GAETZ BROOK WIND FARM

ENVIRONMENTAL ASSESSMENT – JULY 2013

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PHOTO TAKEN BY HILARY HENDSBEE

Executive Summary

This Environmental Assessment has been prepared for the proposed Gaetz Brook Wind Farm by Natural Forces Wind Inc. in accordance with the Nova Scotia Department of Environment guidelines entitled *A Proponents Guide to Environmental Assessment* (NSE, 2009) and the Nova Scotia Department of Environment guidelines entitled *Proponents Guide to Wind Power Projects: Guide for preparing an Environmental Assessment Registration Document* (NSE, 2012)

Work completed as part of this Environmental Assessment includes desktop and field studies to gather background information and to identify biophysical, physical and socio-economic valued environmental components; consultation with federal, provincial, municipal, local resident stakeholders and Mi'kmaq right –holders also took place as part of the assessment. The significance of residual effect due to project activities was studied for the Valued Environmental Components identified in the background studies based on potential impacts after employing the proposed mitigative measures. Finally, appropriate follow up measures were proposed based on the Valued Environmental Component analysis.

It has been determined from this Environmental Assessment that there are no expected significant residual environmental effects for the proposed Gaetz Brook Wind Farm on the Valued Environmental Components. This project promotes responsible renewable energy development in Nova Scotia and will help Nova Scotia meet the provincial requirement of 25% renewable energy by 2015 and the further target of 40% renewable energy by 2020 set by the Department of Energy.

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*Please note that within the appendices Natural Forces Wind Inc. may be referred to as Wind Prospect Inc.

List of Acronyms

ACCDC	Atlantic Canada Conservation Data Center
AMEC	AMEC Environmental & Infrastructure
CBC	Christmas Bird Count
CEDC	Community Economic Development Corporation
CEDIF	Community Economic Development Investment Fund
CLC	Community Liaison Committee
COMFIT	Community Feed In Tariff
COSEWIC	Committee of the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Study
dB(A)	Decibel A-weighting
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EMP	Environmental Management Plan
GBWF	Gaetz Brook Wind Farm
HRM	Halifax Regional Municipality
IBA	Important Bird Area
km	Kilometer
MEKS	Mi'kmaq Ecological Knowledge Study
MBBA	Maritime Breeding Bird Atlas
MW	Megawatt
NSDNR	Nova Scotia's Department of Natural Resources
NSESA	Nova Scotia Endangered Species Act
NSPI	Nova Scotia Power Inc.
PPA	Power Purchase Agreement
Project	Gaetz Brook Wind Farm
Proponent	Natural Forces Wind Inc.
SARA	Species at Risk Act
SCADA	Supervisory Control and Data Acquisition
Strum	Strum Environmental
SPL	Sound Pressure Level
VEC	Valued Environmental Component
W4All	Wind4All Communities Inc.
WAM	Wet Area Mapping
WTG	Wind Turbine Generator

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1.0 Introduction

1.1 Overview

The Gaetz Brook Wind Farm (Project or GBWF) as proposed is a 2.3 megawatt (MW) single wind turbine generator (WTG) project. The Project is located in the Halifax Regional Municipality (HRM), in the community of Gaetz Brook on the eastern shore of Nova Scotia.

Natural Forces Wind Inc. (Proponent) is proposing to develop the Project in the community of Gaetz Brook under the Nova Scotia Department of Energy Community Feed in Tariff (COMFIT) program. The proposed WTG location is situated on existing privately owned land, located approximately 5.5 km southwest of Musquodoboit Harbour and 9 km east of Porters Lake. Currently, construction activities are expected to begin near the end of 2013, and Project completion is expected in early 2014. The Project will have an operational phase of 20 years.

The Nova Scotia *Renewable Electricity Plan* sets out clear legal requirements in regards to the source of electricity supplied; that is, 25 percent must be from renewable sources by 2015 and a further target of 40 percent renewable by 2020. The Project will help meet the provincially mandated targets outlined in the Renewable Electricity Plan, while at the same time enabling local ownership and community economic development; both of the initiatives are supported by the Province of Nova Scotia.

The COMFIT program is part of the Nova Scotia 2010 *Renewable Electricity* Plan and is designed to introduce locally-based renewable electricity projects that are majority owned by residents from communities throughout the province. The Proponent has used a Community Economic Development Investment Fund (CEDIF) to enable local investment and ownership in the Project.

The COMFIT program is integral to Nova Scotia's 2010 *Renewable Electricity Plan* and is designed to promote locally-based renewable electricity projects that are majority owned by one of six qualifying eligible entities. The following entities are eligible to receive COMFIT approval:

- Community Economic Development Investment Funds (CEDIFs);
- Co-operatives;
- Mi'kmaq band councils;
- Municipalities or their wholly-owned subsidiaries;
- Not-for-Profit Organizations; and
- Universities.

The Proponent plans to use a CEDIF to enable local investment and ownership in the Project. COMFIT approval for the proposed GBWF was awarded to the Community Economic Development Corporation Wind4All Communities Inc. (W4All) in the spring of 2012. W4All was created and sponsored by the Proponent. The Proponent will not be using any source of public funding for the purpose of this project.

It typically takes approximately three years to develop and construct a wind farm. Although, the proposed GBWF is still in the development phase, public consultation began in late 2011 with a public open house, meetings with community members, the municipalities and stakeholders.

1.2 Proponent

Natural Forces Wind Inc. is a company that was established in 2001 based in Halifax, Nova Scotia and entirely Maritime owned. Composed of a small team, the Proponent has over 30 years of international (Canada, USA, Europe and Australia) experience in the wind industry. The Proponent is a wind farm developer, constructor, operator and asset owner.

The Proponent has two operational wind farms in the Maritime Provinces; Kent Hills Wind Farm and Fairmont Wind Farm. Kent Hills Wind Farm is a 150 MW wind farm in New Brunswick constructed in 2008. The Fairmont Wind Farm is a 4.6 MW wind farm near Antigonish, Nova Scotia, which became energized at the end of 2012.

The Proponent is currently working on developing projects in Nova Scotia and British Columbia.

In the next few years, the Proponent aims to develop five projects in Nova Scotia with a total approximate capacity of 21 MW. The first two projects to be developed include this 2.3 MW single WTG wind farm on the Eastern Shore in Gaetz Brook and a 4.0, MW two WTG wind farm in Hillside Boularderie, Cape Breton.

1.3 Regulatory Framework

1.3.1 Federal

Federal environmental approvals are not required for the proposed project. The Project is not expected to require permitting through harmful alteration, disruption or destruction of fish habitat or have an impact to navigable waters.

Consultation with Federal authorities has been ongoing with Navigation Canada, Transport Canada, the Department of National Defence, and the Canadian Wildlife Service (CWS).

1.3.2 Provincial

The Environmental Assessment process, as required under the provincial *Environmental Assessment Act* is a Proponent-driven, self-assessment process. The Proponent is responsible for determining if the Environmental Assessment (EA) process applies to the Project, what category the Project belongs to and when the EA process should be initiated.

Under Section 49 of *the Environmental Assessment Act*, new electricity Projects or 'Undertakings' can be classified under one of two categories, Class 1 undertakings or Class 2 Undertakings (EAR, 1995). Wind farms with a rated capacity of 2 MW or greater are considered Class 1 undertakings. It is anticipated that the rated capacity for the GBWF is 2.3 MW and therefore is a Class 1 undertaking.

Four guidance documents were used in the preparation of this EA for the GBWF Project, they are:

1. *A Proponent's Guide to Environmental Assessment*, published by the Environment Assessment Branch of the Nova Scotia Department of Environment (NSE, 2009);
2. *Proponent's Guide to Wind Power Projects: Guide for preparing an Environmental Assessment Registration Document*, also published by the Environment Assessment Branch of the Nova Scotia Department of Environment (NSE, 2012);
3. *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document,* published by the Environment Assessment Branch of the Nova Scotia Department of Environment (NSE, 2005); and

1.3.3 Permitting

At the provincial level, a number of permits are required to progress the various stages of development and construction of a wind farm. A list of the required provincial permits shown in Table 1-1, although additional permits may be required following continued stakeholder consultation.

Table 1-1: Federal and Provincial permitting requirements.

Permit Required	Permitting Authority	Status
Heritage Research Permit	NS Department of Tourism, Culture and Heritage	Issued
Special Move Permit	NS Transportation and Infrastructure Renewal	Not issued
Transportation Plan	NS Transportation and Infrastructure Renewal	Not issued
Environmental Assessment Approval	NS Environmental Assessment Branch	Under review
Watercourse Alteration	NS Environment Protected Areas and Wetlands Branch	Not Issued

Additional municipal permits and authorizations are required. Table 1-2 lists the municipal permits and authorizations required. Again, additional permits may be required following further consultation with municipal stakeholders.

Table 1-2: Municipal permitting requirements.

Permit Required	Permitting Authority	Status
Development Approval	Halifax Regional Municipality	Issued
Development Permit	Halifax Regional Municipality	Not Issued

1.4 Development and Structure of Document

This EA was prepared by Natural Forces Wind Inc. based on high level advice from Verterra Group Environmental Strategies Ltd. as our consultant. Verterra Group's knowledge of scoping and EA structure development supported the expertise of GBWF's Project Manager and Vice President of Developments Andy MacCallum, and Development Officer Chris Veinot, who compiled primary and secondary data sources to draft this EA document.

The following document will present in Section 2, a Project description in which information regarding site location and layout, proposed WTG, wind regime, planning and design, construction, operation and maintenance, decommissioning, future phases and other projects in the area. Section 3 will detail the approach to the assessment in terms of scoping and assessment boundaries, desktop and fieldwork completed as well as the methodology of assessment. Section 4 will describe the environmental setting relating to biophysical, physical and socio-economic aspects as related to the Project. Section 5 details consultation efforts the Proponent has engaged in throughout the development stage as well as future engagement plans. Based on the environmental background provided in Section 4, Section 6 will provide a detailed assessment of the identified Valued Environmental Components (VEC) focusing on potential impacts and providing appropriate mitigative measures to determine the significance of the impact on the identified VEC. Section 7 will identify subsequent commitments the Proponent will engage in. Following this, Section 8 will provide a Project summary, which will conclude the formal body of the report.

2.0 Project Description

2.1 Site Location and Layout

The GBWF is located on privately owned land in the Halifax Regional Municipality in the Gaetz Brook community, located approximately 5.5 km south west of Musquodoboit Harbour and adjacent to Highway 107. The Proponent plans to construct and operate a single 2.3 MW wind farm; the proposed location for the WTG is shown below, in Figure 2-1 and can also be seen in Figure 2-2.

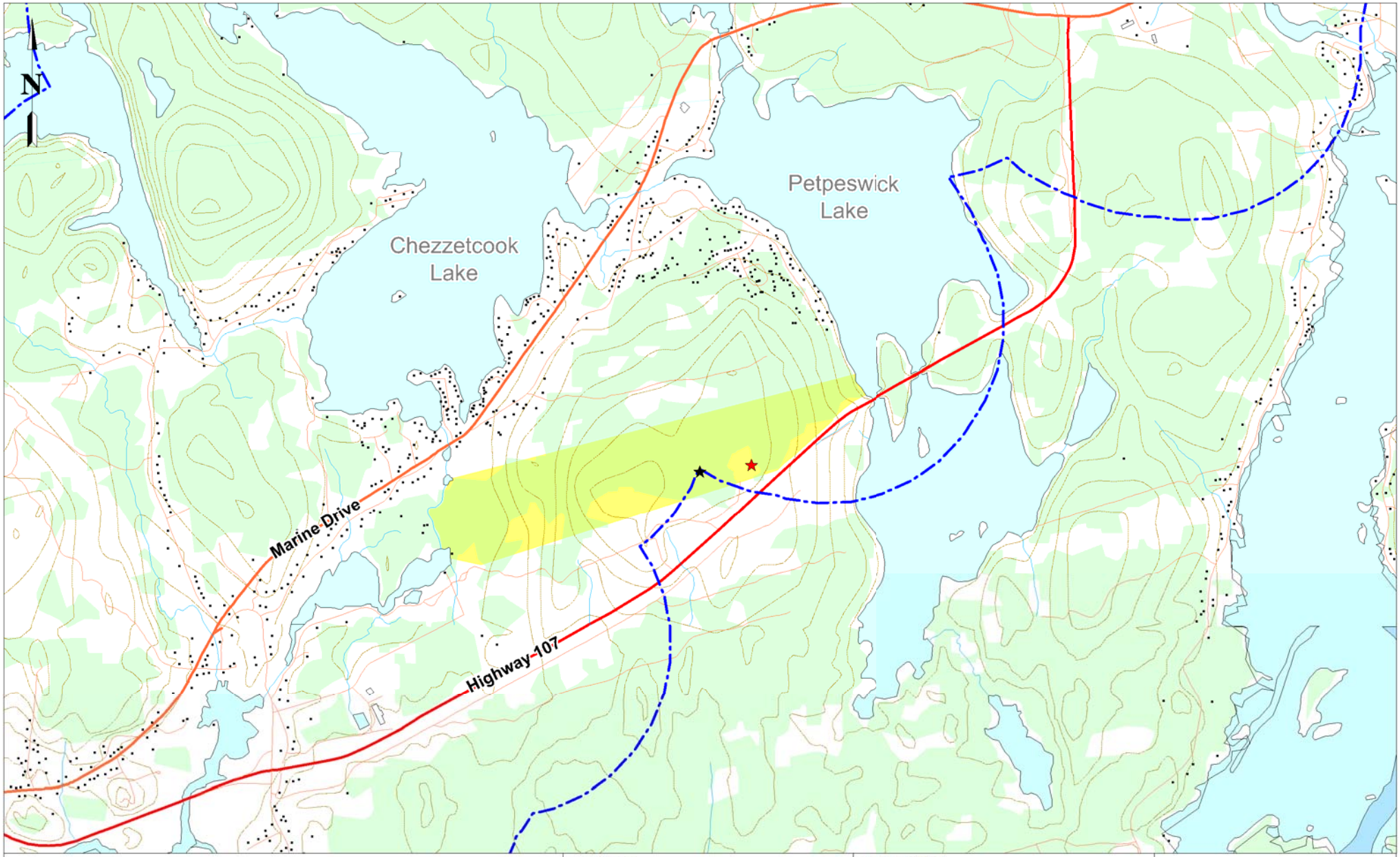
- Proposed location for WTG: 44°45'28" N, 63°12'16" W
- UTM Zone 20 T: 483,812 m E, 4,956,090 m N

Figure 2-1: Proposed WTG location (Photo courtesy Davis MacIntyre & Associates Ltd.).

Setback distances from residential dwellings to the WTG are greater than 1000 m.

The GBWF will connect to the Nova Scotia Power Inc's (NSPI) distribution grid via 3-phase distribution by connecting to the 87H-311 circuit located on Motts Drive east of the Project site. This connection will require new 3-phase distribution line to be constructed by NSPI from the WTG to existing NSPI infrastructure near Motts Drive in the Eastern Shore Industrial Park.

The lands under option consist of four land parcels owned by 10 different land owners. The four land parcels cover a total of 271 acres; the land parcel the WTG will be located on covers 100 acres and is intersected by the Highway 107. The proposed Project will have a total footprint of approximate 1.75 Hectares. The Project land is located in HRM Planning Districts 8 & 9 and is zoned as Rural Wind Zone



LEGEND

- Project site
- Waterbody
- Vegetation
- Highway
- Arterial & minor road
- Contour line - 5m
- Buffer line - 1000m
- Watercourse
- House
- Proposed wind turbine generator
- Meteorological mast

Source: Nova Scotia Department of Natural Resources

SCALE

0 0.5 1
kilometres

1:30,000

KEY MAP

PROJECT
Gaetz Brook Wind Farm

FIGURE
Figure 2-2

TITLE
General Overview

DATE
June 6th 2013

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(RW-1). The HRM permits the development of utility scale wind turbines in lands zoned as Urban Wind Zone and Rural Wind Zone when compliant with the municipal setback by-laws (HRM, 2011).

The access road will be constructed by using one of two options currently available. The first option (Option 1) allows access to the Project site by entering from Motts Drive. The second access road option (Option 2) will enter the Project site off of Marine Drive heading south east towards the WTG location. Both access road designs may follow existing unpaved roads where appropriate, mainly along old skidder trails that have been used in clear cutting activities within the last 15 years. Wetlands and watercourses have been identified for the Project site; any alteration to the identified wetlands and watercourses will comply with the regulations set out in Nova Scotia's *Environment Act* as detailed in the *Nova Scotia Wetland Conservation Policy* (NSE, 2011).

The Proponent has extensive knowledge in site finding and development of community based wind farms. There are three main factors to consider during the site finding phase of the development of a wind farm. These factors include wind regime, local power grid infrastructure and environmental/ socio-economic concerns. Detailed assessment of these three factors have led the Proponent to determine that the location of the GBWF presents the best opportunity to capture the wind regime in an effort provide efficient wind energy to the local community given the environmental, socio-economic, regulatory and technical factors.

2.2 Wind Turbine Generator

A single Enercon E92 WTG will be used on site for the duration of the Project. The Enercon E92 has a total rated capacity of 2.3 MW, a turbine tower height range of 78 – 98 m and rotor blade diameter of approximately 92 m. From base to blade tip the WTG will have a maximum height of 144 m.

All Enercon WTGs are designed and certified according to the latest international standards. Currently the basis for design is the International Electrotechnical Commission (IEC) standards of the IEC-61400 series.

This IEC standard utilizes assumptions and conditions that are used to define the load cases that the WTG has to endure. The safety system of the Enercon WTG features various control sensors that protect the turbine and its components from damage. This includes, among other things, high and low temperatures, vibrations, oscillations and strain. In the case that one or more of these sensors detect conditions outside the design limits, the main control of the WTG will take the appropriate measures, which range from small power limitations to complete stop of the turbine (Enercon, 2012).

Ice may form on the rotor blades of the WTG in specific weather conditions. The ice build-up poses the risk of ice chunks detaching, creating safety hazards to the surrounding area. The Enercon WTG will be equipped with a reliable ice detection system. Once ice has been detected, the Enercon bade de-icing system will activate and effectively melt the ice on the WTG blade to reduce the risk of ice throw.

Additional WTG specifications are presented in Table 2-1 as well as in Appendix A.

Table 2-1: Enercon E92 specifications (Enercon, 2012).

Characteristic	Value
Rotor diameter	92 m
Swept area	6648 m^2
Rotations per minute	5 – 16 min^{-1}
Cut out wind speed	28 – 49 m/s (Enercon storm control)
Hub height	85 – 138 m
Max sound pressure level	105 dB(A)

2.3 Wind Regime

A detailed wind resource assessment at the GBWF site was initiated in July 2012 with the installation of a 60 m meteorological mast (met mast) containing anemometers at 40 m, 50 m and 60 m above ground level. A Triton was installed in May 2012, which measures wind speed and direction at heights of 50 m, 60 m, 80 m and 100m. The wind resource assessment studies wind direction, wind speed, temperature, relative humidity and atmospheric pressure. A collective assessment of these parameters will be used to determine the feasibility of harnessing the wind regime; and to determine optimized WTG micro-siting.

Based on the preliminary wind resource assessment conducted with data available from May 18, 2012 to October 14, 2012 at the anemometer 60 m above ground, the prevailing wind direction was observed to be southwest. A long-term wind resource assessment will be conducted with the data collected from July 2012 to July 2013. The Nova Scotia wind atlas was used in preliminary site finding and indicates an approximate wind speed of 6.5 – 7.5 m/s at 80 m (NS Wind Atlas, 2013).

2.4 Planning and Design

The planning and design phases are crucial steps of the Project that can set the stage for following project activities and help avoid issues that may be encountered in future project phases. Specifically, the GBWF site is an attractive site due to the wind resource, distance from dwellings, capacity of the distribution grid and minimal ecological concerns.

A variety of criteria has been considered in the site selection of the GBWF. The criteria include technical, environmental and land use consideration. The following is a list of the criteria considered:

- Technical Considerations;
    - Sufficient wind resource;
    - Proximity to electrical distribution network; and
    - Capacity of the local electrical distribution network.
- Environmental Considerations;
    - Proximity to provincial or national parks, wetlands; and
    - Sensitivity of flora & fauna.
- Land use considerations;
    - Available access to the land and suitable ground conditions; and
    - Proximity to residential properties, communities and towns.
- Planning Considerations.
    - County or Municipal zoning by-law regulations.

Technical Considerations

The GBWF is located approximately 8 km from Nova Scotia's coastline with the Atlantic Ocean. During the summer, a sea-breeze is observed from the Atlantic Ocean where the land heats up quicker than the water and provides a prevailing south west wind. The Project site is approximately 70 m above sea level on top of a gradual hill. Typically at exposed elevations, similar to the Project site, uninterrupted laminar wind flow can provide an optimal wind resource.

A Distribution System Impact Study conducted by NSPI on behalf of the proponent indicates the Project can be connected to the nearby local electrical distribution system. Through an agreement with NSPI, the Project will be connected to the 87H-311 circuit of the Musquodoboit Harbour substation, which provides electricity to Gaetz Brook, Musquodoboit Harbour and surrounding communities. The proximity of the GBWF to a high electrical load center such as Musquodoboit Harbour is a key determinate in securing a feasible grid connection to the existing NSPI distribution system. Projects

located further from load centers and substations tend to be less feasible in terms of securing a successful grid connection.

There are existing communications tower located approximately 5 km west of the Project site and approximately 6 km northeast of the Project site.

Environmental Considerations

The landscape of the GBWF site lies on previously clear cut areas interspersed with windthrow and mid-aged to mature soft wood forest.

The Project site is located approximately 3 km west of the Petpeswick inlet with an elevation range of 40 – 80 m above sea level. The proposed turbine location is approximately 70 m above sea level.

Land Use Considerations

The closest local communities are Gaetz Brook, in which the Project site is located and Head of Chezzetcook, located approximate 2.5 km west of the Project. These communities consist of sparsely spaced rural dwellings. The proposed turbine location has a minimum setback of 1000 m from the closest dwelling. The Project site is bound by Highway 107 to the south, the Eastern Shore Industrial Park and other land parcels to the north and south. Further to the north is the old Highway # 7, also known as Marine Drive.

The landowner has made the land available for the installation a single WTG and ancillary infrastructure on their land. An access road will be constructed to gain access to the proposed WTG location.

2.5 Construction

Construction of the GBWF is proposed to take approximately six months and will include the following main construction activities:

- Clearing and grubbing of Project area;
- Construction of access road, lay down area and crane pads;
- Construction of turbine foundation;
- Construction of power pole, power lines and underground electrical;
- Turbine installation;
- Commissioning of the WTG; and
- Removal of all temporary works and restoration of the site.

The proposed schedule for these construction activities is presented in Table 2-2.

Table 2-2: Schedule of construction activities.

Construction Activity	Typical Distribution (months)					
	1	2	3	4	5	6
Surveying and siting activities	■					
Construction of access road and crane pad	■	■				
Construction of crane pad & turbine foundation		■	■			
Construction of electrical works			■	■		
Wind turbine assembly and installation			■	■		
Removal of temporary works and site restoration						■

2.5.1 Surveying, Siting and Logistic Activities

Prior to the commencement of access road, foundation construction and turbine installation, a number of enabling works need to be undertaken. These will include:

- Engineering site visits to evaluate the Project land and soils conditions;
- Boring of holes and/or excavation pits for geotechnical investigations;
- Improvement of land drainage as required to facilitate construction;
- Widening and improvement of the site entrance for safe vehicle access.

The Proponent will coordinate transportation of large-scale wind turbines that will require overweight special move permits. Service Nova Scotia and Municipal Relations officers will be consulted to ensure any other potential permits (ie. over-dimensional and overweight vehicle permits) are obtained and transportation regulations are followed. Although the WTG transportation route has yet to be planned, the Proponent is aware of certain road weight restrictions. Roads used for the construction phase of the Project will comply with intermediate and maximum weight road restriction lists (Road designation, 2012).

2.5.2 Access Road

Access roads required for the development are typically 5 – 6 m wide with a maximum width of 12 m in certain areas to facilitate moving a fully assembled crane. The access road will be used to move workers and equipment about the site during construction, operation and decommissioning phases.

The construction of new road will involve the removal of soil to a depth of between 0.25 – 1.0 m (depending on the ground conditions encountered during the geotechnical investigations) and placing layers of crushed stone. The stone would be compacted, with a finished construction depth between 0.25 – 0.5 m, again dependent on the strength of the underlying road formation. The internal site road would be maintained in good condition during construction and throughout the lifetime of the Project.

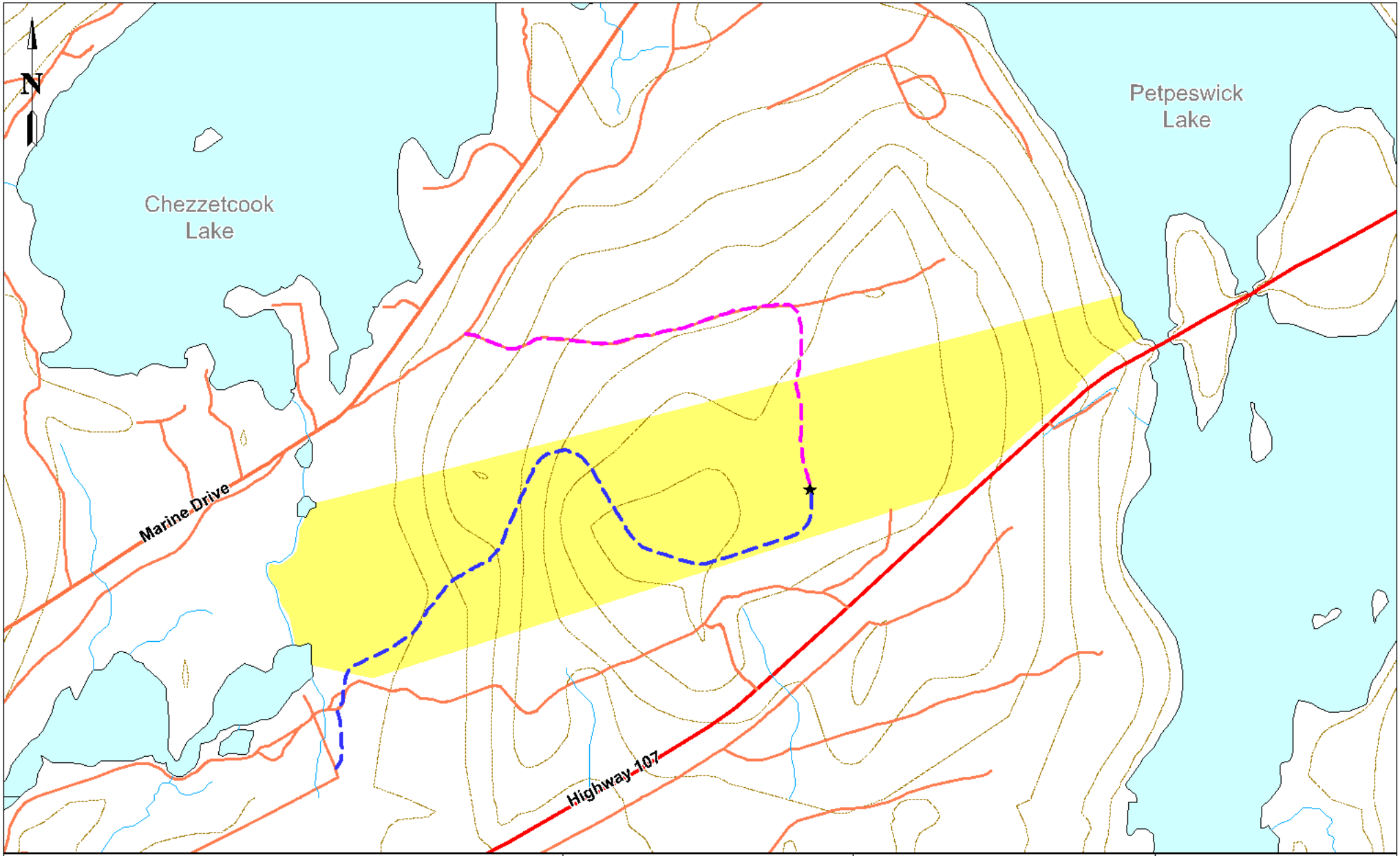
The removed topsoil would be stored in accordance with best practice guidance, and later used for site restoration. Soils needed for backfill would be stored temporarily in bunds adjacent to the excavations until needed. Any remaining excavated material would be shaped into fill slopes in the road bed, or removed from site to an approved landfill. The proposed access road designs can be seen in Figure 2-3.

Access Road Option 1

Access road Option 1 for the Project is approximated to be 1.7 km in length. Option 1 provides access to the project site via Motts Drive. This access road will be designed such that it makes use of the current dirt road where it is feasible and logical. The Proponent has made an effort during the road design such that minimal clearing and grubbing is required. By using existing roads, of the 1.7 km required for the access road approximately 40 % will not require clearing, significantly reducing the environmental impact. As part of the construction of the proposed access road Option 1, up to two watercourses and three wetland alterations may be necessary. The alteration to wetlands and watercourses is further discussed in Section 4.1.3. Access road Option can be seen in Figure 2-3.

Access Road Option 2

Access Road Option 2 is being investigated as an alternative to Option 1. Access road Option 2 provides access to the project site from the north via Marine Drive. The access road may follow an old unpaved road used for clearing activities that have taken place in the last 15 years. This access road option will require approximately 1.3 km of road design; half of this distance may make use of the existing unpaved road. If the Proponent decides to use Option 2, formal wetland delineation will be conducted as the Project site is known to be sparsely populated with wetlands and watercourses. Access road Option 2 can be seen in Figure 2-3.



LEGEND

- Project site
- Waterbody
- Highway
- Arterial & minor road
- Access road option 1
- Access road option 2
- ★ Proposed wind turbine generators

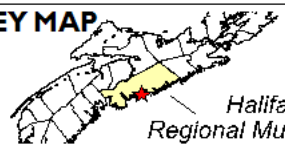
SCALE

0 250 500

metres

1:15,000

KEY MAP



PROJECT

Gaetz Brook Wind Farm

FIGURE

Figure 2-3

TITLE

Access road options

DATE

July 2nd 2013

naturalforces
1205-1801 Hollis Street
Halifax, NS B3J 3N4
Tel: 902.422.9663
Fax: 902.422.9780
www.naturalforces.ca

Source: Nova Scotia Department of Natural Resources

2.5.3 Crane Pad & Turbine Foundation

Crane Pad

The Enercon E92 will require a crane pad that will be approximately 50 m by 25 m. Its purpose is to safely accommodate the weight of the large crane necessary for turbine installation and maintenance. The exact arrangement of the crane pad would be designed to suit the specific requirement of the turbine and the surrounding topography of the Project site.

Construction of the main crane pad would involve the removal of soil to a depth of between 0.25 – 0.5 m, depending on the ground condition encountered during the geotechnical investigation. The subsoil would be covered by layers of graded crushed stone. Total construction depth is between 0.25 – 0.5 m, again dependent on the characteristics of the underlying soil formations.

The crane pad may be retained throughout the operation life of the wind farm to allow for periodic WTG maintenance, and to accommodate any crane necessary for the replacement of large components should they require replacement during the operation phase of the Project.

Turbine Foundations

A concrete foundation approximately 20 m in diameter will be required for the WTG. A detailed geotechnical investigation will be undertaken to establish the nature of the soil at each identified WTG location. A registered Civil Engineer will design the foundations to match the soil conditions. Foundations will most likely be a gravity (inverted "T") design, designed by Enercon.

The construction of the reinforced concrete foundation will include excavation to a depth of several meters, the placement of concrete forms and steel reinforcement, and the pouring of concrete within the forms. The upper surface of the base will lie approximately 1 m below ground level. Rock chipping may be required to facilitate excavation. The central support pedestal would extend 0.20 m above existing ground level to receive the bolted bottom tower section. Suitable excavated material would be compacted in layers on top of the concrete foundation to terminate in line with the existing ground level, leaving room to allow sufficient topsoil reinstatement for vegetation growth.

The soils removed would be stored in accordance with provincial regulations and best practice guidelines, and replaced during the restoration phase in consultation with the landowner. Soil material needed for backfill would be stored temporarily in a designated area adjacent to the excavations until needed. Any remaining excavated material will be recycled to another site needing clean fill material or removed from site and sent to an approved landfill.

2.5.4 Civil and Electrical Works

The electricity produced from the WTG will be transformed to 12.5 kV by a transformer located in the base of the WTG. The electricity will then be conducted via insulated electrical cables through cable ducts cast into the WTG foundation routed out to new power poles on site, and then to the new point of connection to the existing NSPI distribution system.

A bare copper earthing (grounding) cable will be laid alongside the WTG foundation for lightning protection of the WTG; grounding will also be installed at other areas as determined by the electrical design.

The electrical, communications and grounding cable will leave the WTG foundation below grade via cable ducts cast into the WTG foundation. Where the cables are to cross the site roads and crane base, they may be located in cable ducts surrounded by 0.15 m of concrete to ensure the integrity of the cable is maintained independent of the vehicle site crossings above. The overhead cabling configuration will be similar to the standard 12 m wooden utility poles found throughout the surrounding area. Any buried electrical cable will likely be marked with permanent safety signs to warn of potential hazards from excavation. The size, type and location of the marker signs will be determined in consultation with the landowner and be in accordance with applicable safety standards.

2.5.5 Interconnection to Grid

The connection point to the NSPI electrical distribution system will be located on the Project site. A new 3-phase distribution line that will be constructed, owned, and operated by NSPI will follow the access road within the Project lands leading to an existing NSPI distribution line adjacent to Motts Drive. The existing NSPI distribution line runs in a north-easterly direction connecting to the 87H substation. Figure 2-4 indicates the proposed location of the interconnection to the NSPI grid.

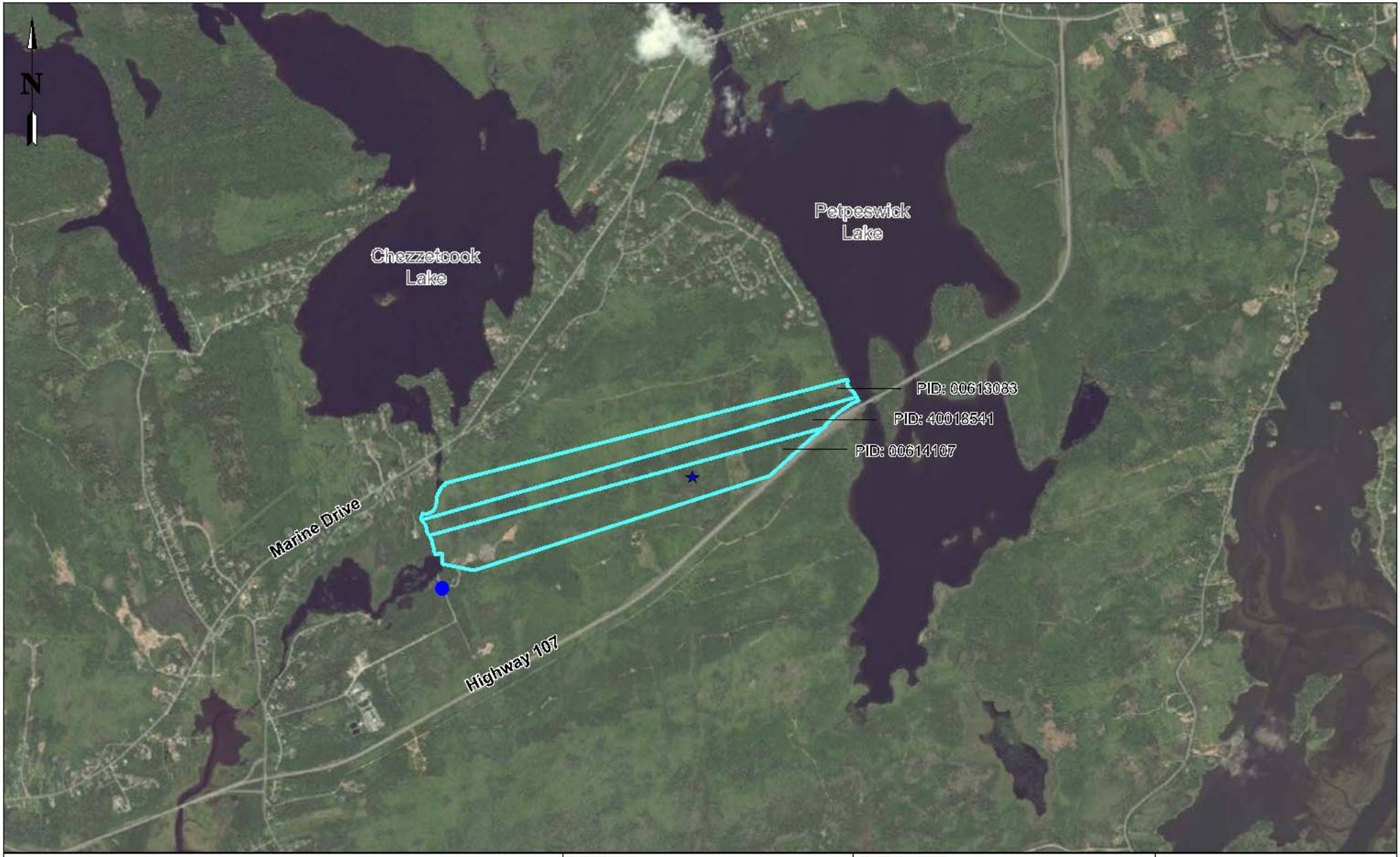
2.5.6 WTG assembly and installation

The main WTG components include the tower sections, nacelle, hub and blades. Towers are normally delivered in four sections. The overall erection process for the WTG will take approximately one to four weeks, depending on the wind conditions, and would not start until suitable wind conditions prevail.

Once delivered, the tower sections will be erected in sequence on the WTG foundation using 150 tonne tailing crane and a large 800 – 1000 tonne main lift crane. The smaller crane will erect the base and lower-midsection of the tower and then assist the main crane with the erection of the upper-midsection, the tower top section, the nacelle and the rotor. The main erection crane also lifts heavy internal components such as the generator.

For the nacelle and blades, the assembly will involve the use of a small 135 tonne rough-terrain crane for vehicle off-loading, a 150 tonne tailing crane for preliminary assembly, and a main erection crane of approximately 800-1000 tonnes for the main lift.

The blades are attached to the hub on the ground. The hub and blades are then lifted as one unit, called the rotor. The tailing crane helps to control the orientation of the rotor during this lift, while the main crane lifts the weight.



LEGEND

- Project site
- Proposed wind turbine generator
- Connection point

Source: Nova Scotia Department of Natural Resources

SCALE

0 0.5 1

kilometres

1:30,000

KEY MAP

PROJECT

Gaetz Brook Wind Farm

FIGURE

Figure 2-4

TITLE

Aerial View

DATE

June 18th 2013

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1205-1801 Hollis Street
Halifax, NS B3J 3N4
Tel: 902.422.9663
Fax: 902.422.9780
www.naturalforces.ca

2.5.7 Site Restoration

After construction, erection and commissioning are completed and the Project is in the operation phase, all temporary works will be removed and the land re-graded. The stored topsoil will be replaced and fine graded, and the site will be dressed to restore maximum tillable area and a pleasing appearance.

2.5.8 Other

Entry to the Project site will be adjacent to Motts Drive. This will be the entry point for all workers, construction equipment and WTG components for the duration of the construction phase. Minor, temporary road widening may be required along specific portions of the road.

During construction of the access road and the WTG foundation, there will be an increase in truck traffic on the roads leading to and from the Project site. Increased dust is possible, although water trucks will dampen the roads and excavation area when necessary to control fugitive dust.

During delivery of the WTG components, delivery of oversized loads may slow traffic flow. Every effort will be made to ensure that oversized loads are delivered during times of lowest area traffic. Pilot vehicles and licensed flaggers will be provided to coordinate traffic flow and ensure public safety.

Delivery of materials and equipment will be phased throughout the construction period depending upon the specific construction activity. The vehicles likely to be involved include:

- Large trucks with trailers for delivery of materials, earth-moving equipment and cargo containers for storage of tools and parts;
- Dump trucks to deliver and/or move stone for constructing internal site roads;
- Concrete trucks for constructing WTG foundation;
- One 800-1000 tonne main lift crane;
- One 150 tonne tailing crane;
- One 135 tonne rough-terrain crane for assembling WTG;
- WTG component delivery vehicles; and
- Miscellaneous light vehicles including cars and pickup trucks.

Of these predicted vehicle movements, approximately 12 will be oversized loads associated with the delivery of WTG component parts (towers, blades, and nacelles) and the cranes required for erection. These deliveries are anticipated within months 4 through 6 and subject to movement orders as agreed upon with governing authorities.

2.6 Operation and Maintenance

2.6.1 Site Access and Traffic

Once the wind farm is operational, minimal vehicle activity will be required. The internal site roads will be used for periodic maintenance and safety checks. A comprehensive Supervisory Control and Data Acquisition (SCADA) system will be installed within the turbine for remote monitoring and control of the

wind turbine, which will minimize the need for on-site personnel. The SCADA system ensures safe efficient operation of the turbine and of the overall Project site.

2.6.2 Project Safety Signs

A Project sign will be located at the entrance to the site. This sign will provide essential safety information such as emergency contacts and telephone numbers. As well, the sign will provide information about the wind farm and the companies involved in the Project. Safety signs and information will also be installed throughout the Project Site. These signs will be maintained throughout the operational life of the wind farm.

2.6.3 Maintenance Plans

Scheduled maintenance work will be carried out several times each year throughout the operational phase. Unscheduled maintenance is minimal, as the SCADA system provides 24-hour monitoring of the turbine. Maintenances procedures may require the use of small or large cranes for brief periods of time, for replacement of blades or other turbine components.

2.6.4 VEC Monitoring

Avian species and bats will likely be monitored for a period of time during the first few years of the operational phase.

2.7 Decommissioning

The Gaetz Brook Wind Farm Project will be in operation for approximately 20 years. The lifetime is based on the duration of the Power Purchase Agreement (PPA) signed between Nova Scotia Power and the Proponent. This is also consistent with the length of the land lease that will be signed by participating land owners.

Decommissioning will commence within six months after the license has been terminated. The decommissioning phase will be completed within six months after its commencement.

The WTG components will be dismantled and removed from the site. Similar traffic movements to those experienced during the delivery of the turbine components are anticipated. The decommissioning phase will require considerably lower vehicular support than during the construction phase. The following four steps are anticipated in the decommissioning phase:

1. The WTG will be dismantled and removed from the site for scrap or resale. The base will be removed to below plough depth, and the top soil will be reinstated so that the land may be returned to its former use.
2. The internal site roads and site entrance, if not required may be removed. After removal, the land will be reinstated to its former use.
3. The underground cables will be below plough depth and contain no harmful substances. They may be recovered if economically attractive or left in the ground. Terminal connections will be cut back below plough depth.

4. All other equipment will be dismantled and removed, and the land will be returned to its former use.

2.8 Future Phases of the Project

There are no future phases planned for the GBWF Project. There are three contributing factors that have been considered in determining the 20 year project duration.

1. The current land lease agreement details that the duration of the lease once the Project has been commissioned will be 20 years.
2. The Proponent has agreed upon a 20 year fixed rate power purchase agreement with NSPI.
3. The WTG has a life expectancy of 22 years.

Based on these three factors, at this time the has no further plans to develop this Project after the proposed 20 year Project life has elapsed.

2.9 Other Projects in Area

There are two proposed project in the surrounding area. The Halifax Regional Water Commission has proposed a 4.6 MW wind project in North Preston approximately 21 km to the west of the proposed GBWF. The Halifax Regional Water Commission has also proposed an 11.5 MW wind project near Lake Major approximately 24 km west of the proposed GBWF (NSDoE, 2013). There is also a small scale single turbine behind the Porters Lake Superstore located approximately 6.6 km west of the Project site.

Other than the proposed Lake Major and North Preston wind farms and the small scale Porters Lake WTG, there are no other proposed, under construction or operating projects within a 10 km radius that would potentially cause cumulative effects to the physical, biophysical or socio-economic environment. Since the distance between the GBWF and the proposed Lake Major and North Preston wind farms are over 10 km, the Lake Major project will not be considered in the VEC analysis. The Porters Lake wind farm is a single turbine with a name plate capacity of 100 kW and has a hub height of 36 m. The Porters Lake turbine will be considered in the potential cumulative effects VEC assessment where applicable.

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3.0 Approach to the Assessment

3.1 Scoping and Bounding

The scoping process identifies the physical, biophysical and socio-economic VECs that may be subject to impact given the works proposed as described previously in Section 2. The proposed work is composed of the construction, operation and maintenance phases of the Project conducted by the Proponent including any accidents and malfunctions that may occur. The decommissioning of the GBWF is also included as part of the assessment. The identification of the VECs is based on the potential interaction of the Project within the environmental and socio-economic settings described in Section 4. Additionally, any concerns from stakeholders and the general public as identified through the consultation process described in Section 5 are taken into great consideration when identifying the VECs to be assessed.

The scope of the assessment is formed by the potential interaction of the project activities with the VECs. The scoping was completed at a preliminary level to define the appropriate desktop and field studies that would be relevant to the Project. The scoping is continually refined as the Project progresses, the environmental setting is studied and consultations are held. While it is difficult to assess all of the potential effects of a project, properly defining a scope reduces the risk of overlooking an important project impact.

The Proponent has identified the physical, biophysical and socio-economic aspects that will be subject to assessment based on its knowledge and experience, review of the regulatory requirements, as well as feedback from the community, First Nations, regulatory authorities and other stakeholders. This process has identified the physical, biophysical and socio-economic VECs to be evaluated for the Project; these VECs are listed in Table 3-1.

Table 3-1: Identified Valued Environmental Components.

Physical	Biophysical	Socio-economic
Ambient Air	Wetlands / Watercourses	Land Use
Ground & Surface Water	Fish and Fish Habitat	Aboriginal Resources / Uses
Ambient Noise	Migratory and Breeding Birds	Archaeological Resources
Ambient Light	Flora	Recreation and Tourism
	Species at Risk	Vehicular Traffic
		Telecommunications
		Landscape Aesthetics
		Health and Safety
		Local Economy

Spatial and temporal boundaries must be determined in the assessment process to properly evaluate the Projects impacts on the aforementioned VECs. Spatial boundary is the physical bounds in which the

Project facilities and activities are located as well as zones affected by project activities, i.e. discharge and emissions. Temporal boundary is the time frame in which the activities within the spatial boundary overlap with the presence of identified VECs.

Based on the *Proponent's Guide to Wind Power Projects'* it has been determined that the Project site sensitivity is classed as high, which classifies the GBWF as a category 2 on the level of concern category matrix. Projects in this category present a moderate level of risk to wild species and/or their habitat, and require basic surveys, usually spread over a one year period, to obtain quantitative information on wild species and habitats on the site (NSE, 2012). The proponent has engaged the services of external consultants to provide these surveys, and will be discussed throughout this EA.

The study area includes a spatial boundary that encompasses the footprint of all activities associated with the construction, operation and decommissioning of the proposed Project. Further, the study area also includes all areas that interactions between the project and environment could be reasonably expected to occur. The spatial boundary will be defined for each separate VEC assessment since it is not reasonably possible to define a single spatial boundary to encompass all project activities and VECs.

The temporal boundaries include, but are not limited to the timeline for short term construction activities, as a long term temporal boundary includes the 20 year operation of the project as well as its decommissioning. The temporal and spatial boundaries are identified in the VEC analysis in Section 6.

3.2 Desktop and Field Work Completed

3.2.1 Avian Study

The Proponent has engaged the services of Strum Environmental (Strum) to provide an assessment of potential effects of the proposed Project on local and migratory bird populations. Strum surveys were conducted by an expert birder and were designed in consultation with officials from Nova Scotia Department of Natural Resources (NSDNR) and Canadian Wildlife Services (CWS) while conforming to protocols outlined in the CWS document *Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds*.

The avian study conducted by Strum consisted of the following surveys:

1. Breeding season survey;
2. Shorebird survey;
3. Fall migration survey;
4. Winter survey; and
5. Spring migration survey.

The full avian survey conducted by Strum can be found in Appendix B.

Breeding Season Survey

Breeding birds were evaluated using the point count methodology. This method consists of establishing survey locations at least 300 m apart, with considerations for habitat types and species of conservation concern, and counting all birds observed/heard during a 10 minute period. Surveys were conducted within four hours of sunrise, to encompass the periods of highest bird activity, during site visits on June 21, 2012 and July 1, 2012. A total of 14 point count surveys were conducted at seven locations.

Identified species were assigned one of three breeding classifications as per the criteria outlined in the *Maritime Breeding Bird Atlas Guide for Atlassers*. In this classification scheme, species are designated as "Possible", "Probable", or "Confirmed" breeders on the basis of behavioral observations.

Shorebird Survey

As recommended through consultation with NSDNR, a shorebird survey was conducted. Shorebirds were evaluated using the watch count methodology. This method consists of establishing a vantage point allowing a high degree of shoreline/open water visibility, and recording data on species composition/abundance, behavior, and flight routes to and from shoreline/intertidal foraging areas. Shorebird surveys were designed to encompass both low and high tides, and were conducted during visits to the general Project area on August 22, 2012 and September 7, 2012. A total of seven watch counts were carried out at six locations. The average distance of the point count survey to the proposed WTG location was 4.8 km.

Fall Migration Survey

Birds migrating during the fall were evaluated using the stopover count methodology. This method consists of walking 300 m transects and recording all birds observed/heard, as well as noting the distance to the observer or flight direction, in the case of flyovers. Surveys were conducted within four hours of sunrise, to encompass the peak foraging times for insect and seed eating passerine migrants, during site visits on September 17, 2012 and October 4, 2012. Survey dates were chosen based on availability of suitable weather conditions and to coincide with the peak migration periods for insect eating and seed eating migrants in Nova Scotia. A total of 18 stopover count surveys were carried out, each at a different location.

Winter Survey

Winter birds were evaluated using the area search methodology. This method consisted of establishing survey locations in priority habitats and recording all birds observed/heard, as well as the approximate distance from the observer. Surveys were conducted within four hours of sunrise, to encompass peak activity times for over-wintering passerines, during a site visit on January 15, 2013. The survey date was chose based on the availability of suitable weather conditions that are representative of winter conditions in Nova Scotia. A total of seven area search surveys were carried out, each at different locations.

Spring Migration Survey

Use of the Project site by birds during the spring migration season was evaluated using the stopover count methodology. A total of 53 stopover count surveys were carried out during site visits on May 7, 22 and 30, and June 16, 2013. Survey dates were chosen to coincide with weather conditions potentially affecting the distribution of spring migrants at the site, including fog and rain events. Surveys were conducted based upon the expected peak of spring passerine migration in the general Project area, based on local knowledge and consultations with NSDNR.

3.2.2 Bat Monitoring

The Proponent has engaged the services of Strum to conduct a study of the bat community and to provide an assessment of potential effects of the proposed Project on bat species. Study methodology includes a desktop review of available information on the ecology of bat species in Nova Scotia and the general Project area, as well as field surveys. The full Bat Impact Assessment can be found in Appendix C.

Desktop Study

The desktop study consisted of a review of relevant literature as well as the following digital databases.

1. Nova Scotia Abandoned Mine Openings Database (NSDNR, 2011); and
2. Nova Scotia Significant Species and Habitats Database (NSDNR, 2012).

The desktop study was used to identify bat species around the Project site, as well as bat hibernacula such as caves and abandoned mines that could be used to develop an appropriate field survey.

Field Survey

Bat migration and habitat surveys were carried out from August 30, 2012 to October 3, 2012 using an AnaBat SD2 Detector deployed at the Project site. The AnaBat system records echolocation sounds made by the bats when flying near the detector. The distance at which the bats can be detected is a function of the frequency of the call emitted by the particular species. The microphone that detects the bats echolocation sounds was attached to a constructed tower and suspended approximately 3.5 m in the air to elevate the device above the vegetation in the immediate area. This measure was taken to reduce the effects of vegetation noise and to ensure that vegetation did not impede echolocation signals from reaching the microphone. The microphone was housed in a protective housing constructed with ABS-tubing to prevent damage resulting from adverse weather conditions, and a Plexiglas® plate installed at a 45 degree angle below this housing to deflect signals into the microphone.

The detector was deployed in an open cluster of young balsam fir trees at the Project site, adjacent to the cleared area where the meteorological tower is currently installed. The detector was positioned approximately 300 m to the east of the proposed WTG location.

The detector was set to record between 7:00 pm and 7:30 am daily, coinciding with sunrise and sunset times to ensure that all periods of bat activity were encompassed in the monitoring period. The detector was visited nine days after re-deployment, at which time data was downloaded, the power source was replaced and the system was tested to ensure it was functioning properly.

3.2.3 Archaeological

A historic background study was conducted by Davis MacIntyre & Associates Limited in September 2012, and supplemented by a second site visit in April 2013. Historical maps, manuscripts and published literature were consulted at the Nova Scotia Archives in Halifax. The Maritime Archaeological Resource Inventory, available at the Department of Communities, Culture and Heritage, was searched to understand prior archaeological research and known archaeological resources neighboring the study area. Finally, a field reconnaissance was conducted in order to further evaluate the potential for both buried and surface archaeological resources. The full Archaeological Impact Assessment can be found in Appendix D.

3.2.4 Mi'Kmaq Ecological Knowledge Study

The proponent has engaged the services of AMEC to provide a Mi'Kmaq Ecological Knowledge Study (MEKS). The purpose of the MEKS is to understand the relationship between the Mi'kmaq and the region in which the Project is located. The GMWF MEKS methodology consisted of two main exercises:

1. A desktop review of existed data was performed to gather site specific information, while consultations with local First Nations groups and individuals enabled the collection of local site specific knowledge of historical and current Mi'Kmaq use of natural resources.
2. Field surveys were then conducted to confirm and update the existing available knowledge.

Review of Available Data

In many regions, indigenous organizations and researchers have adopted a process for traditional ecological knowledge data collection that moves away from individual informant interview and brings small groups of community members together in a workshop format. This enables researchers to observe and collect information from a variety Mi'Kmaq knowledge holders (such as youth, elders, women, hunters, community leaders, etc.) during community level workshops that build upon active social engagement strategies.

Information on the general area encompassing the site was requested from the Treaty and Aboriginal Rights Research Center. In addition, the Gorsebrook Research Center at St. Mary's University and the Treaty and Aboriginal Rights Research Center has collaborated on a Mi'Kmaq place names research project. This research has demonstrated the significant cultural and environmental history that is tied to the Mi'Kmaq names of places through their traditional territory. AMEC communicated with researchers to seek information on place names in and near the Project site.

A workshop was held with members of Millbrook First Nation on April 11, 2013 in order to discuss current land and resource uses within areas proposed for wind farm development. Hunters, fishers and Councillors attended the meeting and provided information on the current state of harvesting activities within the community. While some participants were familiar with the Project area, they acknowledged that primarily and recreational land use activities focused on areas closer to the Millbrook reserve.

Field Surveys

A site visit was undertaken to identify and locate potential medicinal plants and other related resources that may be of importance today. Vegetation surveys were conducted on October 11, 2012 by AMEC's Biologist and Mi'Kmaq Specialist within the study area depicted in Figure 4.1 of Appendix E. Prior to conducting field surveys, the various habitats located within the study area were assessed and classified using information gathered during a desktop study (e.g. aerial photography and Nova Scotia Forest inventory database, etc.). Habitat modeling was conducted to identify the potential presence of plant species of significance to Mi'kmaq based on available habitat. Vegetation Surveys focused on plant species identified during the desktop review and consisted of optically controlled meanders through habitat polygons identified to potentially contain plants of Mi'kmaq significance. General locations of significant plants identified in the field were recorded using a GPS and photographs of the habitat were recorded with a digital camera.

While surveys specifically targeting wildlife species were beyond the scope of this study, a review of the historical use of wildlife and fish resources by Mi'kmaq, combined with known wildlife habitat preferences and the results of the habitat surveys, allowed a determination of wildlife species potentially using the Project site. The results of the desktop reviews, field surveys and the public consultation exercise were compiled and a habitat modeling exercise was conducted. This exercise consisted of comparing habitat preferences of Nova Scotia wildlife species with the habitats known to occur at the Project site, in order to determine the likelihood of each species' present at the Gaetz Brook site.

The full MEKS report can be found in Appendix E.

3.2.5 Wetland and Watercourse

The proponent has engaged the services of Strum in providing wetland and watercourse assessments for the proposed Project site focusing on the WTG location, crane pad and access road.

An initial wetland and watercourse assessment was conducted in August 2012 and consisted of a desktop study for preliminarily wetland identification, as well as a field study to delineate and characterize the wetlands and watercourses.

A second wetland and watercourse field survey was conducted in April 2013 at the Project site. This survey was to provide more detail of the wetlands and watercourses surveyed in August 2012 and to assess a new access road design and the wetlands and watercourses the road may affect.

Desktop Study

Preliminary identification of location and extent of potential wetlands across the Project site was completed by reviewing information from the following resources:

1. Aerial photography;
2. Nova Scotia Wet Areas Mapping database (WAM);
3. Nova Scotia Geomatics Centre;
4. Nova Scotia Significant Species and Habitats database; and
5. Topographical maps.

The information was then analyzed, using the following four criteria to identify areas with a high potential for wetland habitat:

1. Wetlands identified on topographical maps and the Nova Scotia Significant Species and Habitats database.
2. Areas identified by WAM to have a depth to groundwater of less than 0.5 m.
3. Areas identified by WAM to have a depth to groundwater of between 0.5 m and 2.0 m and located adjacent to mapped wetlands.
4. Areas of relatively flat land existing between areas identified by the WAM to have a depth to groundwater of less than 0.5 m, or between Nova Scotia Department of Natural Resources mapped wetlands.

All high potential areas were incorporated into the development of a site plan that was then used to develop a field survey strategy.

Field Surveys

The field surveys were completed in August 2012 and April 2013; the surveys were designed to focus on land associated with the proposed WTG location and access road Option 1. The survey area included a 30 m wide easement along proposed access road locations and approximately 2 hectares for the proposed WTG location. Field observations and desktop information were used in combination to establish conservative wetland boundaries.

The following three criteria were used by the field team to determine wetland habitat:

1. Presence of hydrophytic (water loving) vegetation.
2. Presence of hydrologic conditions that result in periods of flooding, ponding, or saturation during the growing season.
3. Presence of hydric soils.

Wetland boundaries were defined within the survey area by completing frequent soil pits to confirm the presence/absence of wetland hydrology and hydric soils. In addition, a general vegetation survey was completed to confirm the presence/absence of hydrphytic vegetation. Watercourses observed within

the assessment area were identified and locations were recorded using a GPS. General characterization of the watercourse, including depth, width, and substrate was also completed.

A formal wetland delineation will be conducted in July 2013.

3.2.6 Flora

The proponent has engaged the services of Strum to conduct a study on the plant species at the Project site. Study methodology includes a desktop review of available information on the plant species within 100 km of the Project site and a field survey.

Desktop Study

Prior to undertaking the field survey, the Atlantic Canada Conservation Data Center (ACCDC) database was reviewed to compile a list of recorded observations of flora species within 100 km of the Project site. This preliminary list was then used to develop a list of plant species of conservation interest that may be present at the Project site. These can be found in Appendix G. For the purpose of the assessment, plant species of conservation interest included:

- Species listed as "Red" or "Yellow" under the Nova Scotia Department of Natural Resources General Status Ranks of Wild Species in Nova Scotia;
- Species assessed as endangered, threatened, or of special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC);
- Species ranked as endangered, threatened or of special concern under the Species at Risk Act (SARA); and/or
- Species protected under the Nova Scotia Endangered Species Act.

The results of the desktop review were then used by botanists to develop a field assessment strategy based on site habitat.

Field Survey

A vascular plant survey was completed in August 2012 within the designated survey area. The survey was designed to focus on those areas of the Project site associated with the proposed WTG location and access road options. The survey area included a 30 m wide easement along the proposed road options, and approximately 2 hectares at the proposed WTG location.

3.3 Methodology of Assessment

The assessment focuses on the evaluation of potential interactions between the VECs and socio-economic aspects with the various Project activities as described in Section 2.

As defined in the Nova Scotia Environment Act:

"Environment" means the components of the earth and includes

(i) air, land and water;
(ii) the layers of the atmosphere; organic and inorganic matter and living organisms;
(iii) the interacting systems that include components referred to in sub clause (i) to (iii); and
(iv) for the purpose of Part IV, the socio-economic, environmental health, cultural and other items referred to in the definition of environmental effect.

"*Environmental Effect" means in respect of an undertaking*

(i) any change, whether positive or negative, that the undertaking may cause in the environment, including any effect on socio-economic conditions, environmental health, physical and cultural heritage or on any structure, site or thing including those of historical, archaeological, paleontological or architectural significance, and;
(ii) any change to the undertaking that may be cause by the environment, whether that change occurs inside or outside the Province.

The assessment is designed to focus on the evaluation of the potential interactions between the VECs and the various Project activities that have been previously outlined in Section 2. The residual environmental effects are those that remain after mitigation and control measures have been applied. The prediction of residual environmental effects follows three general steps.

- Determining whether an environmental effect is adverse;
- Determining whether an adverse environmental effect is significant; and
- Determining whether a significant adverse environmental effect is likely to occur.

The analysis evaluates the interactions between the Project activities and the VECs, and determines the significance of any residual adverse environmental effects, i.e., effects that may persist after all mitigation strategies have been implemented. To determine and appreciate the relevance of residual effects following mitigation, the following definitions of impact have been adhered to:

- *Significant:* Potential impact could threaten sustainability of the resource in the study area and should be considered a management concern;
- *Minor:* Potential impact may result in a small decline of the quality of the resource in the study area during the life of the Project – research, monitoring and/ or recovery initiatives should be considered;
- *Negligible:* Potential impact may result in a very slight decline of the quality of the resource in the study area during the life of the Project – research; monitoring and/ or recovery initiatives would not normally be required;
- *No impact:* the consequences of the Project activity have no effect on the specific VEC; and
- *Beneficial impact:* the consequence of a Project activity enhances the specific VEC.

Further, a review of the effect of the environment on the Project is included in the assessment. This includes climate impact and extreme events.

4.0 Environmental Setting

4.1 Biophysical

4.1.1 Geophysical

The proposed GBWF is located in the Halifax sub-Unit of the Quartzite Barrens. The Quartzite Barrens region is interspersed by exposed quartzite bedrock between areas of deeper glacial till where drumlins of reddish Lawrencetown Till are found, which are derived from eroded sandstones and siltstones. The NSDNR Ecological Land Classification system classifies the Project site as (WMDM) well drained, medium textured soil on drumlins or flutes (NSDNR, 2013a) The GBWF is located approximately 8 km from the Atlantic Ocean and approximately 70 m above sea-level.

The proponent is aware of the provincial regulations under Section 66 of the Nova Scotia Environment Act pertaining to the disposal of sulphide bearing materials (Environment Act, 1994). It has been recognized that the Project site is located adjacent to the sulphide bearing Halifax Slate Formation. This geological formation has been provincially recognized for its composition containing sulphides and its susceptibility to acid generation when exposed to oxygen and water. Geotechnical investigations will screen for the sulphide bearing material and the Proponent will follow the approval and disposal process given the unexpected event that sulphide bearing material be discovered at the Project site.

4.1.2 Atmospheric

The GBWF is located along the eastern shore of the HRM. Climate data was taken from an Environment Canada weather station located at the Shearwater Airport, approximately 27 km west of the Project site. The data collected from Environment Canada representing climate averages and extremes are shown in Table 4-1.

Table 4-1: Shearwater, Nova Scotia Atmospheric Conditions (Environment Canada, 2012).

Parameter	Time Period	Value
Average Daily Temperature (°C)	Yearly Average (1971-2000)	6.7
Extreme Maximum Temperature (°C)	August 10, 2001	33.3
Extreme Minimum Temperature (°C)	February 8, 1994	-26.5
Average Total Rainfall (mm)	Yearly Average (1971-2000)	1254.3
Maximum Daily Rainfall (mm)	August 17, 1981	184.9
Average Total Snowfall (cm)	Yearly Average (1971-2000)	176.4
Maximum Snow Depth (cm)	February 9, 1992	84.0
Prevailing Wind Direction	Yearly Average (1971-2000)	West
Average Wind Speed (km/h)	Yearly Average (1971-2000)	15.1

Parameter	Time Period	Value
Maximum Gust Speed (km/h)	December 1, 1964	150.0

Visibility & Fog

The Project setting is considered rural to the north east and industrial to the west, with little to no presence of artificial lighting. Light pollution from Cole Harbor and Dartmouth would be very minimal and could be considered the only significant sources of artificial light.

According to the internationally-accepted definition of fog, it consists of suspended water droplets or ice crystals near the Earth's surface that lead to a reduction of horizontal visibility to below 1 km (NOAA, 1995). Adverse fog conditions can inhibit avian activities, when structures such as a WTG are introduced into migration flight paths. Environment Canada's database of Canadian Climate Normals 1971-2000 was consulted to provide baseline fog data relevant to the Project site. A weather station at the Shearwater Airport was selected, which is 27 km west of the Project site. Based on this data presented in Table 4-2, fog can be expected to occur 7% of the time, throughout the duration of an average year.

This data will provide background site information for the assessment of the significance of adverse affect on the environment in the VEC analysis section focusing on avian flight.

Table 4-2: Shearwater, Nova Scotia fog data average from 1971 – 2000 (Environment Canada, 2012).

Month	Hours with visibility less than 1 km	% of foggy weather*
January	33.5	4.5
February	33.2	4.8
March	49.6	6.7
April	56.9	7.9
May	89.1	12.0
June	86.8	12.1
July	99.0	13.3
August	72.8	9.8
September	26.4	3.7
October	24.7	3.3
November	23.7	3.2
December	23.8	3.2
Annual	**619.5**	**7.0**

* Based on days/month x 24 hr/day.

Wind Regime

Based on Natural Forces' independent Wind Resource Assessment a wind rose found in Figure 4-1 indicates the prevailing wind at the Project site location. The wind was measured with a pair of

anemometers mounted on a meteorological mast at a height of 60 m for a period from May 18, 2012 to October 14, 2012.

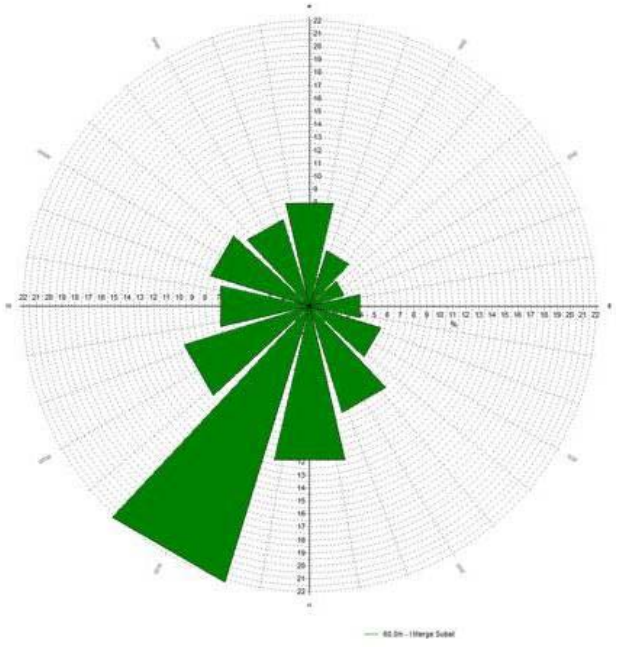

Figure 4-1: Meteorological mast wind rose.

4.1.3 Wetlands and Watercourses

A wetland and watercourse assessment has been conducted by Strum to provide a detailed wetland and watercourse assessment of the Project site. The assessment considered access road design Option 1, crane pad design and WTG foundation footprint in the assessment of potential impact on wetlands and watercourses.

Desktop Review

The majority of areas with high potential for wetland habitat were found to exist via a combination of mapped wetlands and the NSDNR's WAM database. West of the proposed WTG location, high potential for wetland habitat was identified in the same location as a NS Geomatics identified swamp and where the WAM indicated a depth to groundwater of less than 0.5 m. The area connects to two mapped wetlands north of the Project site. In addition, WAM indicated that these wet areas likely connect to the Chezzetcook River located to the west of the Project site.

Field Surveys

Wetland and watercourse field surveys were completed in August 2012 and April 2013. Between the two surveys a total of nine wetlands were recorded and three water courses. The WTG location and crane pad were surveyed were surveyed on both occasions and as a result, no wetlands or watercourses

were identified. Figure 4-2 represents the wetlands and watercourses that have been identified at the Project site during both the August 2012 and April 2013 surveys.

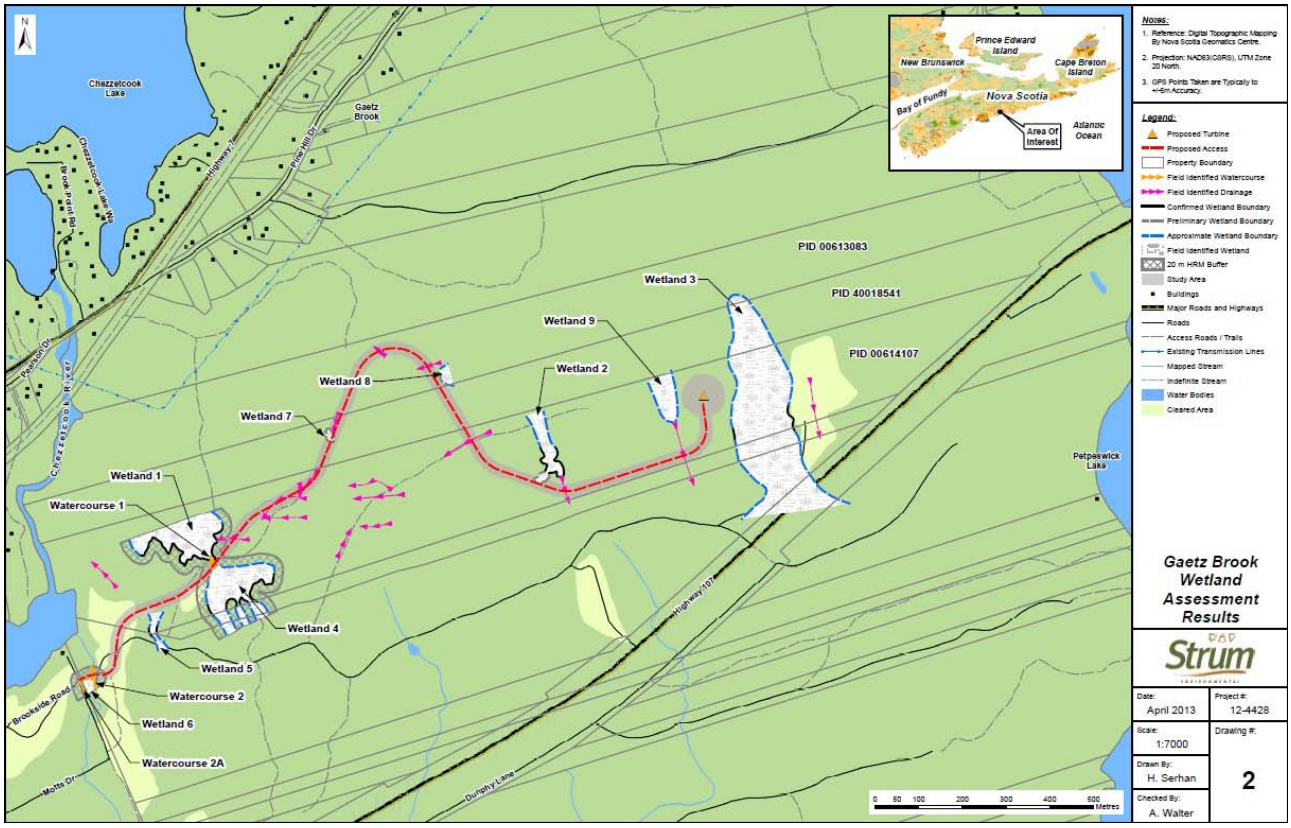

Figure 4-2: Wetland and Watercourses at Project site (Strum , 2013).

Based on the current development footprint with access road Option 1, five wetlands (Wetlands 1, 2, 4, 6 and 7) and three watercourses (Watercourse 1, 2 and 2a) may be potentially influenced by the construction of the access road. No wetlands or water courses will be impacted by the turbine lay-down pad. Table 4-3: Description of wetlands found at Project site presents a description of all wetlands and watercourses identified at the Project site as well as a brief description of the potential impact that may incur.

Table 4-3: Description of wetlands found at Project site (Strum Wetland & Watercourse Survey, 2012/2013).

Water Feature ID	Impacted by Project	Description
Wetland 1 (Appendix F: Photo 1)	Southern region of wetland potentially impacted by road construction.	Treed swamp area with cinnamon fern, three seeded sedge, speckled alder, red maple, black spruce and balsam fir. Watercourse 1 enters wetland 1 from beyond the southern wetland boundary.

Water Feature ID	Impacted by Project	Description
Wetland 2 (Appendix F: Photo 2)	Southern region of wetland potentially impacted by road construction.	Shrub swamp area with cottongrass, woolgrass, cinnamon fern, black spruce and red maple. Drainage from weeds road provides source of water
Wetland 3	No impact.	Treed swamp area with cinnamon fern, Canada holly, black spruce and red maple. No observed source of water but likely sourced by an area of open water to the north and/or connected to a watercourse.
Wetland 4 (Appendix F: Photo 3)	Northern region of wetland potentially impacted by road construction.	Shrub swamp area with three seeded sedge, cinnamon fern, woolgrass, soft rush, eastern larch, balsam fir and red maple. No observed source of water but drains into watercourse 1 to the north.
Wetland 5	No Impact.	Shrub swamp area with cinnamon fern, Canada holly and red maple. Source of water was determined to be a drainage channel south of the Project site boundary.
Wetland 6	Northern region of wetland potentially impacted by road construction.	The northern edge of this shrub swamp wetland may be impacted by road construction. Watercourse 2 and 2a flow through this wetland,
Wetland 7 (Appendix F: Photo 4)	Eastern region of wetland potentially impacted by road construction.	The eastern edge of this treed swamp wetland may be impacted by road construction,
Wetland 8 (Appendix F: Photo 5)	No Impact.	This treed swamp wetland will not be impacted by the Project footprint.
Wetland 9	No Impact.	This bog wetland will not be impacted by the Project footprint.
Watercourse 1 (Appendix F: Photo 1)	Watercourse potentially impacted by road construction.	Wetland 4 drains into this watercourse beneath an existing road via culvert and then flows through wetland 1. Direction of flow is south to north.
Watercourse 2 (Appendix F: Photo 8)	Watercourse potentially impacted by road construction.	Flows through wetland 6, merges with watercourse 2a, and then passes beneath Brookside Road via a culvert. Direction of flow is south to north.
Watercourse 2a (Appendix F: Photo 8)	Watercourse potentially impacted by road construction.	Flows beneath Motts Drive through culvert into Wetland 6 and then merges with watercourse 2. Direction of flow is west to east.

Provincial and Municipal Regulations

The Proponent is aware of the Nova Scotia Wetland Alteration Approval process and that it defines the following four activities as wetland alteration:

1. Filling;
2. Draining;
3. Flooding; and
4. Excavating.

If wetland and watercourse alteration is required the Proponent will follow the provincial permitting requirements and acquire the necessary permits in advance. Further, confirmation of wetland and watercourses will be completed during the growing season, defined as June 1 to September 30. The water features at the Project site have been classified according to the HRM water course definition. Accordingly, appropriate 30 m buffer requirements have been applied to wetland boundaries and watercourses as represented in drawing 2 of Appendix H.

The Proponent will continue to optimize the access road throughout the design phase such that it minimizes the potential impact on the identified wetland and watercourses.

4.1.4 Avian Study

Five avian surveys were completed by Strum; these consisted of breading season, shorebird, fall migration, winter resident and spring migration surveys. The detailed results from the Avian Survey can be found in Appendix B.

Breeding Season Survey

The breeding bird survey consisted of 14 point count surveys at seven locations. A total of 53 species were observed during the breeding season surveys, consisting of 1,141 individual birds. A total of 12 of these species were considered "confirmed" breeders, while 19 were considered at least "probable" breeders. On average, 81 birds were detected per survey, with an average of 21 species detected per survey.

Species observed during the fall migration surveys were screened against the criteria outlined in the NSE document *A Guide to Addressing Wildlife Species and Habitats in an EA Registration Document* to develop a list of priority species. The priority species observed during the breeding season surveys are listed in Table 4-4.

Table 4-4: Priority species observed during breeding season survey.

Common Name	Scientific Name	NSDNR Rank (NSDNR, 2010)
Canada Warbler	*Wilsonia canadensis*	Red

Common Name	Scientific Name	NSDNR Rank (NSDNR, 2010)
Common Loon	*Gavia immer*	Red
Common Snipe	*Gallinago gallinago*	Yellow
Golden-crowned Kinglet	*Regulus satrapa*	Yellow
Pine Siskin	*Spinus pinus*	Yellow
Ruby-crowned Kinglet	*Regulus calendula*	Yellow
Tree Swallow	*Tachycineta bicolor*	Yellow
Willet	*Tringa semipalmata*	Red
Wilson's Warbler	*Wilsonia pusilla*	Yellow
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Yellow

The habitat diversity at the Project site accounts for the density of breeding passerines observed, particularly those commonly associated with regenerating/shrubby habitat, such as Alder Flycatcher (*Empidonax alnorum*), American Robin, Hermit Thrush (*Catharus guttatus*), Magnolia Warbler and White-throated Sparrow. Treed swamp and coniferous forest habitat supports relatively high densities of breeding Common Yellowthroat and Dark-eyed Junco (*Junco hyemalis*). The Project site generally lacks mature forest, which likely accounts for the absence and/or low density of breeding woodpeckers and birds of prey. Similarly, the Project site is of limited use to most breeding aerial insectivores, including swallows and swifts, due primarily to the lack of open-water bodies.

Shorebird Surveys

The shorebird survey consisted of seven watch counts, carried out at six locations. A total of 13 species, consisting of 1,008 individual birds were recorded during the shorebird watch counts. Semipalmated Plover and Semipalmated Sandpiper were the most abundant species. Herring Gull and American Black Duck were the most frequently observed species. Average shorebird abundance at the Project site was 38 birds, compared to 236 in the areas surrounding the Project site. This was due primarily to single observations of large flocks of Semipalmater Plover and Semipalmated Sandpiper along the Chezzetcook Inlet to the south of the Project site. These large observations also account for the high degree of variability observed in the numbers of birds/survey in the land surrounding the Project site. The priority species observed during the shorebird surveys are listed in Table 4-5.

Species observed during the shorebird surveys were screened against the criteria outlined in the NSE document *A Guide to Addressing Wildlife Species and Habitats in an EA Registration Document* to develop a list of priority species. The priority species observed during the breeding season surveys are listed in Table 4-5.

Table 4-5: Priority species observed during shorebird survey.

Common Name	Scientific Name	NSDNR Rank (NSDNR, 2010)
Greater Yellowlegs	*Tringa melanoleuca*	Yellow
Semipalmated Sandpiper	*Calidris pusilla*	Yellow

Common Name	Scientific Name	NSDNR Rank (NSDNR, 2010)
Spotted Sandpiper	*Actits macularius*	Yellow
Willet	*Tringa semipalmata*	Red

Birds observed from survey locations at the Project site were generally flying in a south/southeast direction, but were passing over lands to the south/southwest of the site. The results of the shorebird watch counts suggest that the Project site does not appear to be of importance to roosting shorebirds or staging waterfowl, and does not lie within an important flyway for shorebird or waterfowl migrants in the fall. While shorebird activity was relatively high at coastal inlets to the south of the Project site, the habitats are not favorable for roosting during high tide periods when foraging is limited. Likewise, the lack of open-water bodies at the Project site means that waterfowl species are unlikely to use the site directly. Full shorebird survey results can be found in Appendix B.

Fall Migration Survey

The fall migration survey consisted of 18 stop over count surveys at 18 different locations. A total of 51 species, consisting of 1,014 individual birds were recorded during the fall surveys. On average, 56 birds were detected per survey, with an average of 13.5 species detected per survey. A total of 38 of the species recorded during the fall migration surveys were also present during breeding season surveys.

Species observed during the fall migration surveys were screened against the criteria outlined in the document "A Guide to Addressing Wildlife Species and Habitats in an EA Registration Document" (NSE, 2009) to develop a list of priority species. The priority species observed during the fall migration surveys are listed in Table 4-6.

Table 4-6: Priority species observed during fall migration survey.

Common Name	Scientific Name	NSDNR Rank (NSDNR, 2010)
Blackpoll Warbler	*Dendroica striata*	Yellow
Boreal Chickadee	*Poecile hudsonicus*	Yellow
Common Loon	*Gavia immer*	Red
Common Nighthawk	*Chordeiles minor*	Red
Golden-crowned Kinglet	*Regulus satrapa*	Yellow
Gray Jay	*Perisoreus canadensis*	Yellow
Pine Siskin	*Spinus pinus*	Yellow
Ruby-crowned Kinglet	*Regulus calendula*	Yellow

Surveys indicate that the Project site is used by both resident and migrant species during September and October; the peak of fall migration for insect and seed eating passerines in Atlantic Canada. Resident species or at least those that commonly over-winter in Nova Scotia were dominant during the fall migration surveys. These species, which include American Crow, Black-capped Chickadee, Boreal Chickadee, and Golden-crowned Kinglet, were dominant at the Project site. Most migrant flocks were

relatively small, and no obvious migration corridors were indicated by the surveys. Full fall migration survey results can be found in Appendix B

Winter Survey

The winter survey consisted of 7 area search surveys, at seven different locations. There were 10 species, consisting of 68 individual birds, recorded during winter surveys. On average, 10 birds were detected per survey, with an average of 4 species detected per survey.

Species observed during the fall migration survey were screened against the criteria outlined in the document "A Guide to Addressing Wildlife Species and Habitats in an EA Registration Document" (NSE, 2009) to develop a list of priority species. The priority species observed during the winter surveys are listed in Table 4-7.

Table 4-7: Priority species observed during winter migration survey.

Common Name	Scientific Name	NSDNR Rank (NSDNR, 2010)
Boreal Chickadee	*Poecile hudsonicus*	Yellow
Golden-crowned Kinglet	*Regulus satrapa*	Yellow
Gray Jay	*Perisoreus canadensis*	Yellow

Spring Migration Survey

The spring migration survey consisted of 53 point count surveys, at 13 different locations. On average, 18 birds were detected per survey, with an average of 10 species detected per survey.

Species observed during the spring migration surveys were screened against the criteria outlined in the document "A Guide to Addressing Wildlife Species and Habitats in an EA Registration Document" (NSE, 2009) to develop a list of priority species.

Common Name	Scientific Name	NSDNR Rank (NSDNR, 2010)
Blackpoll Warbler	*Dendroica striata*	Yellow
Canada Warbler	*Wilsonia canadensis*	Red
Boreal Chickadee	*Poecile hudsonicus*	Yellow
Golden-crowned Kinglet	*Regulus satrapa*	Yellow
Gray Jay	*Perisoreus canadensis*	Yellow
Common Loon	*Gavia immer*	Red
Tennessee Warbler	*Oreothlyopis peregrine*	Yellow
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Yellow

Early spring migrants, most notably White-throated Sparrow, Palm Warbler (*Dendroica palmarum*), and Yellow-rumped Warbler, are common at the Project site in early May, while the migrant pulse of wood warblers reached the site by the May 22, 2013 survey. By early June, reasonable numbers of Magnolia

Warbler, Common Yellowthroat, Black-throated Green Warbler, and Black-and-white Warbler (*Mniotilta varia*) are present, which is consistent with observations during the 2012 breeding season. The close proximity of the Project site to the coast likely accounts for the presence of Blackpoll Warbler and Fox Sparrow (*Passerella iliaca*) although in very low numbers. Full spring migration survey results can be found in Appendix B

4.1.5 Bats

The desktop study completed by Strum identified one bat hibernacula within 20 km of the Project site. Lake Charlotte Gold Mine is an abandoned gold mine located 17.7 km east and is known to support *Myotis* species hibernation. The field surveys of bat migration and habitat use were carried out from August 30, 2012 to October 3, 2012 using an AnaBat Detector system. The bat survey recorded 4,087 ultrasound files, of which 10 were determined to be bat generated ultrasound. All remaining files were determined to be extraneous noise likely caused by rustling vegetation, precipitation or wind gusts. It should also be noted that echolocation calls were only recorded on the nights after the re-installation of the detector upon the discovery of malfunction. All calls were recorded between September 15 and September 23 and all but one was associated with *Myotis* species bats (i.e., Little brown myotis and Northern long-eared myotis). Activity was highest between September 15 and September 17, during which 7 of the 10 bat calls were recorded.

Additional Surveys

Based on conversations with DNR's Species at Risk Biologist it has been determined that the last week in August to the second or third week of September is the ideal time frame to conduct effective bat monitoring. In light of this conversation, the Proponent has initiated additional bat surveys scheduled to start during the week of August 19 - 23, 2013 and will continue for several weeks to encompass the ideal bat monitoring time frame. While the 2012 bat survey started mid-week during the last week of August, the survey did not indicate a high presence of bats at the project site. It is not expected that the 2013 survey will indicate a high presence of bats at the Project site, as a result it is not expected that the site sensitivity will increase.

Once the additional bat survey is complete, it will be submitted to the Technical Review Committee.

4.1.6 Flora

Results of the flora desktop review indicated that 250 vascular flora species have been identified within 100 km of the Project site. Of the 250 vascular plant species identified by ACCDC, 168 vascular species of conservation interest were identified within 100 km of the Project Site. No vascular plant species of conservation interest were observed during the plan survey. The full vascular plant study can be found in Appendix G; within this Appendix Table 2 presents a full list of observed vascular plant species at the Project site.

The vascular plant survey encompassed four habitat types, these are:

1. Roadside and disturbed areas;
2. Regenerating forests;
3. Upland forests; and
4. Wetlands.

Roadside and Disturbed Areas

Roadsides have diverse weedy plant communities of annuals and short-lived perennials. Depressions in these areas form pools and ditches that feature cattails (*Typha latifolia*), woolgrass (*Scirpus cyperinus*), bone set (*Eupatorium perfoliatum*) and spikerus (*Eleocharis ovate*). Grassland communities were encountered that were composed primarily of exotic species such as creeping white clover (*Trifolium repens*), timothy grass (*Phleum arvense*), sheeps fescue (*Festuca ovina*), mouse-eared hawweed (*Hieracium pilosella*), and knapweed (*Centaurea nigra*). Such disturbed grasslands often have uncommon native orchids, however, these areas were searched and no plants of uncommon or rare ranking were discovered.

Regenerating Forests

Away from zones of disturbance, the landscape has been clear-cut and regrowth is dominated by shrubs [sheep laurel (*Kalmia angustifolia*), lowbush blueberry (*Vaccinium angustifolium*), velvet-leaf blueberry (*V. myrtilloides*), and false holly (*Nemopnathus mucronata*)], herbs [bracken fern (*Pteridium aquilinum*), wild sarsaparilla (*Aralia nudicaulis*), bunchberry (*Cornus Canadensis*), and pink lady's-slipper (*Cyprepedium acaule*)], and trees [red maple (*Acer rubrum*), balsam fir (*Abies balsamea*), white spruce (*Picea glauca*)]. In wetter regrowth areas, vegetation was somewhat different and includes shrubs [false holly, Canada holly *(Ilex verticillata*), black huckleberry (*Gaylusacia baccata*), foxberry (*Vaccinium vitis-idaea*), Blanchard's dewberry (*Rubus recurvicularis*)], herbs [cinnamon fern (*Osmunda cinnamomea*), clintonia lily (*Clintonia borealis*), Canada mayflower *(Maianthemum canadense*), teaberry (*Gaultheria hispidula*), three seeded sedge (*Carex trisperma*), and three seeded sedge (*Carex canescens*)] and trees [eastern larch (*Larix laricina*) and black spruce (*Picea mariana*)].

Upland Forests

Upland forest habitats were, in general, of low diversity and of early successional stage. Typical forest cover was made up of balsam fir, red maple, and spruce (white and red). There were usually clearings in these stands in which a dense growth of hay-scented fern dominated the area.

Except for wetland areas, forest soils were not rich. Where soils were richer, yellow birch (*Betula allegheniensis*) was more common.

Wetlands

Wetland consisted of red maple/eastern larch associations with a speckled alder (*Alnus incana*) balsam fir, black spruce, eastern larch and false holly understory. Diversity in wetland conditions throughout

the survey area was observed. Some of the larger areas incorporated a range of flooding conditions that included bare muck areas. Woody cover was generally red maple and eastern larch with an understory of speckled alder. Common herbs include rattle snake grass (*Glyceria canadensis*), tall meadow rue (*Thalictrum pubescens*), and cinnamon fern. Treed swamps of balsam fir, black spruce and eastern larch had a range of hydrological indicators including imperfectly drained soils and standing water around tip-ups of old balsam fir trees that supported burreed (*Sparganium americanum*), three seeded sedge, and crested fern (*Dryopteris cristata*). A larch/red maple swamp located in northwestern portions of the Project site showed signs of previous landscape disturbance as the area had large amounts of cattail and softrush (*Juncus effuses*). Evidence of black spruce, eastern larch and false holly associations may represent swamp/treed fen transitions in wetter portions of the site. Other common species within the wetlands included leatherleaf (*Chamaedaphne calyculata*), withered (*Viburnum nudum*), speckler alder, rhodora (*Rhododendron canadense*) and Canada holly. Sphagnum cover was widespread throughout wetlands and a collection of wetland plants grew with wet woodland plants.

Proposed Turbine Locations

The habitat surrounding the proposed WTG location is balsam fir woodland coinciding with red maple and red spruce subordinates. The forest is immature and large stumps from the former tree cohort are in evidence. The ground flora consists of small herbs [rose twisted stalk (*Streptopus roseus*), starflower, partridge berry (*Mitchella repens*), one sided wintergreen (*Orthilia secunda*), ghost plant (*Monotropa uniflora*), dutchman's pipe (*Monotropa hypopithys*), and snowberry], ferns [wood fern (*Dryopteris intermedia*) and cinnamon fern], and occasional shrubs (leather leaf and false holly). A deep layer of schreber's moss (*Pleurozium shreberi*) and patches of *Bazzania* were also present.

4.1.7 Fish and Fish Habitat

There are three watercourses that have been identified in the western region of the Project site. It is assumed for the purpose of this EA that all watercourses are 'fish bearing' and will be treated as such throughout the development phase.

In the Chezzetcook Lake and Petpeswick Lake, typical freshwater fish species may include Perch, Trout, Small Mouth Bass and Gaspreau (NS Fishing, 2013).

Common Name	Scientific Name	NSDNR (NSDNR, 2010)	COSEWIC (COSEWIC, 2012)	SARA (SARA, 2012)
White Perch	*Morone americana*	Green	Not Listed	Not Listed
Yellow Perch	*Perca flavescens*	Green		Not Listed
Brook Trout	*Salvelinus fontinalis*	Green	Not Listed	Not Listed
Smallmouth Bass	*Micropterus dolomieu*	Green	Not Listed	Not Listed
Gaspreau (Alewife)	*Alosa pseudoharengus*	Yellow	Not Listed	Not at Risk

Watercourse alteration may be required if the access road design Option 1 entering from the south-western region of the Project site is used. Watercourse alterations that pose potentially impact to fish and fish habitat, if necessary, will be minor, controlled and will follow all requirements of the *Fisheries Act*.

4.1.8 Species at Risk

Plants

A vascular plant survey was completed in August 2012 by Strum. The objective of this survey was to determine if any rare plants exist at the Project site. No plant species of conservation interest were observed during the plant survey. This includes federal SARA-listed and COSEWIC assessed species, species listed under the Nova Scotia Endangered Species Act, and Red and Yellow-listed species under NSDNR General Status Ranks of Wild Species in Nova Scotia.

Birds

During the pre-construction bird surveys, 13 avian species observed were listed as Yellow and four birds listed as Red. Table 4-8 provides a list of the species at risk that have been observed at the Project site.

Table 4-8: Identified birds at risk.

Common Name	Scientific Name	NSDNR (NSDNR, 2010)	COSEWIC (COSEWIC, 2012)	SARA (SARA, 2012)
Blackpoll Warbler	*Dendroica striata*	Yellow	Not Listed	Not Listed
Boreal Chickadee	*Poecile hudsonicus*	Yellow	Not Listed	Not Listed
Golden-crowned Kinglet	*Regulus satrapa*	Yellow	Not Listed	Not Listed
Gray Jay	*Perisoreus satrapa*	Yellow	Not Listed	Not Listed
Pine Siskin	*Spinus pinus*	Yellow	Not Listed	Not Listed
Ruby-crowned Kinglet	*Regulus calendula*	Yellow	Not Listed	Not Listed
Common Snipe	*Gallinago gallinago*	Yellow	Not Listed	Not Listed
Tree Swallow	*Tachycineta bicolour*	Yellow	Not Listed	Not Listed
Wilson's Warbler	*Wilsonia pusilla*	Yellow	Not Listed	Not Listed
Yellow-bellied Flycatcher	*Empidonax flaviventrius*	Yellow	Not Listed	Not Listed
Greater Yellowlegs*	*Tringa melanoleuca*	Yellow	Not Listed	Not Listed
Semipalmated Sandpiper	*Calidris pusilla*	Yellow	Not Listed	Not Listed
Spotted Sandpiper	*Actits macularius*	Yellow	Not Listed	Not Listed
Common Loon	*Gavia immer*	Red	Not Listed	Not Listed
Common Nighthawk	*Chordeiles minor*	Red	Threatened	Threatened
Canada Warbler	*Wilsonia pusilla*	Red	Threatened	Threatened
Willet	*Tringa semipalmata*	Red	Not Listed	Not Listed

* Identified offsite in shorebird survey

Mammals

In conversation with NSDNR's species at risk biologist moose species *Alces alces americana* is identified as a species at risk in Nova Scotia. From the conversation with NSDNR it has been determined that the Project is not located in an identified moose habitat region. As a result, no moose surveys were conducted for the purpose of the Project.

Observations of Little Brown Bat (*Myotis lucifugus*) and Northern Long-eared Bat (*Myotis septentrionalis*) were recorded on 10 occasions. Due to the similarity of their echolocation calls it was not possible to distinguish the two apart. Both species are listed as "Yellow" by the NSDNR, impact assessment and mitigative measures are discussed in section 6.2.

4.2 Socio-economic

4.2.1 Community

The community of Gaetz Brook and surrounding communities of Porters Lake, Musquodoboit Harbour and Chezzetcook has a population of approximately 10,000 people. Based on the 2011 Census of Population the population consists of approximately 42% under the age of 34, 34% between the ages of 35 and 55 and 24% over the age of 55 (Statistics Canada, 2011).

While the community is small, sparsely spaced rural development points of interest within the community include a community center, firehall and Gaetz Brook Junior High SchoolEastern Shore Industrial Park is located immediate west of the Project site which is used for small scale fabrication and other local industrial businesses. There are a total of 338 dwellings within a 2,000 m radius of the proposed WTG location

4.2.2 Cultural Resources, Heritage Sites and Archaeological Sites

The Proponent has involved Davis MacIntyre & Associates Limited for the purpose of carrying out an Archaeological Resource Impact Assessment. The following historical information was recovered during this assessment; the full impact assessment can be found in Appendix E.

Desktop Study

There is very little documented in the history annals about the area of Gaetz Brook. The majority of existing information comes from historic maps dating from the last half of the 19th century and the very early 20th century. It was probably originally part of the district of Chezzetcook. Early land grants in the study area indicate that John Pettipas was a grantee. Pettipas, along with five other men, their wives, and children (the total amounting to 39 persons) applied to the government in 1787 for a grant of land on the east side of Chezzetcook Harbour, which they had been settled on for a number of years previous and which they had cleared and improved. They were subsequently notified that the land had been previously granted to Captain Allan and others in 1765, although it was reported that Allan and the earlier grantees had made no improvements upon the land.

In 1671 it was reported that 13 people were living at Chezzetcook, all of which were Acadians. In 1745, a man and three children were reportedly settled in Chezzetcook and in 1748 there were seven or eight families. In 1749, the year Halifax was founded; Governor Cornwallis reported that there were a few French families on each side of Chezzetcook Bay, about three leagues inland.

The first Acadian recorded by name in Chezzetcook was Claude Pettipas. Pettipas was married to Marie-Thérèse Amérindienne, a Mi'kmaq qoman. They settled in Chezzetcook sometime between 1686 and 1708. Marie Thérèse died sometime prior to 1713 and Claude relocated to Port Toulouse (St. Peter's, Cape Breton) and remarried. Acadians were expelled from British territory in 1755 but in 1768, authorities in Halifax began to issue licenses of occupation to Acadians. Two of Claude's children from his second marriage (Jean Baptise and Joseph) made their way to Chezzetcook and settled, first as squatters but eventually were given proper title. Presumably the John Pettipas that petitioned for land in 1787 is Jean Baptiste as he is listed in the 1768 census of Chezzetcook. John owned the land on which the WTG is proposed. It is not known if he settled this land, however, as he and others were also granted several lots of land to the south.

The village around the study area was eventually named Gaetz Brook after the Gates family. Joseph G. Gates received a grant of 100 acres in 1899 and in 1914 Henry and John Gates received 150 acres. The Gates family operated an inn for many years. Beyond that, little is known of the small community. Ambrose F. Church's map of Halifax County, published in 1865, does not indicate any settlement in the study area. The nearest settlement was to the north, along the south east shore of Chezzetcook Lake and along both sides of Petpeswick Inlet where the main roads ran.

Gold mining operations began in the area of Catcha Lake to the south of the study area and are still carried on today, although activity and settlement does not appear to have extended into the study area.

Field Reconnaissance

An archaeological field reconnaissance was conducted by April MacIntyre and Stephen Davis on September 17, 2012. As the location of the access road was not known at the time of the reconnaissance, only the area around the proposed WTG site was investigated. The site was accessed off the north side of Highway 107 on an old road that leads into an area that has been quarried, likely for construction of the highway. The road into the quarry is constructed of several meters of fill on which the meteorological mast has been constructed. Large glacial erratic can be seen on the surface and the site has been clear cut about 10 to 12 years ago with secondary growth reclaiming the area. Spruce and maple predominate. To the south of the proposed WTG site towards the highway there is a wetland. There was no evidence of past cultural use and the area affords little to have attracted First Nations settlers, although it is acknowledged that the wetlands may have been used for hunting and gathering. Archaeological evidence of such activity, however, is unlikely to exist.

4.2.3 Mi'kmaq Ecological Knowledge Study

Review of Available Data

Discussions were held with researchers from the Gorsebrook Institute and the Treaty and Aboriginal Rights Center. It was noted that research is still ongoing and as a result, information is not available for public release through a MEKS at this time.

Discussions with the participants of the community workshop, as well as other Band members contacted directly by AMEC's Mi'kmaq specialist, indicated that due to the long distance to the project site that the majority of hunters, fishers and harvesters in the community were not currently frequenting the Project area for traditional harvesting activities. Although members of the Band have historically travelled to these areas and hold interest in the area, the close proximity of the site to active residential developments make it less desirable for harvesting activities.

Conversation with individuals from other First Nation's also indicated that there has been little recent harvesting activity in the area near the Project site. Thus participation in the workshop would be unnecessary. Active hunters from the Acadia Band travel to Sheet Harbour and Musquodoboit to hunt. It is important to acknowledge the long-standing relationship the Mi'kmaq have with Mi'kma'ki and locally, the study areas. This intimate relationship is not defined solely by the current use and occupation of a geographical area but by the extensive awareness and interests the Mi'kmaq hold of regional resources. Therefore, the current absence of Mi'kmaq from an area should not be mistaken for an absence of interest (current and future) of the area and resources located within the study areas.

The general attitude towards the GBWF development was positive; many participants supported development of non-carbon based or 'green' energy sources. Some concern was expressed over the

benefits from the project to the local community. Another issue was raised was the potential impacts of the WTG on local wildlife migratory patterns, particularly winged species such as birds, bats and insects. Potential impacts on the Mi'kmaq residents such as noise were not of concern due to the distance from the Band's reserve lands.

Field Survey

A total of 24 plant species of cultural or medical significance to the Mi'kmaq were recorded during the 2012 survey of the study area in October 2012. The complete vegetation survey conducted by Strum conducted in August 2012 was consulted to check for additional species of Mi'kmaq cultural significance. This yielded an additional six species, for a total of 30 species of Mi'kmaq cultural significance. Table 4.1 in Appendix E provides a list of all significant plant species encountered in the study area during both surveys along with the associated habitat in which they were recorded.

A review of the historical use of wildlife and fish resources by Mi'kmaq, combined with known wildlife habitat preferences and the result of the habitat surveys, allowed a determination of wildlife species potentially using the project site. These species are presented in Table 4.2 of Appendix E. As the site does not support any coastal or marine habitat, there is no habitat for edible marine or coastal fish, invertebrate, mammal, or bird species which rely on these habitats. Freshwater habitat on the site is minimal at best and is unlikely to support edible fish species. A few resident edible bird species, primarily Ruffed and Spruce Grouse, may occur on site in the wooded areas. Waterfowl use of the site is limited, as there are no suitable water bodies.

4.2.4 Noise

Sound pressure level is the force of sound on a surface area. This is measured in dB(A); dB or decibels is a logarithmic unit that is used to measure SPL and (A) is the weighting applied to denote, as perceived by humans. Nova Scotia does not currently have any regulations pertaining to maximum sound pressure levels (SPL) required at receptor locations near wind farms; further, the HRM Land Use By-law for Planning District 8 & 9 does not specify any restrictions pertaining to SPLs relating to WTG activities. As a best practice effort, the Proponent has followed the *Ontario Noise Guidelines for Wind Farms* as a guideline regarding acceptable noise emission from the GBWF. The Ontario guidelines present a 40 dB(A) SPL as the maximum exposure level for a noise receptor (Ministry of the Environment, 2008).

A noise assessment was completed for the GBWF using WindPRO software; the software uses ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors standards. By making conservative estimates of factors contributing the SPLs of the WTG, the model yields results that represent a worst case scenario. A WTG hub height of 98 m was used with a SPL of 105 dB(A) being produced from the turbine nacelle, located at the hub height. A total of 338 receptor points were used to represent 338 dwellings within a 2,000 m range of the proposed turbine locations. The model was run using a single turbine layout with no added vegetation layer for conservative results. The closest receptor is located 1006 m from a turbine, this receptor was subjected to a maximum SPL of 34.0 dB(A). Table 4-9 presents

a summary of the 15 closest receptors to the WTG and the maximum SPL that may be experienced under a worst case scenario. The full noise impact assessment can be found in Appendix H.

Table 4-9: SPL from WTG at receptor locations

Point of Reception ID	Distance from Receptor to nearest WTG (m)	Maximum Sound Pressure Level dB(A)
KR	1006	34.0
DZ	1009	34.0
ED	1010	34.0
LQ	1014	33.9
FB	1038	33.7
EF	1041	33.7
KF	1048	33.6
KK	1065	33.4
DQ	1071	33.3
KB	1074	33.3
DO	1077	33.3
LR	1079	33.3
IF	1085	33.2
IE	1087	33.2
KQ	1089	33.2

4.2.5 Visual

ReSoft Ltd WindFarm software was used to create a photomontage of the GBWF. Two locations were chosen to present a predicted view of the wind farm using a 98 m hub height; Figure 4-3 taken from Highway 107 looking northeast at the Project site and Figure 4-4 taken from Marine Drive Looking south across Petpeswick Lake towards the Project site.

Figure 4-3: Predicted view from Highway 107 looking northeast approximately 2.3 km from the proposed WTG location.

Figure 4-4: Predicted view from Marine Drive looking South across Petpeswick Lake approximately 2.5 km from the proposed WTG location.

4.2.6 Shadow Flicker

The Proponent has undertaken a shadow flicker impact assessment for the GBWF to assess the potential impact of shadow flicker on the surrounding shadow receptors. Shadow flicker is the change in light received by a receptor due to a WTG blade impeding the light path between the sun and the receptor. As there are few federal, provincial or municipal guidelines or policies for governing or quantifying what is an acceptable amount of shadow flicker, the German standards, *Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergianlagen* have been adopted for the purpose of this study and are generally used within the wind energy industry as standard guidelines. These guidelines, based on astronomic worst case scenario suggest that acceptable levels at each shadow receptors are:

- No more than 30 hours per year of astronomical maximum shadow (worst case); and
- No more than 30 minutes on the worst day of astronomical maximum shadow (worst case).

The guidelines also specify two factors that limit the shadow flicker effect, due to optic conditions in the atmosphere:

1. The angle of the sun over the horizon, which must be at least 3 degrees; and
2. The blades of the WTG must cover at least 20 % of the sun.

Receptors not exposed to more than 30 minutes per day on the worst affected day or a total of 30 hours per year from all surrounding wind turbines are considered unlikely to require technical mitigation.

Receptors used in the shadow flicker assessment are at the same locations used for the noise assessment; this being a total of 338 receptors representing 338 dwellings. The model was run with WindPRO software to predict astronomical worst case shadow flicker at each receptor in terms of total hours per year, days per year, and maximum minutes per day. Table 4-10 presents a summary of the results; receptors with no predicted shadow flicker have been condensed to reduce paper usage. Receptors may not experience any shadow flicker at all as the model uses conservative assumptions, which is described in detail in the full shadow flicker impact assessment in Appendix I.

Table 4-10: Predicted maximum worst case shadow flicker results summary.

	Predicted astronomical worst case shadow flicker at receptors		
Receptor ID	**Total hrs/yr (hr : min)**	**Days/year**	**Max min/day (hr : min)**
A to AL	0:00	0	0:00
AM	3:01	16	0:14
AN	3:04	18	0:14
AO	3:00	17	0:14
AP	3:00	17	0:14
AQ	3:40	21	0:14

	Predicted astronomical worst case shadow flicker at receptors		
Receptor ID	**Total hrs/yr (hr : min)**	**Days/year**	**Max min/day (hr : min)**
AR	3:14	18	0:14
AS	3:37	21	0:14
AT	3:13	18	0:14
AU	3:24	18	0:14
AV	0:00	0	0:00
AW	3:19	18	0:14
AX	3:21	19	0:14
AY	3:24	19	0:14
AZ	3:30	19	0:14
BA	3:30	18	0:15
BB	3:24	19	0:14
BC	3:31	19	0:15
BD	3:32	19	0:15
BE	3:33	19	0:15
BF	3:32	19	0:15
BG	6:16	33	0:15
BH	3:35	19	0:15
BI	3:40	20	0:14
BJ	3:37	19	0:15
BK	3:38	19	0:15
BL	3:39	19	0:15
BM	3:37	20	0:15
BN	3:40	20	0:14
BO	3:40	20	0:15
BP	5:33	28	0:16
BQ	3:45	19	0:15
BR	3:48	19	0:15
BS	3:45	19	0:15
BT	3:50	20	0:15
BU	3:52	19	0:16
BV	3:56	19	0:16
BW	3:54	20	0:15
BX	4:04	20	0:16
BY	3:54	20	0:15
BZ	4:06	20	0:16
CA	4:03	20	0:16

	Predicted astronomical worst case shadow flicker at receptors		
Receptor ID	**Total hrs/yr (hr : min)**	**Days/year**	**Max min/day (hr : min)**
CB	4:02	20	0:16
CC	4:20	21	0:16
CD	4:27	21	0:16
CE	4:25	21	0:17
CF	4:27	21	0:16
CG	4:35	21	0:17
CH	4:44	22	0:17
CI	4:47	22	0:17
CJ	4:51	22	0:17
CK	4:51	22	0:17
CL	4:52	22	0:17
CM	4:46	22	0:17
CN	4:51	22	0:17
CO	4:58	23	0:17
CP	5:02	23	0:17
CQ	5:00	23	0:17
CR	5:12	24	0:17
CS	5:12	22	0:18
CT	5:13	23	0:17
CU	5:17	23	0:18
CV	5:30	23	0:18
CW	0:00	0	0:00
CX	5:39	25	0:18
CY	7:12	34	0:17
CZ	5:35	24	0:18
DA	8:06	38	0:16
DB	5:38	23	0:19
DC	6:23	30	0:17
DD	6:24	29	0:17
DE	5:56	25	0:18
DF	5:56	24	0:19
DG	6:04	26	0:18
DH	7:37	35	0:17
DI	6:23	28	0:18
DJ	6:35	30	0:18
DK	8:30	40	0:17

	Predicted astronomical worst case shadow flicker at receptors		
Receptor ID	**Total hrs/yr (hr : min)**	**Days/year**	**Max min/day (hr : min)**
DL	6:51	30	0:18
DM	6:30	26	0:20
DN	6:38	26	0:20
DO	7:08	28	0:21
DP	8:47	37	0:19
DQ	7:21	28	0:21
DR	8:05	36	0:16
DS	4:26	26	0:13
DT	5:36	30	0:15
DU	9:49	42	0:19
DV	1:52	17	0:08
DW	15:24	56	0:19
DX	0:00	0	0:00
DY	14:38	54	0:19
DZ	8:19	29	0:22
EA	2:39	20	0:10
EB	8:04	36	0:17
EC	11:01	42	0:20
ED	9:04	32	0:22
EE	8:38	36	0:18
EF	9:27	33	0:22
EG	0:00	0	0:00
EH	0:00	0	0:00
EI	0:00	0	0:00
EJ	1:57	16	0:09
EK to EV	0:00	0	0:00
EW	14:47	48	0:22
EX	0:00	0	0:00
EY	0:00	0	0:00
EZ	0:00	0	0:00
FA	0:00	0	0:00
FB	15:21	48	0:23
FC to LY	0:00	0	0:00
LZ	4:29	24	0:15

4.2.7 Recreation

Regional recreation activities exist in close proximity to the Project site. The Project site is located near Chezzetcook Lake and Petpeswick Lake where recreational activities include boating, kayaking, swimming and fishing.

Land in the area is also used for recreational purposes such as the use of all-terrain vehicles, snowmobiling and other off highway vehicles.

4.2.8 Economic Development

The community of Gaetz Brook and surrounding communities of Porters Lake, Musquodoboit Harbour and Chezzetcook has a population of approximately 10,000 people (Statistics Canada, 2011). The area's population has an employment rate of approximately 63.7% for ages 25 and older with an individual annual income of approximately $30,264 (Statistics Canada, 2006).

The Proponent is committed to using local contractors for Project undertakings when it is commercially reasonable to do so. As an example, the construction of the 4.6 MW Fairmont Wind Farm in the county of Antigonish involved a 35% contribution of Project costs from Nova Scotian investors. In addition, approximately $1.5 million was spent in local businesses during the construction phase, as well as an additional $3.5 million will be spent on local services and taxes during the Projects 20 year operational life. For the GBWF Project approximately $6,000 per megawatt produced will be returned as municipal tax revenue, totalling approximately $13,600/annum for a 20 year period.

5.0 Consultation

5.1 Community Engagement Plan

Open, transparent and comprehensive community engagement is crucial to the success of any development. The Community Engagement Plan, proposed by the proponent forms an integral part of the proposed GBWF development and sets out the formal engagement activities the Proponent will undertake throughout the development, construction, and operation of the wind farm. The Proponent is committed to addressing, to the best of their abilities, all concerns pertaining to this proposed development raised by local residents and community members.

The objective of the Community Engagement Plan is to outline firm engagement activities the Proponent will commit to throughout the development, construction, and operation of the GBWF, included in Appendix J.

The numerous engagement activities described in the following section will provide an opportunity to facilitate meaningful dialogue between various stakeholders and the Project Proponent; as well as provide true and accurate information pertaining to the Project in an open and transparent fashion. A comprehensive stakeholder engagement list has been formed, and will be kept up to date as further stakeholders express their interest in the Project.

5.2 Community

First Public Meeting

An open house was held on March 19, 2012 at the Chezzetcook Lions Club from 5:00 pm – 8:00pm. The meeting was advertised via Canada Post Admail, a service offered that facilitates the distribution of invitations/ flyers to a defined geographic location. The open house was attended by 65 community members and the meeting lasted three hours.

The Proponent handed out questionnaires to attendees of the first public meeting. The questionnaire was designed to gather contact information so interested persons could be provided with up to date information. The questionnaire was also designed to learn about the public's interest in having a wind farm in their community as well as provide an opportunity for the public to express any concerns they had regarding the GBWF Project. The open house format was held as an open discussion where Project information posters were displayed presenting Project information with Proponent representatives were present to answer questions the public had.

Following the meeting, the proponent addressed any questions/concerns that were submitted via the questionnaires by writing personal letters addressing the specific concern of the stakeholder.

Second Public Meeting

A second public open house was held on June 19, 2013 at the Porters Lake Community Center from 5:00pm – 8:00pm. The open house was advertised via Canada Post Admail as described above

approximately 1,500 invitations were sent out. An advertisement was published in The Chronicle Herald advertising details regarding the open house. Stakeholders who expressed interest in the project were personally contacted and invited to attend the second open house. Finally, personal invitations were sent to Government stakeholders and First Nations right-holders inviting them to participate in the open house.

Again, the proponent handed out questionnaires as described above in an effort to collect valuable public feedback. The open house was held as an open discussion with Proponent representatives engaging in conversation with the attendees to address any issues or concern.

The majority of the attendees at the two public meetings were in support of the GBWF. Based on the general project questionnaires completed by public meeting attendees over 80% support or are neutral on the GBWF.

Website

The Proponent has set up a Project website for the GBWF. The website: www.gaetzbrookcommunitywindfarm.ca will be updated periodically and used to inform the general public right-holders and stakeholders about all aspects of the proposed development. Website content and updates will include some or all of the following items:

- Notices for public information sessions;
- Photos of the Project location and turbine types;
- Progress reports on the Environmental Assessment;
- Environmental Assessment;
- Construction activity notifications;
- Online questionnaire and comment form (Have Your Say); and
- Media and PR related material

Newsletters

Previous wind farms developed by the Proponent included newsletters as a key engagement tool to update and inform the local community on recent Project activities. The Proponent may circulate newsletters via email, website and Canada Post to the community throughout the 2013 and 2014 calendar years.

Investment Seminars

The GBWF will be equity financed through a CEDIF, that is to say, the wind farm itself will be majority owned by Nova Scotia residents who purchase shares in the Wind4All Community CEDIF. In order to raise the required capital for the Project the Proponent hosted numerous investment seminars throughout the province. The main goal of the investment seminars was to introduce the Project to potential investors and to present the details of the investment opportunity including all associated risks

and rewards. The investment seminars do not play a key role in the Community Engagement Plan, but certainly aided in raising awareness of the benefits of renewable energy CEDIF's and ultimately the success of the GBWF.

Issues Resolution

The Proponent has drafted a Complaint Procedure document, which covers what community members should do and whom to contact should there be negative impacts affecting the community members or the environment caused by the GBWF development. The complaint procedure can be found in Appendix K.

5.3 Aboriginal Peoples

The aboriginal population has been contacted through right-holder update letters throughout the development process. Most recent efforts include letters mailed to First Nation Chief's in the region providing an update of the Project status, as well as providing the Proponents contact info in an effort to engage First Nations.

The Office of Aboriginal Affairs and the Indian Brook First Nation Office have both been contacted via telephone to engage the First Nations community. This effort was to provide information regarding the public meetings that would be taking place and to extend a personal invite to the Chief of Indian Brook First Nation. Table 5-1 presents a log of communications activities between the Proponent and various Aboriginal groups relative to the GBWF.

Table 5-1: Communication activities with First Nations.

Date	Person Contacted	Band/Organization	Method of Communication	Content
September 15, 2011	Twila Gaudet, Consultation Liaison Officer	Kwilmu'kw Maw-Klusuaqn Negotiation Office	Letter	Initial engagement efforts with Mi'kmaq communities
March 9, 2012	Twila Gaudet, Consultation Liaison Officer	Kwilmu'kw Maw-Klusuaqn Negotiation Office	Letter	Invitation to the First Public Meeting
March 9, 2012	Chief Ruffus Copage	Indian Brook First Nation	Letter	Invitation to the First Public Meeting
August 29, 2012	Office Receptionist	Office of Aboriginal Affairs	Phone Call	Engagement effort with the Mi'Kmaq community
May 30, 2013	Chief Ruffus Copage	Indian Brook First Nation	Letter	Invitation to the Second Public Meeting

5.4 Regulatory

The Proponent has engaged in consultation with Municipal, Provincial and Federal Government bodies regarding the proposed GBWF Project.

Municipal Consultation

The Proponent has engaged members of the HRM planning department to discuss the planning regime such as permitting requirements on numerous occasions. Consultation provided the Proponent with detail regarding regional by-laws, land use and other policies within the HRM that would relate to the proposed development of the GBWF.

Appendix L presents a log of communication between the Proponent and members of the HRM and council member throughout the duration of the Project thus far.

As a continuous effort, the Proponent will be in constant consultation with the municipality and council members throughout the duration of the Project.

Provincial Consultation

The Proponent has met with various provincial organizations regarding the development of the GBWF.

The scoping of this Environmental Assessment document was discussed with the Nova Scotia Department of Environment Environmental Assessment branch (EA branch). The consultation provided valuable information regarding the EA process, document formatting and relevant Health Canada studies to review. Project scoping was also determined through consultation with the EA branch regarding the construction of new transmission lines.

Consultation topics with DNR included:

- Surveys and studies to conduct as part of the GBWF Environmental Assessment.
- Ideal dates to conduct effective bat monitoring surveys (last week of August to second week of September).
- Potential for bat hibernacula in the region.
- Background for further investigating the potential impact the WTG may have on bird and bat species. Particular focus on regional weather, mainly fog and the potential impact WTG will have on species at risk during fog events was discussed and determined to be further investigated in the EA.
- Provide insight on proper course of action to take in effectively avoiding wetlands, mitigating impacts on wetlands and compensation that is required when direct wetland alteration is required.

The Nova Scotia Transportation and Infrastructure Renewal department was consulted regarding permitting for the construction of the access road from Motts Drive to the WTG location on the Project site.

As a continuous effort, the Proponent will be in constant consultation with the appropriate provincial departments throughout the duration of the Project.

Federal Consultation

The Proponent has consulted with various Federal Government entities regarding the construction of the GBWF. Environment Canada, NAV Canada, Transport Canada and the Department of Natural Resources were all contacted regarding the development of the GBWF. Like their provincial counterparts, they have assisted in the preparation of this EA, Project planning and design.

The Proponent will continue to engage Federal regulators when required throughout the development, construction and operation of the GBWF as appropriate.

5.5 Public and Aboriginal Concern

Based on the public meeting questionnaires, individual discussion and aboriginal consultation, local residents and aboriginal people have raised concerns relating to the Project and project activities. These concerns have been addressed in this EA. All issues raised have been identified in Table 5-2; included in this table is the section(s) in which the public and aboriginal issues have been addressed. As previously mentioned in Section 5.1 the Proponent is committed to addressing, to the best of their abilities, all concerns pertaining to this proposed development raised by local residents and community members.

Table 5-2: Summary of issues raised.

Issues Raised	Section(s)
Noise generated by WTG	4.2.4, 6.1, 7.1.3 & Appendix H
Impact on wildlife	4.1.4, 4.1.5, 4.1.6, 4.1.7, 4.1.8, 6.1, 6.2, 7.1.1, 7.1.2, Appendix B, C & G
Health & Safety	6.3
Aesthetics	4.2.5
Future project phases	2.8
Impact on property values	6.3

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6.0 Analysis

The construction, operation and decommissioning phases of the GBWF Project have the potential to affect physical, biophysical, and socio-economic environment. Identifying the VECs is an important part of the EA process. Following the presentation of the Project's activities in Section 2, the Environmental Setting in Section 4 and the review of issues identified from consultation in Section 5, the interaction of the Project activities with the VECs can be completed.

An interaction matrix in Table 6-1 presents the potential interactions between Project activities and each identified VEC. These VECs are presented in the following sub-sections in terms of potential environmental effects of Project activities including accidents and malfunctions, as well as proposed mitigation strategy, cumulative effects and finally, the level of significance of the residual effects. This VEC assessment is completed as outlined in the methodology as presented in Section 3.

Table 6-1: Potential Linkages of Project and the Environment.

	Site Preparation and Construction								Operation and Maintenance			Decommissioning		
	Clearing and Grubbing	Access Road and Laydown Area	Turbine Foundation	Power Pole and Line & U/G Electrical	Crane Pad Construction	Turbine Installation	Commissioning	Accidents and Malfunctions	Turbine Operation	Inspection and Maintenance	Accidents and Malfunctions	Infrastructure Demolition	Site Reclamation	Accidents and Malfunctions
Physical VECs														
Ambient air	•							•				•		•
Ground and Surface Water	•	•	•	•				•			•	•	•	•
Ambient noise	•	•	•	•	•		•		•			•	•	
Ambient light						•			•					
Biophysical VECs														
Wetlands / watercourses	•	•						•						
Fish and Fish Habitat	•	•						•			•			•
Migratory and breeding birds	•								•				•	

	Site Preparation and Construction								Operation and Maintenance			Decommissioning		
	Clearing and Grubbing	Access Road and Laydown Area	Turbine Foundation	Power Pole and Line & U/G Electrical	Crane Pad Construction	Turbine Installation	Commissioning	Accidents and Malfunctions	Turbine Operation	Inspection and Maintenance	Accidents and Malfunctions	Infrastructure Demolition	Site Reclamation	Accidents and Malfunctions
Flora and fauna	•	•											•	
Species at Risk	•	•							•		•		•	
Socio-economic VECs														
Land use	•								•					
Aboriginal resources / uses	•	•	•	•										
Archaeological	•	•	•	•									•	
Recreation and Tourism												•		
Vehicular traffic			•	•	•	•								
Telecommunications & Radar Communications									•					
Landscape aesthetics									•					
Health and safety								•			•			•
Local economy	•	•	•	•	•	•	•		•	•		•	•	

6.1 Assessment of Physical VECs

Ambient Air

Control and monitoring of ambient air quality is important in maintaining a healthy work, recreation and living environment. Based on the nature of activities that will take place at the Project site, ambient air quality has been identified as a VEC.

A significant environmental effect would result if a significant increase in contaminant concentration was determined a result of Project activities.

Boundaries – Spatial boundaries include the Project site for over all vehicular emissions but also focusing on gravel access roads up to the WTG for fugitive dust. The temporal boundary focuses on the Project construction and decommissioning phases during high vehicular traffic activities from machinery and trucks.

Table 6-2: Potential impacts and proposed mitigative measures for ambient air.

Potential Impacts on Ambient Air	Proposed Mitigative Measures
Local air quality may be affected through fugitive dust from access roads during construction and decommissioning	• Fugitive dust during dry weather conditions may be controlled with the application of water.
Local air quality may be affected through tailpipe emissions from construction vehicles and machinery	• All vehicles and machinery will comply with current emission standards and will be used efficiently, minimizing distances travelled whenever possible.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – A decrease in ambient air quality is determined to be negligible; fugitive dust will be eliminated through mitigative measures and vehicle emissions will comply with current emission standards. Therefore, the significance of residual effects on ambient air is to be considered negligible.

Ground and Surface Water

Management of ground and surface water quality is important as they are an integral aspect of a diverse ecosystem and functional ecology. Dwellings in this area rely on well water; therefore ground and surface water are also directly related to human health for this Project. A total of seven wetlands and two watercourses have been identified at the Project site and are assessed in detail in Section 6.2 under wetlands and watercourses. As a result, ground and surface water quality and quantity have been identified as a VEC.

A significant environmental effect would result if a considerable change to ground or surface water quantity or quality could be identified as a result of project activities.

Boundaries – Spatial boundaries include the ground and surface water at the Project site as well as any water bodies and watercourses that are supplied by the ground and surface water. Temporal boundaries are focused on the construction and decommissioning phases but include all phases of the Project in the unlikely event of an unplanned release.

Table 6-3: Potential impacts and proposed mitigative measures for ground and surface water.

Potential Impacts on Ground and Surface Water	Proposed Mitigative Measures
Vegetation clearing, grubbing, ground stripping, excavation and machinery traffic during the construction of the WTG pad and access road might induce a change in hydrology or sediment input into ground and surface water.	• Efforts will be made to design the access road such that it does not interfere with a watercourse, water body or drainage channel; • Where possible, clearing shall take place in the winter months on frozen ground; • Erosion control strategies (ie. Straw bales and geo-textiles) outlined in the Erosion and Sedimentation Control Plan hopes to maintain baseline water quality conditions in the watercourses and wetlands at the site; and • Where water must be pumped out of excavation pits, there will not be a discharge into a wetland, watercourse or defined channel. If pumped water contains total suspended solids (TSS) the water will be pumped to vegetated land with gentle slope to allow sediment to filter, or filtered before release with a filter bag.
Exposure or accidental spillage of hazardous materials such as fuel, oils and hydraulic fluids has potential to contaminate ground water supplies during construction, operation and decommissioning phases.	• Equipment shall be in good working order and maintained so as to reduce risk of spill/leaks and avoid water contamination; • Spill response kits will be provided on site to ensure immediate response to a potential waste release; and • Routine maintenance, refuelling and inspection of machinery will be performed off-site whenever possible.

Potential Impacts on Ground and Surface Water	Proposed Mitigative Measures
Vehicular traffic during decommissioning might induce a change in hydrology or sediment input into ground and surface water.	• WTG access road will be designed such that it does not interfere with a watercourse, water body or drainage channel; • Erosion control strategies (ie. Straw bales and geo-textiles) outlined in the Erosion and Sedimentation Control Plan hopes to maintain baseline water quality conditions in the watercourses and wetlands at the site; and • Used oil filters, grease cartridge containers and other products associated with equipment maintenance shall be collected and disposed of in accordance with regulatory guidelines.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – After employing the proposed mitigative strategy, should any sedimentation / erosion occur it will be temporary, of small magnitude and contained. While any direct release into ground or surface water will be a negative effect, it will be of small magnitude, of short duration and local. The significance of residual effects on ground and surface water is to be considered negligible.

Ambient Noise

Noise is defined as a sound, especially one that is loud, unpleasant or that causes disturbance. The Project poses two issues with noise pollution, which could affect local residents. Noise from the construction and decommissioning phase, as well as noise from the WTG operation is to be expected. As a result, ambient noise has been identified as a VEC.

A significant environmental effect would result if a considerable change in the ambient noise was found to be the result of project activities.

Boundaries – The spatial boundary is the area in which the noise impact study was conducted; this being a 2,000 m radius from the WTG location. The temporal boundary includes all Project activities from site preparation, construction, and operation to decommissioning.

Table 6-4: Potential impacts and proposed mitigative measures for ambient noise.

Potential Impacts on Ambient Noise	Proposed Mitigative Measures
During construction and decommissioning phases the ambient noise sound pressure levels will be affected as a result of the use of equipment and machinery such as excavators, dump trucks and bulldozers. Elevated noise levels can disturb fauna and local residents.	• Noise impact will be limited by restricting construction and decommissioning activities to daytime hours when appropriate; • Health Canada recommends the long-term average day-night sound level (Ldn) be below 57 db(A) at the closest residence. An Ldn of 57 db(A) is expected to be within the threshold for widespread complaints for construction noise. (USEPA, 1974).
Elevated sound pressure levels will be observed during operation from the nacelle, which is 98 m above ground level.	• Locating the WTG outside a 1000 m buffer zone from all dwellings; • A noise impact assessment has been conducted to predict a 'worst case scenario' sound pressure level that can be expected at the surrounding dwellings; and • By minimizing grubbing and clearing, flora on the Project site will aid in attenuation of noise produced from the WTG as perceived by local receptors.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – Elevated SPLs caused by construction and decommissioning phases will be temporary, during the day and short term. Noise production from the WTG during operation has been mitigated by setback distances and confirmed by a noise impact assessment. The Project is not anticipated to have any significant residual environmental effect on the ambient noise levels. While any effect on ambient noise will be negative, the significance of residual effects on ambient noise is to be considered minor.

Ambient Light

There are three attributes associated with the Project that have potential to cause an impact on ambient lighting; lighting during night time construction activities, WTG lighting, and shadow flicker are expected to contribute to ambient lighting. By employing the proposed mitigation strategy, the effect of the Project on ambient lighting can be considered negligible.

A significant environmental effect would result if a considerable change in the ambient light was found to be the result of project activities.

Boundaries – The spatial boundary is the area in which the noise impact study was conducted; this being a 2.0 km radius from the WTG location. The temporal boundary is focused on the operation phase of the WTG but also includes the turbine installation phase of construction.

Table 6-5: Potential impacts and proposed mitigative measures for ambient light.

Potential Impacts on Ambient Light	Proposed Mitigative Measures
During the night time, lighting will be seen atop some of the WTG, depending on the WTG layout.	• LED lighting will be used to minimize light throw; • Only the minimum amount of pilot warning and obstruction avoidance lighting will be used; • Only lights with short flash durations and the ability to emit no light during the 'off phase' of the flash (i.e. as allowed by strobes and modern LED lights) will be installed on tall structures; and • Lights will operate at the minimum intensity and minimum number of flashes per minute (longest duration between flashes) allowable by Transport Canada
Shadow flicker may occur during certain weather conditions and times of the year.	• The potential negative effect of shadow flicker has been mitigated at the design stage through responsible turbine siting • Compliance with industry standard guidelines on shadow flicker. All dwellings will, in a worst case scenario experience less than 30 hours of shadow flicker per year and 30 minutes of shadow flicker on the worst day.
Lighting during night time construction activities such as turbine installation.	• Construction activities will be limited to the day time when possible. The turbine may be erected during the evening as the activity must be completed when the wind is less than 4 m/s. These conditions are commonly seen in the early evening.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – Annoyance during project construction from work lighting, if necessary, will be temporary and of short duration. Lighting concerns from residents during operations such as shadow flicker and WTG lighting is expected to be limited with the proposed mitigation strategy employed. Therefore, while any effect on ambient light will be negative, the significance of residual effects on ambient light is predicted to be minor.

6.2 Assessment of Biophysical VECs

Wetlands / Watercourses

Management of wetlands and watercourses is an important and integral aspect of maintaining a diverse ecosystem. The Projects impact on ground and surface water quality and quantity as assessed in Section 6.1 was predicted to be negligible in terms of significance of environmental effect. While the quality and quantity of ground and surface water is important in terms ecological functionality of wetlands and watercourses the Project may also interact with wetlands and watercourses in terms of direct alteration.

As discussed in Section 4.1.3, construction of the access road Option 1 may require direct alteration to the identified wetlands and watercourse. As a result wetlands and watercourses have been identified as a VEC. The mitigation sequence of avoidance, minimization of impact and compensation as detailed by NSE's Wetland Conservation Policy will be followed (NSE, 2011).

A significant environmental effect would result if a considerable change to wetlands and watercourses was the result of project activities.

Boundaries – Spatial boundaries are limited to works associated with the Project focusing on access road construction as detailed in Figure 4-2. The temporal boundary focuses on Project construction but also includes operation and decommissioning for the unlikely event of an accident or malfunction.

Table 6-6: Potential impacts and proposed mitigative measures for wetlands / watercourses.

Potential Impacts on Wetlands / Watercourses	Proposed Mitigative Measures
During the construction phase, possible impacts to wetlands may arise from clearing, grubbing, infilling and excavation of the soil needed for constructing the access road. Such activities might induce silt run-off, alter flow into the wetlands or see them become repositories of significantly increased water flow, nutrients or sediments.	• Avoidance of wetlands; • Two wetland and watercourse field surveys have been completed to date; • Formal wetland delineation will be completed between June 1 and September 30; • In wetlands associated with sensitive water crossings, grubbing shall be minimized by the placement of geo-textile; • Construction of the access road will attempt to create a buffer surrounding the wetland; • NSE will be continually consulted throughout the wetland and watercourse alteration process; • The EMP will include all Provincial and Municipal regulations as well as all conditions determined by the Nova Scotia Wetland Alteration approval; • Compensation will consist of the restoration of wetlands at a 2:1 ratio (ie. 2 hectares restored for each hectare altered).

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The Project will be continually optimized around the access road design constraints to avoid direct alteration of wetlands and watercourses. The WTG lay down pad has been situated such that Wetland 3 and 9 as described in Table 4-3 are not expected to be affected. Additional work is planned between the dates of June 1 and September 30 to formally delineate the wetlands and watercourses as recommended by the Nova Scotia Wetland Conservation Policy. NSE will be provided with additional detail and all work will be completed as per Provincial requirements. Any direct alteration is expected to be small in magnitude and may fall under the Wetland Conservation Policy exemption. Compensation will be completed as required under the Nova Scotia Wetland Conservation Policy. The significance of residual effects on wetlands and watercourse is predicted to be minor.

Fish and Fish Habitat

Alteration of freshwater environments such as the potential watercourse alteration proposed for access road Option 2 requires the consideration of fish and fish habitat.

A significant environmental effect would result if a considerable change fish and fish habitat was the result of project activities. Aside from the potential watercourse alteration for access road Option 2 there are no further watercourse alterations expected for the Project. As a result of the potential watercourse alteration fish and fish habitat has been identified as a VEC.

Boundaries – Spatial boundaries are limited to the watercourses that may required alteration for the access road design; this is detailed in Figure 4-2. The temporal boundary focuses on Project construction but also includes operation and decommissioning for the unlikely event of an accident or malfunction.

Table 6-7: Potential impacts and proposed mitigative measures for fish and fish habitat.

Potential Impacts on Fish & Fish Habitat	Proposed Mitigative Measures
Loss or damage to fish and fish habitat during watercourse alteration.	• Avoidance of watercourses in access road design; • All construction activities near watercourses will comply with the applicable regulations and guidelines such as the *Fisheries Act*; • All required watercourse crossings will comply with existing regulatory requirements including the *Nova Scotia Watercourse Alteration Specifications* (NSE, 2010); • Crossings should be located in areas that exhibit a stable soil type and where grades approaching the crossings will not be too steep; • The approaches to watercourse crossings will be stabilized with brush mats, where necessary; • Blasting, if necessary will only occur in consultation with Fisheries and Oceans Canada (DFO), and will follow the requirements of the *Fisheries Act* as well as the requirement of the DFO Factsheet *Blasting – Fish and Fish Habitat Protection*(DFO, 2010); and • The Environmental Management Plan will outline site specific details for appropriate fish and fish habitat preservation efforts.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – If access road Option 1 is chosen, there exists the potential for impact to fish and fish habitat. With the above mentioned mitigation measures in place, the significance of residual effects on fish and fish habitat is predicted to be minor. If access road Option 1 is not used the significance of residual effects on fish and fish habitat is predicted to be negligible.

Migratory and Breeding Birds

Throughout the construction operation and decommissioning of a wind farm the potential negative impacts can be classified into four categories: collision, displacement due to disturbance, barrier effects, and habitat loss. As a result, migratory and breeding birds have been identified as a VEC. The Proponent will comply with the *Migratory Bird Convention Act* at all times and for all project related activities.

A significant environmental effect would result if a considerable change to migratory and breeding birds was the result of project activities.

Boundaries – The spatial boundaries include the area in that the WTG will be located, also including pathways and locations that are frequented by birds. The temporal boundary is all phases of the Project.

Table 6-8: Potential impacts and proposed mitigative measures for migratory and breeding birds.

Potential Impacts on Migratory and Breeding Birds	Proposed Mitigative Measures
During construction (clearing/grubbing) some vegetation might be cleared that might be habitat to some migratory birds.	• The Proponent will endeavor to conduct construction activities such as clearing and grubbing during a time period that does not coincide with the time period in which migratory birds would possibly be in the area.
During operation there is a possibility that migrating birds could collide with the WTG.	• A desktop and field study has been conducted to identify and assess the presence of migratory and breeding birds. The studies determined the Project site does not support a large number of migrating birds; • The observed migrant flocks were relatively small, and no obvious migration corridors were indicated by the surveys; • Raptor migration routes coincide with well-defined ridges, features which are lacking in the general Project area. Therefore suggesting that the risk of raptor collision with Project infrastructure is low; and • A follow up avian mortality survey will be conducted after the WTG commissioning.

Potential Impacts on Migratory and Breeding Birds	Proposed Mitigative Measures
Birds may alter their migration flyways and/or local flight paths to avoid WTG.	• Desktop and field studies conducted suggest that due to the size of the GBWF being a single WTG wind farm, flyways and local flight paths should not be adversely affected by the construction of the WTG; and • A follow up avian mortality survey will be conducted after the WTG commissioning.
Fog events can impair avian visibility, increasing the likelihood of mortality from collision with WTG.	• Environment Canada climate database has been consulted to predict the rate of fog occurrence; • An annual average of 7% fog is observed at a weather station in close proximity to Project site; and • Instructions will be given to wind farm maintenance staff to ensure all work lights are turned off upon leaving the site particularly during foul weather events.
The WTG footprint will cause a loss of habitat for breeding and migratory birds.	• Desktop and field studies conducted suggest that no more than 2.0 Hectares will be considered a loss of habitat. This is considered to have no negative impact on migratory and breeding birds; and • A follow up avian mortality survey will be conducted after the WTG commissioning.

Potential Impacts on Migratory and Breeding Birds	Proposed Mitigative Measures
Lighting on turbines can result in adverse impacts on birds. The Proponent recognizes that nocturnal migrant and night-flying seabirds are the birds most at risk of attraction to lights.	• Only the minimum amount of pilot warning and obstruction avoidance lighting will be used; • Only lights with short flash durations and the ability to emit no light during the 'off phase' of the flash (i.e. as allowed by strobes and modern LED lights) will be installed on tall structures; • Lights will operate at the minimum intensity and minimum number of flashes per minute (longest duration between flashes) allowable by Transport Canada; • Instruction will be given to wind farm maintenance staff to ensure all work lights are turned off upon leaving the site particularly during foul weather events; and • A follow up avian mortality survey will be conducted after the WTG commissioning.
There will be an increase in habitat when the Project site is reclaimed at the end of the 20 year project lifetime.	• N/A – no mitigation measures necessary for a positive potential impact.
When the WTG are removed there will no longer be the potential barrier effect impeding flyways or local flight paths.	• N/A – no mitigation measures necessary for a positive potential impact.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – Disturbance of bird habitat during construction will be unlikely to occur by employing the proposed mitigation measures. It is expected that the mortality rate of birds from collision or habitat loss during Project operation, if at all, will be low. Monitoring for bird mortality during operation will verify the effect the Project has on migratory and breeding birds. While not all phases of the Project are negative, construction and operation phases pose potential for negative impact. With the proposed mitigation measures employed, the significance of residual effects on migratory and breeding birds is predicted to be minor.

Flora and Fauna

Information collected during a desktop review of aerial photographs and Nova Scotia Forest Inventory database was used to develop a field survey to ensure that all habitat types were surveyed. The field

survey revealed four major habitat types: roadside / disturbed areas, regenerating forests, upland forests and wetlands. As a result of this classification of the local flora, and the potential for this being a habitable location for fauna, flora and fauna has been identified as a VEC. Species of flora or fauna identified as at risk or of special concern are also addressed in Section 6.2 under Species at Risk.

A significant environmental effect would result if a considerable change to flora and fauna was the result of Project activities.

Boundaries – The spatial boundary is the entire Project site. The temporal boundary includes the construction phase focusing on clearing, grubbing and building the access road, as well as the decommissioning phase focusing on site reclamation.

Table 6-9: Potential impacts and proposed mitigative measures for flora and fauna.

Potential Impacts on Flora and Fauna	Proposed Mitigative Measures
Clearing and grubbing will result in the disturbance of flora, which is considered a habitat for local fauna.	• There will be a land/habitat loss of no more than 2.0 Hectares attributable to the construction phase as determined by desktop and field studies. This is considered to have a negligible impact on flora and fauna; and • The access road will be optimized to make use of the current dirt road at the Project site to reduce the amount of flora to be cleared; and • Location of the access road will be optimized to reduce footprint and to avoid sensitive areas.
Fauna may avoid area during construction phase of the Project.	• Location of the access road will be optimized to reduce footprint and to avoid fauna sensitive areas.
There is a risk of introducing invasive species through plant matter attached to construction equipment	• Construction equipment will be cleaned prior to transportation and use to ensure that no plant matter is attached to the machinery.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The Project will decrease the flora footprint by no more than 2.0 Hectares, consequently reducing the fauna habitat by a maximum of 2 Hectares. While the construction phase presents potential for negative impact, once the decommissioning phase has started, land

reclamation will provide 4.5% more land for flora and fauna habitation. With the proposed mitigation measures employed, the significance of residual effects on flora and fauna is predicted to be negligible.

Species at Risk

Species at risk listed under NSDNR, SARA or COSEWIC are legally protected under the Federal Species at Risk Act (ACCDC, 2012). Based on the desktop and field studies, 17 bird species and one bat species were identified at the Project site that are considered to be species at risk. Table 6-10 presents the identified species at risk and their ranking based on NSDNR, COSEWIC and SARA. Accordingly, species at risk has been identified as a VEC.

A significant environmental effect would result if a considerable change to wetlands and watercourses was the result of project activities.

Table 6-10: Identified species at risk.

Common Name	Scientific Name	NSDNR	COSEWIC	SARA
Little Brown Bat	*Myotis lucifugus*	Not Listed	Endangered	Not Listed
Blackpoll Warbler	*Dendroica striata*	Yellow	Not Listed	Not Listed
Boreal Chickadee	*Poecile hudsonicus*	Yellow	Not Listed	Not Listed
Golden-crowned Kinglet	*Regulus satrapa*	Yellow	Not Listed	Not Listed
Gray Jay	*Perisoreus satrapa*	Yellow	Not Listed	Not Listed
Pine Siskin	*Spinus pinus*	Yellow	Not Listed	Not Listed
Ruby-crowned Kinglet	*Regulus calendula*	Yellow	Not Listed	Not Listed
Common Snipe	*Gallinago gallinago*	Yellow	Not Listed	Not Listed
Tree Swallow	*Tachycineta bicolour*	Yellow	Not Listed	Not Listed
Wilson's Warbler	*Wilsonia pusilla*	Yellow	Not Listed	Not Listed
Yellow-bellied Flycatcher	*Empidonax flaviventrius*	Yellow	Not Listed	Not Listed
Greater Yellowlegs	*Tringa melanoleuca*	Yellow	Not Listed	Not Listed
Semipalmated Sandpiper	*Calidris pusilla*	Yellow	Not Listed	Not Listed
Spotted Sandpiper	*Actits macularius*	Yellow	Not Listed	Not Listed
Common Loon	*Gavia immer*	Red	Not Listed	Not Listed
Common Nighthawk	*Chordeiles minor*	Red	Threatened	Threatened
Canada Warbler	*Wilsonia pusilla*	Red	Threatened	Threatened
Willet	*Tringa semipalmata*	Red	Not Listed	Not Listed

Boundaries – The Project boundary is the entire Project site. The temporal boundary includes the construction and operation phases.

Table 6-11: Potential impacts and proposed mitigative measures for species at risk.

Potential Impacts on Species at Risk	Proposed Mitigative Measures
During construction (clearing/grubbing) some vegetation might be cleared that might be habitat to some species at risk.	• Canada Warbler was the only species identified as a "probable" breeder at the Project site. Only two Canada Warblers were observed, this suggests that the Project site is not an area of particular importance from a population perspective. • Desktop and field studies conducted suggest that no more than a 4.5% of the total Project site will be considered a loss of habitat. This is considered to potentially have a minor impact on migratory and breeding birds; and • A follow up avian mortality survey will be conducted after the WTG commissioning.
During operation there is a possibility that species at risk could collide with the WTG.	• A desktop and field study has been conducted to identify and assess the presence of avian species, the results of the assessment does conclude that a negative impact on species at risk is not expected; and • A follow up avian mortality survey will be conducted after the WTG commissioning.
Fog events can impair avian visibility, increasing the likelihood of mortality from collision with WTG.	• Environment Canada climate database has been consulted to predict the rate of fog occurrence; • An annual average of 7% fog is observed at a weather station in close proximity to Project site; and • Given the minimal presence of species at risk and the low fog rate, the impact is to be considered negligible.
The WTG footprint will cause a loss of habitat for species at risk.	• Desktop and field studies have not identified any nesting evidence of species at risk on the Project site.
There will be an increase in habitat when the Project site is reclaimed at the end of the 20 year Project lifetime.	• N/A – no mitigation measures necessary for a positive potential impact.
When the WTG are removed there will no longer be the potential barrier effect impeding flyways or local flight paths.	• N/A – no mitigation measures necessary for a positive potential impact.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – Thorough desktop and field studies have been conducted to identify species at risk that may be present at the Project site. Presence of species at risk on the Project site is low; combined with the detailed mitigative measures, the significance of residual effects on species at risk is predicted to be negligible.

6.3 Assessment of Socio-economic VECs

Land Use

The proposed GBWF makes use of a 100 acre land parcel in the community of Gaetz Brook. The land is currently used for wood harvesting and for the use of off-highway vehicles such as ATVs. Land surrounding the Project land parcels to the north is primarily used as residential land; land to the west of the project site is currently used as the Eastern Shore Industrial Park. There are no residential properties within a 1,000 m radius of the proposed WTG location, and approximately 338 within a 2 km radius as presented in Section 4.2.1.

A significant environmental effect would result if a considerable change to land use was the result of project activities.

Boundaries – The spatial boundary is defined as the Project site where the WTG are located and also consider a 3.5 km radius from the WTG proposed locations. The temporal boundary includes all phases of the Project including construction, operation and decommissioning.

Table 6-12: Potential impacts and proposed mitigative measures for land use.

Potential Impacts on Land Use	Proposed Mitigative Measures
Public concern that property value may decrease as a result of the Project	• Recent real estate value studies have consistently determined no correlation between proximity to wind farms and property devaluation (Canning et. al., 2010); and • Education through public consultation can be effective in providing factual, relevant information to alleviate the concerns of local residents.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The significance of residual effects on land use is expected to be negligible.

Aboriginal Resources / Uses

Desktop and field studies have been completed as part of a Mi'kmaq Ecological Knowledge Study to promote a strong relationship between the Proponent and the Mi'kmaq population. Focusing on vegetation, the study identified any species that has significant importance for use of traditional medicine, food, clothing or other living necessities.

A significant environmental effect would result if a considerable change to Aboriginal resources / uses was the result of Project activities.

Boundaries – The spatial boundary includes all areas of the Project site. The temporal boundary focuses on the early construction phases of the Project when clearing and grubbing, access road construction and turbine pad construction will take place.

Table 6-13: Potential impacts and proposed mitigative measures for aboriginal resources / uses.

Potential Impacts Aboriginal Resources / Uses	Proposed Mitigative Measures
Potential impact on culturally significant plant species and general habitats.	• Mi'kmaq ecological knowledge study was conducted to identify potential for valued aboriginal resources; • Through roundtable discussions with Mi'kmaq right holders it was determined that the Projects impact on culturally significant flora and fauna species is negligible; • The Proponent will maintain communications with the local Mi'kmaq communities; and • Location of the access roads may be optimized to reduce footprint and to avoid areas of cultural significance.
Direct impact to Mi'kmaq artifacts during construction activities, such as blasting and excavation.	• If an artifact or object of potential historic significance is thought to have significance is discovered during project activities the KMK will be contacted immediately along with other appropriate individuals/ organizations to determine a suitable method of mitigation.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The significance of residual effects on land use is expected to be negligible. In the unlikely case that an artifact with potential interest/value to Mi'kmaq heritage is discovered appropriate individuals/ organizations will be contacted immediately.

Archaeological Resources

The results of the archaeological resource impact study indicate that little or no cultural activity has taken place in the hills that comprise the Project site. As a result, it is not expected that a significant adverse environmental effect is to occur. Completed field work to date has not found any evidence or sign of archaeological important structures or artifacts.

A significant environmental effect would result if a considerable change to archaeological resources was the result of project activities.

Boundaries – The spatial boundary for this VEC is the entire Project site. The temporal boundary is the construction phase where ground disturbance is likely to occur.

Table 6-14: Potential impacts and proposed mitigative measures for archaeological resources.

Potential Impacts on Archaeological Resources	Proposed Mitigative Measures
Direct impact to cultural resources during construction activities, such as blasting and excavation.	• The Archaeological resource impact study indicates no presence of cultural activity; • No mitigative measures at this time are proposed; and • Should an archeological resources be encountered, all activities are to stop and the Coordinator of Special Places will be contacted immediately to determine a suitable method of mitigation

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The significance of residual effects on archaeological resources is expected to be negligible.

Recreation and Tourism

The Project is proposed on private land that is occasionally used for recreation with all-terrain vehicles. In close proximity to the site (1,300 m from WTG location) is Petpeswick Lake and Chezzetcook Lake, which is used for recreational boating, fishing and swimming.

A significant environmental effect would result if a considerable change to recreational activities was the result of project activities.

Boundaries – The spatial boundary is defined as the Project site where the WTG are located and also considers a 3.5 km radius from the WTG proposed locations. The temporal boundary includes all phases of the Project including construction, operation and decommissioning.

Table 6-15: Potential impacts and proposed mitigative measures for recreation and tourism.

Potential Impacts on Recreation and Tourism	Proposed Mitigative Measures
Petpeswick Lake and Chezzetcook Lake are located within close proximity to the Project site and may potentially be affected by noise during construction and operation.	• A noise assessment has been conducted and is described in Section 6.1 under Ambient Noise.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – It is predicted that a SPL of approximately 34 db(A) would be the maximum observed SPL at the Petpeswick Lake under worst case scenario conditions. As a result, the significance of residual effects on recreation and tourism is expected to be negligible.

Vehicular Traffic

The Project will be accessed via Motts Drive located in an industrial park approximately 400 m from Highway 107. During construction of the access road and WTG foundations, there will be an increase in truck traffic on the roads leading to and from the Project site. During delivery of the WTG components, delivery of oversized loads may slow traffic flow.

Of these predicted vehicle movements, approximately 12 will be oversized loads associated with the delivery of WTG component parts (towers, blades, and nacelles) and the cranes required for erection. These deliveries are anticipated within months 4 through 6 of the project construction schedule and subject to movement orders as agreed upon with governing authorities.

Boundaries – The spatial boundaries are all roads that will be used through the construction phase of the Project and the Project site. The temporal boundaries are those associated with the construction phase of the Project.

Table 6-16: Potential impacts and proposed mitigative measures for vehicular traffic.

Potential Impacts on Vehicular Traffic	Proposed Mitigative Measures
Vehicular traffic may increase as a result of construction activities and transportation of WTG components to the Project site.	• Every effort will be made to ensure that oversized loads are delivered during times of lowest traffic to mitigate traffic jams; and

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The time frame in which an impact to traffic may occur will be temporary, and combined with the proposed mitigative measure of avoiding high traffic times; the significance of residual effects on vehicular traffic is expected to be negligible.

Telecommunication and Radar Communications

With the installation of a WTG there is the possibility that the turbine rotor may interfere with the transmission and receiving of telecommunication signals. The proponent has consulted with the Department of National Defence and the Meteorological Service of Canada to mitigate potential negative impacts on telecommunications and radar communications. As a result, telecommunication and radar communication has been identified as a VEC.

A significant environmental effect would result if a considerable change to telecommunication and radar communications was the result of project activities.

Boundaries – The spatial boundary consists of the local area including the proposed WTG and neighbouring communication infrastructure. Temporal boundaries include the operation phase of the Project.

Table 6-17: Potential impacts and proposed mitigative measures for telecommunications.

Potential Impacts on Telecommunications	Proposed Mitigative Measures
WTG operation may interfere with telecommunication and/or radar communication infrastructure	• Consultation was completed as recommended by CanWEA and Radio Advisory Board of Canada's guidance document – *Technical Information and Guidelines on the Assessment of the Potential Impact of Wind Turbines, on Radio Communications, Radar and Seismoacoustic Systems*; • A desktop EMI assessment was conducted by the proponent in line with the Radio Avisory Board of Canada guidelines. The results of the assessment showed that the turbine will not interfere with the telecommunication links of nearby towers; • Application process with NAV Canada's Land Use Proposal Submission Form to ensure that the Project does not pose any hazard to the navigational systems of NAV Canada; and • Department of National Defence and Transport Canada have also been consulted.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – Based on consultation with the appropriate authorities, no impedance on communication infrastructure is to be expected. As a result, the significance of residual effects on telecommunication and radar communication is expected to be negligible.

Landscape Aesthetics

The proposed WTG is located in the rural community of Gaetz Brook on a hill with a WTG pad elevation of approximately 70 m above sea level. A visual impact assessment was completed by collecting photographs from high-traffic areas around the Project site. Photomontages were created at two high traffic areas using WindFarm software. These photomontages produce a realistic projection of what the WTG will look like superimposed on the Project landscape. Since the Project site is a rural, scenic area landscape aesthetics has been identified as a VEC. The photomontages can be viewed in Section 4.2.5.

A significant environmental effect would result if a considerable change to landscape aesthetics was the result of project activities.

Boundaries – The spatial boundary is defined as the areas surrounding the Project site in which the WTG are visible. The temporal boundary is the Project operation phase.

Table 6-18: Potential impacts and proposed mitigative measures for landscape aesthetics.

Potential Impacts on Landscape Aesthetics	Proposed Mitigative Measures
Community members may have a negative reaction towards the aesthetics of the WTG.	• The Proponent considered landscape aesthetics when deciding on specific siting of the WTG; • The paint on the WTG will be selected so that they do not contrast sharply with the environment; and • By-Laws regarding responsible siting of WTG were followed to minimize the potential impact on the landscape aesthetics during WTG siting;

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The perception of landscape aesthetics is a subjective matter. The Proponent recognizes that development of the proposed WTG may have a negative effect in the perception of the community. It is possible that the negative reaction may be a result of a change in the landscape and may diminish over time. While landscape aesthetics will be altered with the development of the GBWF, the significance of residual effects on landscape aesthetics is expected to be negligible.

Health and Safety

Public health and safety are of the greatest concern in the development of a Project such as the GBWF. During the construction, operation and decommissioning phase the protection of workers and the public's health and safety is protected under the provincial Occupational, Health and Safety Act (OHS). It is best practice to consider a 'worst case scenario' when developing a health and safety policy / plan, as a result, health and safety has been identified as a VEC.

A significant environmental effect would result if a considerable change to health and safety was the result of project activities.

Boundaries – The spatial boundary includes the Project site and for the sake of ambient noise and ambient light, a 2.0 km radius from the WTG. The temporal boundaries include all phases of the Project.

Table 6-19: Potential impacts and proposed mitigative measures for health and safety.

Potential Impacts on Health and Safety	Proposed Mitigative Measures
During extreme cold weather events there is the potential for ice to build up and throw ice from the WTG blades.	• WTG is equipped with ice-detection systems on each blade; • WTG is designed to shut down in the case of ice-buildup; and • When ice is detected the blade has a heating element that will effectively melt the ice to mitigate ice-throw; and • Personal Protection Equipment (ie. hard-hats) will be worn when near the WTG.
During extreme weather events, there is the potential for electrical fires within the turbine nacelle through lightning strikes.	• WTG is equipped with lightning protection that, in the unlikely event of a lightning strike, will dissipate the lightning current to the ground.
Potential aviation hazard to low flying aircraft.	• Application process with NAV Canada's Land Use Proposal Submission Form to ensure that the Project does not pose any hazard to the navigational systems of NAV Canada.
Increase in vehicular traffic may have the potential to affect public safety.	• Every effort will be made to ensure that oversized loads are delivered during times of lowest traffic to mitigate road traffic.
Shadow flicker may affect human health.	• This potential impact has been addressed in the Ambient Light Section 6.1.
Noise impact may affect human health.	• This potential impact has been addressed in the Ambient Noise Section 6.1.
Potential for accidents and malfunctions pose a risk to workers and the public's health and safety;	• The OHS Act will be followed.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – Based on Project planning and design, the top priority has been health and safety. This is to make every effort reasonably possibly to eliminate any negative potential impacts the Project may have on the public's health and safety. By following the proposed mitigative measures as well as regulatory guidelines pertaining to health and safety, the significance of residual effects on health and safety is expected to be negligible.

Local Economy

During the Project phases, there will be a significant amount of money spent within the HRM, Gaetz Brook, surrounding communities and Nova Scotia. During the development, the need for contractors and trades will be required and the Proponent will make every effort to utilize local companies to promote the local economy.

The COMFIT program will guarantee a "feed-in-tariff" that is a rate per kilowatt hour that the community owned Project is guaranteed for the 20 year power purchase agreement.

A significant effect would result if a considerable change to local economy was the result of project activities.

Boundaries – The spatial boundary is any area, business and individual that may observe a financial impact from the Project. The temporal boundary includes all phases of the Project.

Potential Impacts and Proposed Mitigative Measures – Potential positive impacts during the development phase of the Project include:

- Hiring local consultants; and
- Use of local services such as accommodations, restaurant and gasoline.

Potential positive impacts during the construction and decommissioning phase of the Project include:

- Contracting construction work to local businesses;
- Use of local services such as accommodations, restaurant and gasoline; and
- Municipal taxes being paid to the HRM.

Potential positive impacts during the operation phase of the Project include:

- Use of local services such as accommodations, restaurant and gasoline;
- Involvement of local residents in the CEDIF to invest in the Project and as a result benefit from dividends produced through the power purchase agreement;
- Municipal taxes being paid to the HRM; and
- Long term contracts may be used in the operation and maintenance of the Project.

Cumulative Effects – As described in Section 2.9 there is one 500 kW turbine approximate 6.6 km west of the Project site. Given the small scale of both projects it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The Proponent will, when appropriate make every effort to utilize local services and products, this promotes local economy, which is in line with the Proponents ideology of community based projects. The predicted effects of this Project on the local economy are positive and

as a result of the municipal taxes, CEDIF and economic spinoff, the significance of residual effects on local economy is expected to be beneficial.

6.3.1 Effect of Environment on Project

Extreme Weather

Severe weather events could potentially damage WTG due to conditions exceeding the operational design of the WTG. High winds, extreme temperatures and icing on blades all have the potential to shut down the WTG. Extreme weather events that could occur within the HRM, Nova Scotia region are listed in Table 6-20.

Table 6-20: Extreme events, associated effects and mitigation.

Weather Event	Effect	Mitigation
Extreme wind	Damage to blades	Automated control system would initiate shut down
Hail	Damage to blades	Appropriate WTG maintenance
Heavy rain and flooding	None anticipated	None
Heavy snow	Damage to WTG components	Automated control system would initiate shut down
Ice storms	Icing on blades resulting in potential ice throw	Automated control system would initiate shut down and heating system
Lightning	Potential for fires within nacelle of WTG	Lightning protection system would conduct electrical surge away from nacelle
Seismic activity	None anticipated	None
Severe drought	None anticipated	None

Turbine Icing

Ice accumulation on WTG blades can occur during the winter months when the appropriate conditions of temperature and humidity exist, or during certain extreme weather conditions, such as freezing rain (Seifert et al., 2003). In the event that ice builds up on the WTG blades, there are two types of risks possible: the first is ice throw from an operating WTG, and the second is ice fall from a WTG that is not in operation.

When a WTG is in operation, it is assumed that ice may collect on the leading edge of the rotor blade and detaches regularly due to aerodynamic and centrifugal forces (Seifert et al., 2003). The distance that the ice will be thrown from the moving WTG blade will vary depending on the wind speed, the rotor azimuth and speed, the position of the ice in relation to the tip of the blade, as well as characteristics of the ice fragment.

In a Canadian study titled *Recommendations for Risk Assessments of Ice Throw and Rotor Blade Failure in Ontario* (LeBlanc et al., 2007) ice throw was investigated to determine the individual risk probability for an individual to be struck by ice thrown from an operating WTG. The following parameters and assumptions were used:

- Rotor diameter of 80 m;
- Hub height of 80 m;
- Fixed rotor speed of 15 RPM;
- Ice fragment is equally likely to detach at any blade azimuth angle and 3 times more likely from the blade tip than the rotor;
- Ice fragments have a mass of 1 kg and frontal area 0.01 square ms;
- All wind directions are equally likely; and
- Ever-present individual between 50 m and 300 m (dounut shaped buffer around WTG), individual equally likely in any given 1 square m within that area.

The statistical analysis found that individual risk probability for an individual is 0.000000007 strikes per year or, 1 strike in 137,500,000 years. For an individual to be ever-present in the defined area, this assumes that the individual would be outside during the unpleasant weather necessary for icing conditions. This analysis does not take into account the presence of trees that could provide shelter from potential ice throw (Seifert, H. Et al., 2003). The Enercon E92 has slightly different specifications than used in this example; however this should be used as general example to understand the risk probability of an individual being struck by ice throw.

As with trees, power lines masts and buildings, ice can accumulate on a stationary WTG, and will be eventually be released and fall to the ground. Depending on the rotor position of the stationary rotor, different fall distances along the current prevailing wind will occur (Seifert, H. Et al., 2003).

Potential Surface Water Impacts

Activities associated with the Project that can impact surface water resources include the development of gravel pits, road construction, stream crossings, concrete use and disposal, and petroleum products from WTGs and heavy ground moving. To mitigate such impacts, a Spill Contingency Plan will be enforced, as well as the Environmental Management Plan.

6.3.2 Summary of Impacts

Based on the completed VEC analysis, it has been determined that the Project activities are only expected to have minor negative effects on wetlands/watercourses, ambient noise, bats and migratory and breeding birds, while the local economy will see a beneficial impact. All other VECs are predicted to observe a negligible residual effect from the Project. Where a minor effect is predicted, monitoring and follow up initiatives should be considered. A summary of the VEC assessment is presented in Table 6-21, in terms of the following assessment criteria:

- Nature – positive (+), negative (-), or No impact where no impact is predicted;
- Magnitude – order of magnitude of the potential impact: small, moderate, large;
- Reversibility – reversible (REV) or irreversible (IRR);
- Timing – duration of impact, short for construction or decommissioning and long for Project operation or longer;
- Extent – spatial extent of the impact, local, municipal, provincial etc.; and
- Residual Effect – negligible, minor, significant, beneficial or no impact as described in Section 3.3.

Table 6-21: Summary of identified VECs.

	Nature	Magnitude	Reversibility	Timing	Extent	Residual Effect
Ambient Air	-	small	REV	Short	Local	Negligible
Ground and Surface Water	-	small	REV	Short	Local	Negligible
Ambient Noise	-	small	REV	Long	Local	Minor
Ambient Light	-	small	REV	Long	Local	Negligible
Wetlands/ Watercourses	-	small	REV	short	Local	Minor
Fish and Fish Habitat	-	small	REV	short	Local	Minor/ Negligible
Migratory and Breeding Birds	-	small	REV	Long	Local	Minor
Flora and Fauna	-	small	REV	Short	Local	Negligible
Species at Risk	-	small	IRR	Long	Local	Minor
Land Use	-	small	REV	Long	Local	Negligible
Aboriginal Resources / uses	-	small	IRR	Long	Local	Negligible
Archaeological Resource	-	small	IRR	Short	Local	Negligible
Recreation and Recreation	-	small	REV	Long	Local	Negligible
Vehicular Traffic	-	small	REV	Short	Local	Negligible
Telecommunications	-	small	REV	Short	Local	Negligible

	Nature	Magnitude	Reversibility	Timing	Extent	Residual Effect
Landscape Aesthetics	-	small	REV	Long	Local	Negligible
Health and Safety	-	small	IRR	Long	Local	Negligible
Local Economy	+	moderate	REV	Long	Provincial	Beneficial

7.0 Follow Up and Monitoring

The purpose of this section is to describe the potential follow-up programs and management plans required during the construction, operation and decommissioning phases of the Project.

7.1 Post-Construction Monitoring

7.1.1 Avian

Referring to the VEC assessment in Section 6.2 the Project was assessed as having a minor significance of residual effects on migratory and breeding birds. As a result, a post-construction monitoring plan will be implemented for a period of time. This monitoring program will be developed in consultation with the appropriate authorities.

7.1.2 Bats

Additional bat surveys have been initiated to commence during the second last week of August to encompass the ideal migration period of the last week in August to the second/ third week of September.

7.1.3 Ambient Noise

Referring to the VEC assessment in Section 6.2 the Project was assessed as having a minor significance of residual effects on ambient noise. As a result, a public input mechanism will be established to resolve issues pertaining to ambient noise levels.

7.2 Management Plan

Throughout the life of the Project, various management and contingency plans, as listed below, may be required to aid in the responsible development of the Project. These plans will be developed and implemented prior to construction of the GBWF and will explicitly outline the steps taken for different Project concerns.

It is anticipated that some or all of the following management plans will be required as the Project development matures.

Management Plan Requirements

- Environmental Management Plan;
- Erosion and Sedimentation Control Plan;
- Spill Contingency Plan;
- Decommissioning and Site Reclamation Plan; and
- Public Complaint Procedure.

A number of permits will be required during pre-construction, all of which are listed in Section 1.3.

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8.0 Closure

Natural Forces Wind Inc. wishes to develop the proposed Gaetz Brook Wind Farm with the intent of helping Nova Scotia meet its renewable energy regulations and targets.

This EA has been prepared in accordance with the guidelines set out by the Environmental Assessment and Approval Branch of the Nova Scotia Department of Environment. The scope of the EA was discussed in advance with Nova Scotia Department of Environment Environmental Assessment branch. Consequently, it is anticipated that this EA meets all criteria outlined by the Nova Scotia Environmental Assessment Act.

A thorough analysis of the Project components and activities has been carried out for the construction, operation and decommissioning phases of the Project. Baseline environmental characteristics of the region have been documented and Valued Environmental Components have been identified. Consultation has been undertaken with a wide variety of local stakeholders, right-holders, and government stakeholders to gauge the full range of impacts and concerns with regards to the Project. The impact of the Project on the local environment has been evaluated based on all of these criteria. Mitigative measures have been presented and adopted in an effort to reduce the significance of residual impact as a result of the Project's activities. Cumulative effects of the Project on the environment due to other regional Projects and activities have also been identified and assessed.

The following benefits would result due to the GBWF and are considered as advantages of the Project, these include:

- Increased revenue for the HRM through payment of annual property taxes by the Project Proponent;
- Increased revenue for local businesses due to activities surrounding the construction, operation and decommissioning phases of the Project;
- Creation of supplementary income and income diversity for local landowner;
- Creation of additional employment in the region during the entire Project life;
- Production of emission-free energy, which will displace energy produced from fossil fuels in Nova Scotia; and
- Help Nova Scotia meet its renewable energy regulations and targets for 2015 and 2020.

In conclusion, it is anticipated that through proposed mitigative measures the Gaetz Brook Wind Farm will have minimal significant residual effects on the physical, biophysical and socio-economic environment.

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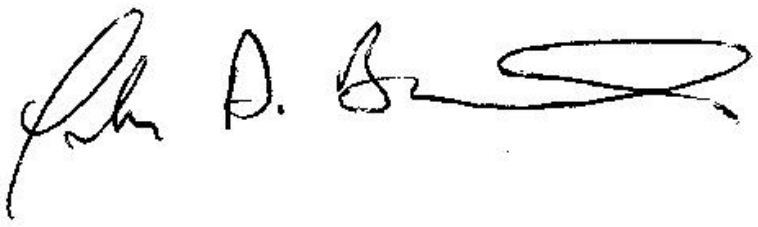
9.0 Company Signature

Table 9-1 below defines the concluding signature of this Environmental Assessment for Natural Forces Wind Inc.

Table 9-1: Signature Declaration

EA CONDUCTED BY:	Chris Veinot, Natural Forces Wind Inc.
PROPONENT:	Natural Forces Wind Inc.
PROPONENT SIGNATURE:	
DATE:	July 2, 2013

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