikely	Not At Risk		Endangered	S1	At Risk	49 ±1
	Moose	*Alces americanus*	Woodlands providing both mature softwood cover and young hardwood browse. Also swamps, bogs and lakeshores, generally remote from human habitation.	Unlikely			Endangered	S1	At Risk	19 ±10

Table 5.11 Terrestrial Mammals and Herpetiles Recorded within 100 km of the Project Study Area (ACCDC 2011a) and Information on their Preferred Habitat, Population Status, and Distance from the Proposed Wedgeport Wind Farm

Group	Common Name	Scientific Name	Preferred Habitat	Likely Onsite?	*COSEWIC*	*SARA*	NS *ESA*	ACCDC Rank	NSDNR Rank	Distance (km)
	Tri-colored bat	*Perimyotis subflavus*	Hibernate in cave walls or ceilings where there is minimal airflow, females form small maternity colonies of in buildings, tree cavities, and rock crevices during summer. Forage along forest edges and over ponds and waterways.	Possible	Endangered			S1?	Sensitive	91 ±0
	Southern Flying Squirrel	*Glaucomys volans*	Pine and hardwood trees provide suitable foraging and nesting habitat, and dead trees are also important nest sites.	Unlikely	Not At Risk			S2S3	Sensitive	80 ±10

5.7 SOCIO-ECONOMIC ENVIRONMENT

5.7.1 Population

The Project Study Area is located within the Municipality of the District of Argyle, Yarmouth County, Nova Scotia. Nearby communities include Little River Harbour, Comeaus Hill, Upper Wedgeport, Wedgeport and Lower Wedgeport. Population statistics for the District of Argyle from the 2011 census are summarized in Table 5.12 below.

Table 5.12 Population Statistics for the District of Argyle

Population and Dwelling Counts	Argyle Municipal District
Population in 2011	8,252
Population in 2006	8,656
2001 to 2006 population change (%)	-4.7
Total private dwellings	3,798
Private dwellings occupied by usual residents	3,382
Population density per square kilometer	5.4
Land area (square km)	1,528.01

Source: Statistics Canada 2011 Census

The population of the Municipality of the District of Argyle has declined 4.7% from 2006 to 2011. In 2006 the median age was 42.7, which is slightly older than the provincial median of 41.8. Approximately 16.3% of the population was over the age of 65, which is somewhat higher than 15.1% for the province in 2006. Approximately 14.8% of the population identified as Aboriginal, while 1.9% identified as foreign-born (Statistics Canada 2007).

5.7.2 Industry and Employment

Table 5.13 lists the participation in local industry for the Argyle Municipality. Tourism likely falls into the category of “Other Services”, as it is not specifically listed by Statistics Canada. The largest industries for the Municipality of Argyle are the agriculture and other resource-based industries (*e.g.*, fishing and processing) and the manufacturing services.

Table 5.13 Employment Statistics (Industry Participation) for the District of Argyle

Industry	Total Employed
Total – Experienced Labour Force 15 Years and Over	4,425
Agriculture and Other Resource-Based Industries	1,080
Construction	245
Manufacturing	785
Wholesale Trade	120
Retail Trade	490
Finance and Real Estate	110

Table 5.13 Employment Statistics (Industry Participation) for the District of Argyle

Industry	Total Employed
Health Care and Social Services	390
Educational Services	290
Business Services	375
Other Services	535

Source: Statistics Canada 2007

In 2005, 6,875 residents of the Argyle Municipal District, 15 years of age or more, earned an income (from either full time or part time jobs) The primary industries in the area are agriculture and other resource based industries (*e.g.*, fishing and processing) (Statistics Canada 2007).

Based on the 2006 census, the unemployment rate for the Argyle Municipal District was 10.7% which is slightly higher than the provincial unemployment rate of 9.1%.

5.7.3 Recreation and Tourism

The Municipality of the District of Argyle comprises 1500 km^2 of both coastal and inland communities and is located in the southern region of the province of Nova Scotia. Argyle has a population of approximately 8,700 people with roughly 65% being francophone- mostly of Acadian descent; there are also ties to Mi'kmaq culture within the municipality through the Acadia First Nation Reserve. The area is renowned for its ties to the sea through its many fishing villages and large coastline. The Municipality of Argyle offers a variety of accommodations, dining and heritage sites as well as a number of outdoor recreation and activities include site seeing tours and hiking/walking trails such as Goose Creek Marsh Hiking Trail and Rocco Point Nature Trail. The many miles of coastline are also easily accessible for visiting nearby beaches. Golfing, canoeing, kayaking and birding are also popular outdoor activities (Municipality of Argyle 2012). Within the Project Study Area, there are no formal recreational trails, provincial parks or tourism destinations; however, recreational hunting and ATV use takes place.

5.7.4 Land Use

Land use for the Project Study Area is regulated and zoned under the Municipality of Argyle's Municipal Planning Strategy and Land Use By-law. The Project Study Area is zoned General Use (GU) which allows a variety of land uses including: agricultural, forestry, residential, institutional, recreational, light industrial, institutional etc., as well as wind development (Municipality of Argyle 2000 rev 2010). A development permit is required for the Project and building permits are required for each turbine installation. As required by the Municipal By-law, wind turbines are to be set back not less than twice the total height of a horizontal axis rotor or a vertical axis rotor from existing dwellings in any zone (Municipality of Argyle 2000 rev 2010). For the Wedgeport Wind Farm, the Project would require a setback of 297 m from a turbine to existing residential dwellings.

The land uses adjacent to the Project Study Area include a mixture of residential, institutional, recreational, commercial, utility and industrial activities. The well-developed interconnecting road network has led to the compact linear development of the land on the peninsula. Very little agricultural activity occurs in this area with the exception of some Christmas tree production and growing for the purpose of ornament trees and shrubs. The Project Study Area is west of the second most highly developed community (Wedgeport), with a population of 1,680 persons. Of the estimated 590 dwellings throughout Wedgeport, 558 are single detached dwellings with the remaining consisting of mobile homes, converted dwelling, apartments and a senior citizen home (Municipality of Argyle 2000 rev 2010).

In addition to the residential land uses, commercial land use is also found in close proximity to Highway #334. These developments include fuel pumps, two general stores, a convenience store, funeral home, a restaurant and a credit union bank (Municipality of Argyle 2000 rev 2010). Home occupations are also found in this area; these uses include the manufacturing of lobster traps, fish equipment shops, beauty salon, landscape nursery and a boat shop. The presence of wharves located along the waters of the peninsula allow for industrial land use that are fishing and marine oriented. The industrial uses include a marine shop, fish processing plant, gear sheds and boat shops. Institutional uses include a church, school. Two post offices, museum, fire department, two service clubs and a private club (Municipality of Argyle 2000 rev 2010).

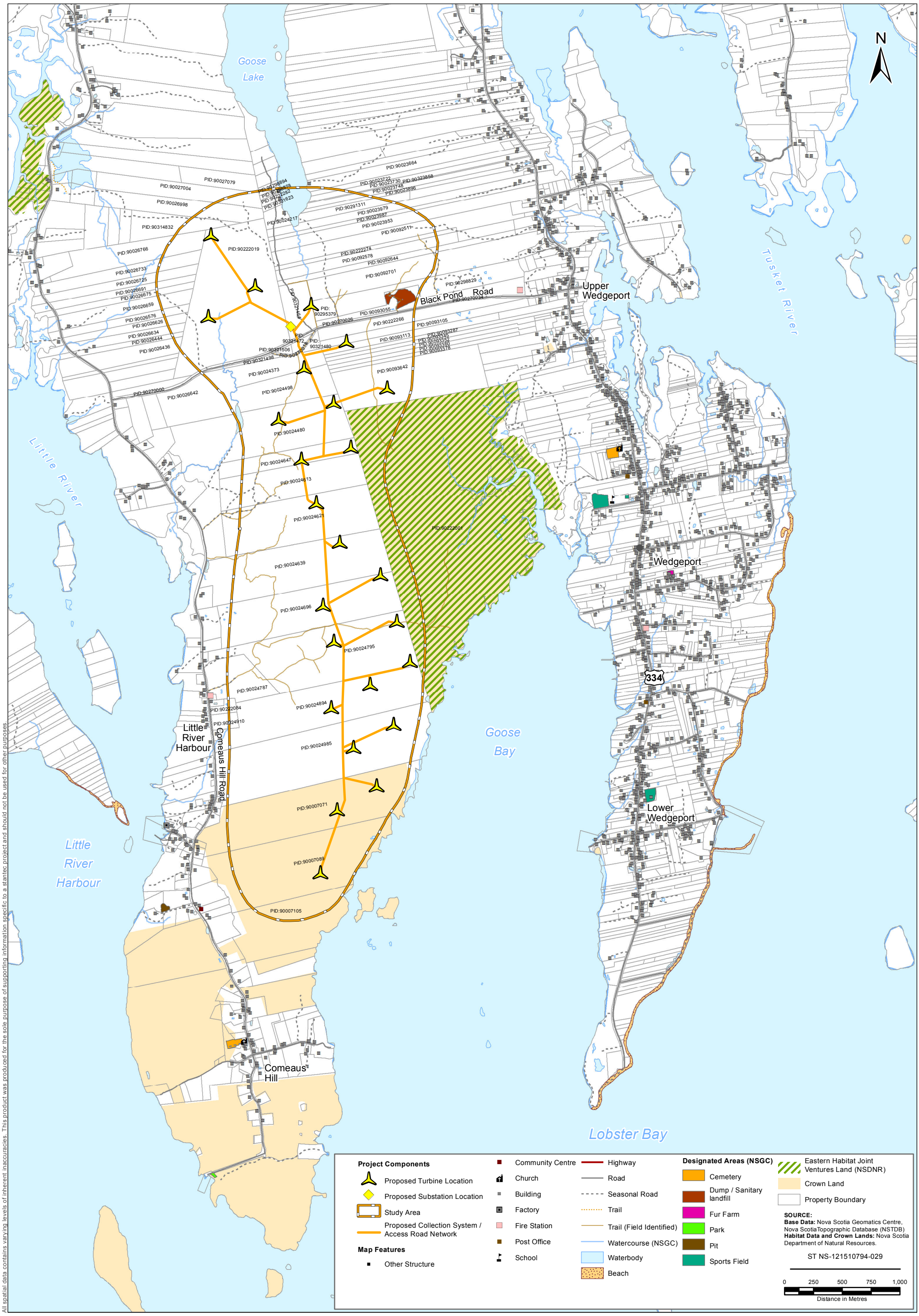
Recreational land use within the Project Study Area mainly includes informal recreation land uses. During field surveys, evidence of informal activities were noted including hiking trails (shown on Figure 5.6), ATV use, hunting and possibly berry picking. Little forestry activity was noted in the area; it generally consisted of forestry activity by private land owners for personal uses.

Residential land use nearest the Project includes homes on Comeaus Hill Road, Black Pond Road and seasonal cottages on Goose Lake. The closest residence is a cottage on Goose Lake located approximately 659 m from the nearest turbine. The majority of residences on Comeaus Hill Road are located more than 1 km from the Project.

Although the majority of properties in the Project Study Area are privately owned properties, there are some crown land parcels, at least one of which the Proponent will be seeking a crown lease agreement to allow turbine placement as shown on Figure 5.6. A crown lease application process has been initiated although NSDNR cannot make a decision on the lease prior to release of the Project from the EA process.

5.7.5 Property Values

In 2006, there were 3,375 dwellings in the Municipality of the District of Argyle, of which 3,130 were owned and 245 were rented. Approximately 78% of the dwellings in the District of Argyle were constructed before 1986. The average value of a home in 2006 was $117,360, approximately $40,640 less than the provincial average (Statistics Canada 2007).



All spatial data contains varying levels of inherent inaccuracies. This product was produced for the sole purpose of supporting information specific to a stantec project and should not be used for other purposes.

PREPARED BY: R Sutcliffe	WEDGEPORT WIND PROJECT	FIGURE NO.: 5.6
REVIEWED BY: C. Shupe		DATE: Jun 14, 2012
AnaiaGlobal RENEWABLE ENERGIES www.anaiaenergy.com	**Land Use**	Stantec

Path: V:\1215\active\121510xxx\121510794_Wedgeport\geomatics\mapping\mxd\EA_final\ST_NS-121510794-029_SocioEconomicOverview_20120509.mxd

5.7.6 Archaeological and Heritage Resources

The assessment of archaeological potential for the site considered both prehistoric and historic period resources. Archaeological potential modeling for prehistoric era sites is based largely on the identification of landscape features which are either known to have attracted past habitation or land use, or which appear to have potential for attracting human use. These features include the availability of potable water, suitability for habitation (*e.g.,* ground conditions), proximity to desirable resources (such as workable stone), and proximity to water transportation routes, coastal areas, portage routes and food supplies. A desktop archaeological assessment and field assessment focusing only on the wind farm site (transmission line excluded) was completed under Heritage Research Permit # A2012NS120 by a professional archaeologist with results summarized below.

Background Research

There are few early maps depicting the Project Study Area in detail. The major industry in the region has always been fishing, and any historic settlement was most likely along the western shore outside of the Project Study Area where access to the water was easily obtained. Historic aerial photographs dated 1945 (A8803-38, 26) show a number of trails in the Project Study Area and some cultivation; however there was no evidence of historic settlement. There was also a notable lack of documentary evidence specific to the Project Study Area. There does not appear to have been a pre-Expulsion Acadian settlement. While it is not exactly clear when Little River Harbour was settled, it presumably grew out of the Wedgeport settlement after the end of the eighteenth century.

Recorded Archaeological Sites

There are no recorded First Nations or historic archaeological sites in the Maritime Archaeological Resource Inventory database.

Archaeological Potential

The Project Study Area consists of low marshy areas with large areas of exposed granite bedrock throughout. There are no major watercourses or water bodies within the Project Study Area. Site conditions combined with the lack of natural resources lower the probability of any settlement or major activity within the Project Study Area. It is much more likely that Mi'kmaq and historic activities were on the western coast of the peninsula where the natural resources, or the access to those resources, was much better. First Nations and historic archaeological potential in the Project Study Area are therefore determined to be low.

Field Survey

Stantec archaeologists conducted a pedestrian survey under Heritage Research Permit A2012NS120 of seven of the proposed turbine locations, which was determined to be sufficient to provide a representative sample for the entire area. The methodology consisted of using a handheld GPS and a sighting compass to navigate to the turbine locations. Observations were

recorded and photos were taken along the way noting both positive and negative evidence of archaeological potential.

Air photos and maps of the Project Study Area indicated that the site consisted generally of low and marshy with extensive granite outcrops. The pedestrian survey confirmed these conditions and it was discovered that the site was covered in dense, entangled ground cover that made walking difficult particularly when combined with the extensive wet areas and the many exposed, partially-buried boulders All of these conditions were noted as being grounds for considering the Project Study Area as low potential.

The archaeologists managed to navigate to 5 turbine locations in the south (WT 1, 2, 4, 6, 9) from which it was possible to observe the general locations of six more turbines (WT3, 5, 7, 8, 10, 11). The survey did not observe any evidence of historic settlement in the area nor did it note any natural resources that would have been attractive to the Mi'kmaq. The northern end of the Project Study Area (north of Black Pond Road) appeared to be low and wet. Site observations confirmed areas of marsh, confirming the initial determination of low potential. The survey then moved to the area south of Black Pond Road and headed to WT20, through a marshy area adjacent to the road then into conditions consisting of very dense underbrush, wet areas, with outcroping. It was quite evident at this point that the site conditions indicated low archaeological potential over whole extent of the study area and the survey was terminated. Based on the field conditions, first Nations and historic archaeological resources potential in the Project Study Area is considered low.

Summary

The pedestrian survey confirmed the background research that determined there was low potential for archaeological resources within the study area. There are no resources within the Project Study Area that would have attracted the Mi'kmaq (no food resources, no source of fresh water, no access to the ocean) nor would the site conditions have attracted historic settlement.

Given the determination that the archaeological potential for the study area is low, it is recommended that the project proceed as planned without the need for further archaeology. It should be noted, however, that this study focused on the turbine locations and did not consider the location of access roads or transmission lines.

5.7.7 Current Use of Lands and Resources by the Mi'kmaq for Traditional Purposes

Anaia commissioned Membertou Geomatics Solutions to complete an MEKS for the Project. The MEKS determines Mi'kmaq land and resource use which is of particular importance to the Mi'kmaq people with respect to the Wedgeport Wind Farm Project and it will also seeks to identify and document ecological knowledge which may be significant to the Project. The MEKS was developed in accordance with the "Mi'kmaq Ecological Knowledge Study Protocol" (Assembly of Nova Scotia Mi'kmaq Chiefs 2007).

Within or adjacent to the Project Site, defined in the MEKS as an area 2-5 km south-west of Wedgeport as well as the proposed transmission line extending to Tusket Falls, it was identified that the Mi'kmaq have historically undertaken some traditional use activities, primarily fishing, and that this practice continues to occur today.

The MEKS also concluded that the Mi'kmaq have historically and presently undertake traditional use activities in the Project Study Area (a 5 km radius of the Project Site). These activities are summarized below:

- Fishing for lobster and trout;
- Hunting rabbits deer, partridge and pheasant; and
- Gathering blueberries, raspberries and blackberries.

A copy of the MEKS prepared by Membertou Geomatics is provided in **Appendix D**. As illustrated in Maps A through E of the MEKS, Mi'kmaq traditional uses both past and present do not occur within the Project Study Area as defined for the EA (thus corroborating the assessment of low archaeological potential in the Project Study Area). Hunting, including hunting of rabbits, deer, partridge and pheasant, occurs to the north of the Project Area with some hunting along the transmission line. Fishing activity, generally lobster, occurs in several areas outside the Project Area including in the Atlantic Ocean as well as coastal areas and major rivers such as the Tusket River and Chebogue River (MGS 2012). Gathering activities, mostly berry picking, occur north and west outside of the Project Area in the areas surrounding Yarmouth Reserve and Arcadia (MGS 2012).

Based on the information gathered and presented in the MEKS, Membertou Geomatics concluded that the proposed Project could potentially have an effect on Mi'kmaq traditional use and recommended that traditional use activities be considered during all phases of the Project.

5.7.8 Transportation Infrastructure

The Project Study Area is not located within a high traffic area. The site is approximately 10.5 km from Highway 103 and 10.7 km from Highway 101. A detailed transportation study will be conducted prior to construction, once the turbine manufacturer and source of equipment has been finalized. It is anticipated that the current local road network will not require upgrades to accommodate construction traffic, although the transportation study will recommend specific transportation routes and recommend upgrades and mitigation as necessary.

5.7.9 Public Health and Emergency Services

In the Argyle Municipal District, South West Nova District Health Authority (SWNDHA) is responsible for delivering health care services to the Municipality and for providing health care services to the residents of Shelburne, Yarmouth and Digby Counties. SWNDHA includes three health care facilities, the Roseway Hospital in Shelburne, Western Regional Health Centre in Yarmouth and Digby General Hospital in Digby. SWNDHA is also responsible for Mental Health,

Public Health and Addiction Services throughout the district (SWNDHA 2006). The Wedgeport and District Fire Department provides fire services and Yarmouth Rural Royal Mounted Police provides emergency services.

5.7.10 Visual Landscape

The Project Study Area is located primarily on barren, undeveloped woodlands and immature and mature coniferous mixed forests. A visual landscape assessment was conducted for the Project. This assessment was completed with the use of a computerized simulation that superimposed wind turbine images, which are located and scaled to size, onto a photograph of an existing view in the area for the purpose of creating a realistic representation of the proposed wind farm from a specific view. The relatively flat and open terrain in lands surrounding the Project Study Area, including adjacent peninsulas, offers a relatively unobstructed view of the Project Study Area. There are no protected viewplanes in the area.

Further information and viewshed photographs on the area's visual landscape are presented in Section 6.5.4.