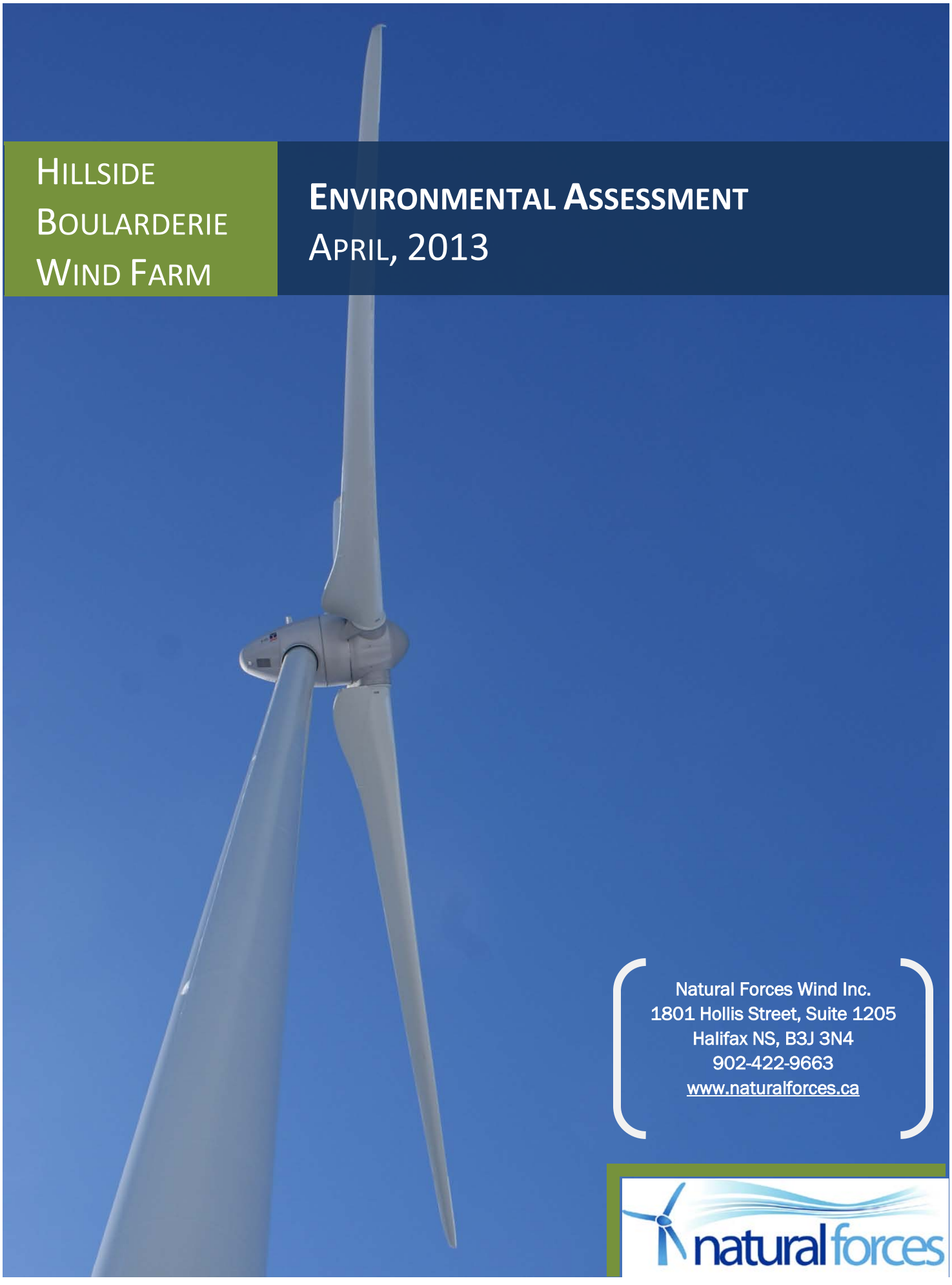

HILLSIDE BOULARDERIE WIND FARM

ENVIRONMENTAL ASSESSMENT

APRIL, 2013

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natural forces

Executive Summary

This Environmental Assessment has been prepared for the proposed Hillside Boularderie 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 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 effects 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 Hillside Boularderie 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
CBRM	Cape Breton Regional Municipality
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 Service
EA	Environmental Assessment
HBWF	Hillside Boularderie Wind Farm
IBA	Important Bird Area
km	Kilometer
MEKS	Mi'kmaq Ecological Knowledge Study
MBBA	Maritime Breeding Bird Atlas
MW	Megawatt
NSESA	Nova Scotia Endangered Species Act
NSPI	Nova Scotia Power Inc.
PPA	Power Purchase Agreement
Project	Hillside Boularderie Wind Farm
Proponent	Natural Forces Wind Inc.
SARA	Species at Risk Act
SCADA	Supervisory Control and Data Acquisition
UNESCO	United Nations Educational, Scientific and Cultural Organization
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 Hillside Boularderie Wind Farm (Project or HBWF) as proposed is a 4.0 megawatt (MW) two wind turbine generator (WTG) project. The Project is located in the Cape Breton Regional Municipality (CBRM), in the community of Hillside Boularderie and bordering the community of Groves Point.

Natural Forces Wind Inc. (Proponent) is proposing to develop the Project in the community of Hillside Boularderie under the Nova Scotia Department of Energy Community Feed in Tariff (COMFIT) program. The proposed WTG locations are situated on existing privately owned farmland approximately 1.5 kilometers (km) north of the Groves Point Provincial Picnic Park and approximately 17 km northwest of Sydney. 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 CBRM has been a leader in embracing the green energy revolution, and has lead the province in welcoming wind farm development throughout the municipality. The recently published CBRM mayoral proposition paper, titled *Shaping Our Future in the Cape Breton Regional Municipality – A Reorganization Plan for Positive Change*, not only supports green energy development, but strongly advocates for community economic development initiatives (Clark, 2012). Many other local agencies throughout the CBRM have been known to support responsibly developed green energy projects, including the Cape Breton County Economic Development Authority, the Cape Breton Partnership, the Atlantic Coastal Action Program and Cape Breton University.

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 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 HBWF 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.

It typically takes approximately three years to develop and construct a wind farm. Although, the proposed HBWF is still in the development phase, public consultation began in late 2011 with a public open house, presentation to Council and meetings with community members 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 in fall 2012 and is currently generating electricity.

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 4.0 MW two WTG wind farm in Hillside Boularderie and a 2.3 MW single WTG wind farm on the Eastern Shore near the community of Gaetz Brook.

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 Environment 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 HBWF is 4.0 MW and therefore is a Class 1 undertaking.

Four guidance documents were used in the preparation of this EA for the HBWF 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
4. *Environmental Impact Statement Guidelines for Screening of Inland Wind Farms under the Canadian Environmental Assessment Act*, published by Natural Resources Canada (NRCan, 2003).

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 is 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
Work Within Highway 'Right-of-way' Permit	NS Transportation and Infrastructure Renewal	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

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	Cape Breton Regional Municipality	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 HBWF'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 first present in Section 2, a Project description in which information regarding site location and layout, proposed WTGs, 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 HBWF is located on privately owned land in the Cape Breton Regional Municipality in Hillside Boularderie and Groves Point community, located 8 km northwest of North Sydney and adjacent to Hillside Boularderie Road. The Proponent plans to construct and operate a 2 WTG, 4.0 MW wind farm; the proposed locations for WTG 1 and WTG 2 are below and can be seen in Figure 2-1.

- WTG 1: 46°14'50" N, 60°21'6" W Easting: 704148 Northing: 5124925
- WTG 2: 46°14'40" N, 60°20'54" W Easting: 704416 Northing: 5124625

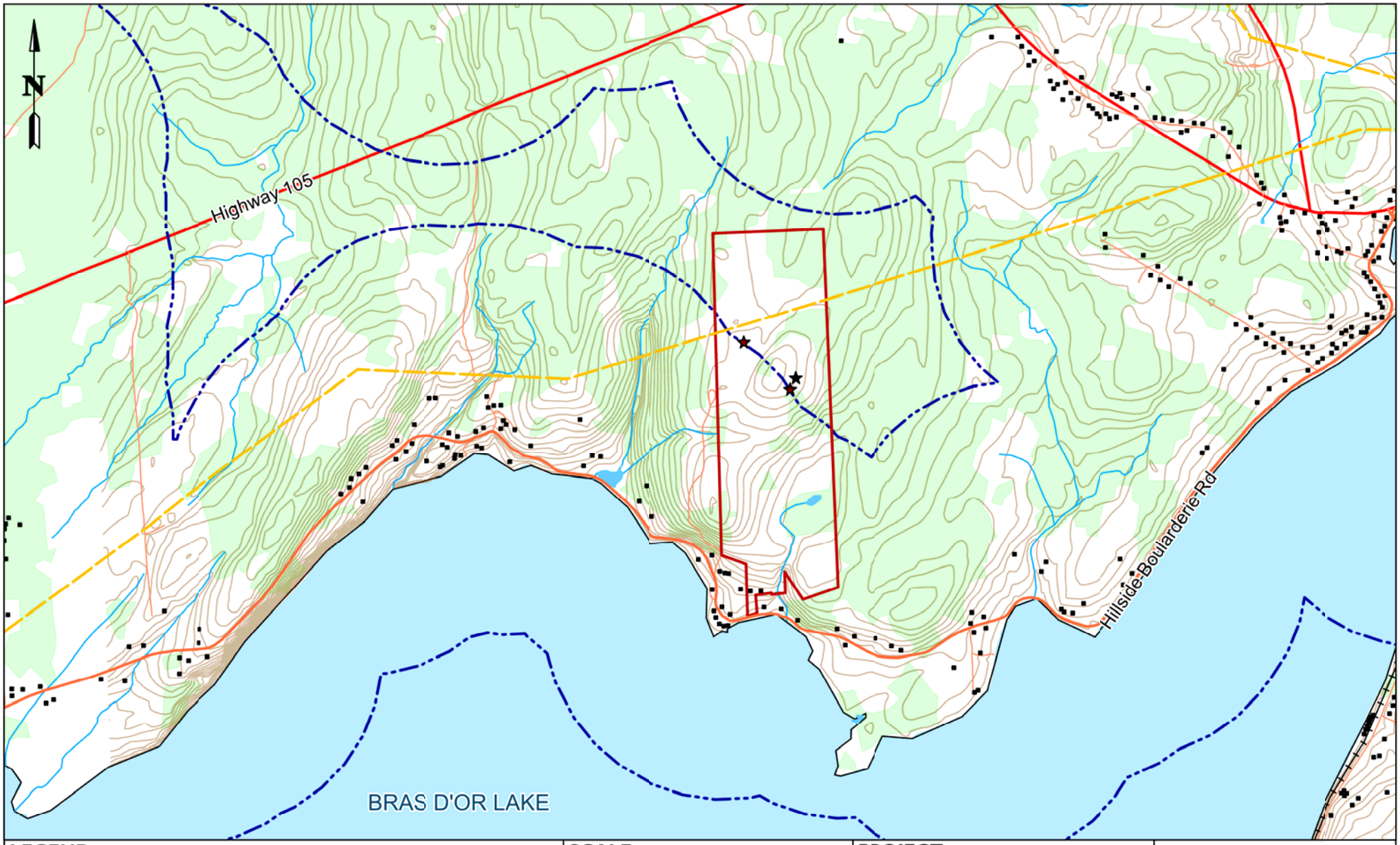
Setback distances from residential dwellings to the nearest WTG are greater than 1000 m.

The HBWF will connect to the Nova Scotia Power Inc's (NSPI) distribution grid via 3-phase distribution lines located adjacent to the Trans-Canada Highway northeast of the Project site. This connection will require a new 3-phase distribution line, to be constructed by NSPI from the WTG's to existing NSPI infrastructure near the Trans-Canada Highway. The new distribution lines will then piggyback the existing NSPI distribution infrastructure heading south and eventually connect to NSPI distribution circuit 3S-301 near the community of Bras d'Or. NSPI will construct, own and operate all of the new distribution lines.

The project land under Option to Lease is composed of two land parcels, both owned by the same land owner. The combined land parcels cover 277 acres that is approximately 65% cleared farm land and 35% deciduous forest; both WTGs will be located on existing cleared farmland. The Project land is separated into two municipal zones; Rural CBRM zone and Rural Residential Subdivision zone, the land parcels are intersected by the community boundary of Hillside Boularderie and Groves Point. The CBRM permits the development of utility scale wind turbines in all zones when compliant with the municipal setback by-laws (CBRM, 2004).

The access road will be constructed by entering the Project site from the Hillside Boularderie Road. The proposed access road will make use of an existing farm road that will be upgraded to accommodate the wind farm equipment; by using existing roads the Proponent aims to minimize the overall environmental impact of the project. Water bodies and watercourses have been identified for the Project site; these water bodies will be avoided during the construction and upgrading of the roads.

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 and socio-economic concerns. Detailed assessment of these three factors have led the Proponent to determine that the location of the HBWF presents the best opportunity to capture the wind regime in an effort to provide efficient wind energy to the local community given the environmental, socio-economic, regulatory and technical factors.



LEGEND

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

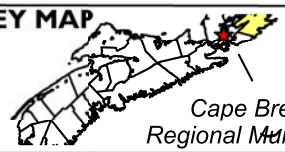
Source: Nova Scotia Department of Natural Resources

SCALE

0 0.5 1
kilometres

1:30,000

KEY MAP



PROJECT
Hillside Boularderie Wind Farm

FIGURE
Figure 2-1

TITLE
General Overview

DATE
March 1 2013

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

2.2 Wind Turbine Generator

Two Enercon E92 or E82 WTGs will be used on site for the duration of the Project. Each WTG has a rated capacity of 2.0 MW, thereby providing a total capacity of 4.0 MW. The turbine towers will have a height range from 78 m – 98 m, and the rotor blade diameter will range from 82 m - 92 m. Each installed WTG will have a maximum height of 144 m from base to blade tip.

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 WTGs 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 WTGs 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 and E82 specifications.

Characteristic	Value	
	Enercon E92	**Enercon E82**
Rotor diameter	92 m	82 m
Swept area	6648 m^2	5281 m^2
Rotations per minute	5 – 16 min^{-1}	6 – 17.5 min^{-1}
Cut out wind speed	28 – 49 m/s (Enercon storm control)	28 – 34 m/s (Enercon storm control)
Hub height	85 – 138 m	78 – 138 m
Max sound pressure level	105 dB(A)	105 dB(A)

2.3 Wind Regime

A detailed wind resource assessment at the HBWF site was initiated in May 2012 with the installation of a 60 m meteorological mast (met mast) containing six anemometers at 40 m, 50 m and 60 m above ground level. The assessment monitors 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 upon the completion of the yearlong wind monitoring program, which is expected to finish in June of 2013. The Nova Scotia wind atlas shows an approximate wind speed on the project site of 7 – 8 m/s at 80 m.

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 HBWF site is an attractive site due to the wind resource, distance from dwellings, capacity of the distribution grid and minimal ecological impacts.

A variety of criteria has been considered in the site selection of the HBWF. 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 other ecological sensitive areas.
- Land use considerations; and
    - 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 Bras d'Or Lake system is one of the main ecological features in the Cape Breton Regional Municipality. The lands surrounding the Bras d'Or Lake system is relatively hilly terrain with elevations extending to several hundred meters above sea level.

During the summer, a sea-breeze is observed from Bras d'Or Lake where the land heats up quicker than the water and provides a prevailing south west wind. Typically at high 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 3S-403 circuit of the Gannon Road substation, which provides electricity to North Sydney and surrounding communities. The proximity of the HBWF to a high electrical load center such as North Sydney 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 is an existing Communications tower located approximately 2 km north east of the project site.

Environmental Considerations

The landscape of the HBWF site lies on previously cleared land with approximately 35% forest coverage. The history of the land has been used for farming purposes, and shows no signs of 20th century logging activities.

The Project site is located on Boularderie Island at the Northern end of Bras d'Or Lake on land with an elevation range from sea level to 100 m above sea level. The proposed turbine locations are 87 m and 96 m above sea level for WTG 1 and WTG 2, respectively.

Land Use Considerations

The closest local communities are Hillside Boularderie, in which the Project site is located and Groves Point, located directly east of the Project. These communities consist of sparsely spaced rural dwellings along Bras d'Or Lake. The proposed turbine locations have a minimum setback of 1000 m from the closest dwelling. The Project site is bound by Hillside Boularderie Road to the south and the Trans-Canada Highway 1.2 km to the north.

The landowner has made the land available for the installation of two WTGs and ancillary infrastructure on their land. The existing access road from previous land activities will be largely used, reducing the need for creation of new roads.

2.5 Construction

Construction of the HBWF 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 and 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 pads						
Construction of crane pads & turbine foundations						
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 road construction, 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; and
- Widening and improvement of the site entrance for safe vehicle access.

The Proponent is aware that the transportation of large-scale wind turbines will require overweight and over dimensional exceptional move permits. Service Nova Scotia and Municipal Relations officers will be consulted to ensure any other potential 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. These access roads will be used to move workers and equipment about the site during mobilization, construction, operation and decommissioning phases. The access roads required for the Project are approximated to be 1.70 km. The new access road will be design such that it makes use of the existing farm 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.

The construction of new roads 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 of between 0.25 – 0.5 m, again dependent on the strength of the underlying road formation. The internal site roads 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. A proposed access road design can be seen in Figure 4-2.

2.5.3 Crane Pads & Turbine Foundations

Crane Pad

Dependent on the turbine type and the crane selected for erection, a crane pad of approximately 50 m by 25 m may be required adjacent to each turbine location. Its purpose is to safely accommodate the weight of the large crane necessary for turbine installation and maintenance. The exact arrangement of the crane pads would be designed to suit the specific requirements of each turbine and the surrounding topography of the Project site.

Construction of the main crane pads would involve the removal of soil to a depth of between 0.25 – 0.5 m, depending on the ground conditions encountered during the geotechnical investigations. 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 pads 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 each 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 foundations 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 each 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 WTGs will be transformed to 12.5 kV by a transformer located in the base of each WTG. The electricity will then be conducted via insulated electrical cables through cable ducts cast into the WTG foundations routed out to new power poles on site, and then to the new connection point on site with the existing NSPI distribution system.

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

The electrical, communications and grounding cables will leave the WTG foundations below grade via cable ducts cast into the WTG foundations. Where the cables are to cross the site roads and crane bases, they may be located in cable ducts surrounded by 0.15 m of concrete to ensure the integrity of the cables 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 landowners.

2.5.1 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 approximately follow an existing NSPI Transmission corridor located north of the projects lands leading east to an existing NSPI distribution line adjacent to the Trans Canada Highway. Upon reaching the Trans Canada Highway, the new 3-phase distribution line will piggyback on existing NSPI distribution infrastructure in a southeasterly direction, crossing Mill Creek, and eventually connecting to NSPI distribution circuit 3S-301 near the community of Bras d'Or. Figure 2-2 shows the proposed connection point to the NSPI distribution line adjacent to the Trans Canada Highway.

2.5.2 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 each turbine 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 foundations 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.

2.5.3 Site Restoration

After construction, erection and commissioning are completed and the Project is in the start-up 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.

2.5.4 Other

Entry to the Project site will be from the Hillside Boularderie Road. This will be the entry point for all workers, construction equipment and WTG components for the duration of the construction phase.

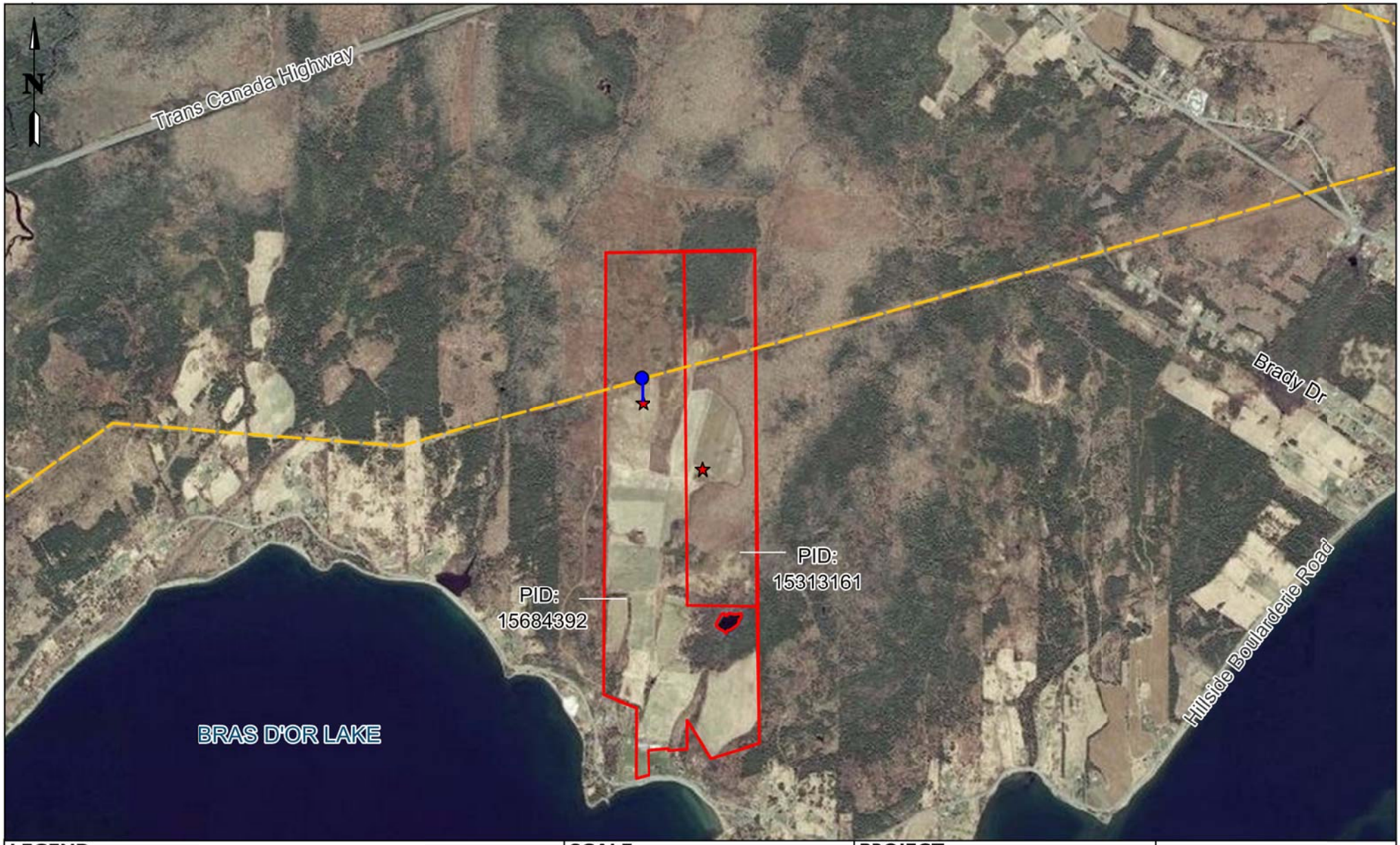
During construction of the access road and WTG foundations, there will be an increase in truck traffic on the roads leading to and from the Project site. Increased dust is possible, although water trucks will dampen the roads and excavation areas when necessary to control fugitive dust.

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 foundations;
- One 800-1000 tonne main lift crane;
- One 150 tonne tailing crane;
- One 135 tonne rough-terrain crane for assembling WTGs;
- WTG component delivery vehicles; and
- Miscellaneous light vehicles including cars and pickup trucks.

Of these predicted vehicle movements, approximately 25 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.



LEGEND

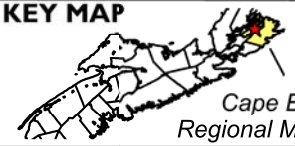
- Project site
- Transmission corridor
- Distribution line connecting to NSPI infrastructure
- Connection point to NSPI infrastructure
- Proposed wind turbine generator

Source: Nova Scotia Department of Natural Resources

SCALE

0 0.5 1
kilometres
1:30,000

KEY MAP



PROJECT
Hillside Boularderie Wind Farm

FIGURE
Figure 2-2

TITLE
Aerial view

DATE
March 1 2013

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

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 each turbine for remote monitoring and control of each wind turbine, which will minimize the need for on-site personnel. The SCADA system ensures safe efficient operation of each 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 turbines. 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 Hillside Boularderie 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 WTGs will be dismantled and removed from the site for scrap or resale. The bases 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 HBWF Project. There are three contributing factors that have been considered in determining the 20 year project duration.

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

Based on these three factors, at this time the Proponent does not have any plans to further develop this Project after the proposed 20 year Project life has elapsed.

2.9 Other Projects in Area

There is one other known wind farm development in the immediate area. Celtic Current GP proposes to develop a 1.9 MW wind farm near the community of Point Aconi of the Cape Breton Regional Municipality. The project has been approved under the COMFIT program similar to that of the HBWF. Point Aconi is located approximately 10 km northeast of the HBWF Project site. The Point Aconi project is expected to be constructed within the next few years.

Other than the proposed Point Aconi wind farm Project, there are no other proposed, under construction or operating Projects within a 10 km radius of the proposed HBWF that would potentially cause cumulative effects to the physical, biophysical or socio-economic environment. As a best practice, the Proponent will take the proposed Point Aconi wind farm into consideration for cumulative effects in the VEC assessment of this EA. This will be discussed further in Section 6.

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 HBWF 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
Wetlands and Watercourses	Fish and Fish Habitat	Aboriginal Resources / Uses
Ambient Noise	Migratory and Breeding Birds	Archaeological Resources
Ambient Light	Flora and Fauna	Recreation and Tourism
	Species at Risk	Vehicular Traffic
	Bats	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' matrix it has been determined that the Project is in category 2 in terms of potential risk to wild species and/or their habitats. Projects in this category present a moderate level of risk to wild species and/or their habitat. Projects in category 2 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 in further detail 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. The study area also includes all areas that project – environment interactions could be reasonably expected to occur. It is not reasonably possible to define a precise study area that properly represents the spatial characteristics in which project's environmental interactions are expected to occur. 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 Bird Monitoring

The Proponent has engaged the services of Dillon Consulting Ltd to provide a spring migratory bird survey and AMEC Earth & Environmental (AMEC) to provide a summer breeding, fall migratory and winter bird surveys. The full avian surveys can be found in Appendix B.

Desktop Review

Prior to conducting field surveys, aerial photographs of the site were reviewed so that survey sites would be selected to ensure that all representative habitat types within the proposed Project footprint were surveyed. A data request from the Atlantic Canada Conservation Data Center (ACCDC) was conducted to obtain a record of species at risk and species of conservation concern previously reported in the area or having the potential to occur within the area based on known species range maps, and to obtain information on biologically significant areas in the vicinity of the proposed Project. The Important Bird Area (IBA) database was consulted to determine whether known areas with significant attributes for birds exist near the Project site. A list of bird species known or suspected to be breeding in the area was obtained through the Maritimes Breeding Bird Atlas (MBBA), and finally the Christmas Bird Count (CBC) database was consulted to obtain records of wintering bird species in the region.

Field Study

Dillon Consulting Ltd conducted three spring avian surveys. The first survey focusing on raptor movement was conducted on April 20, 2012. This survey was completed with the use of a mounted

viewing scope set at the highest point of elevation at the Project site (103 m above sea level) allowing for a 360° view of the surrounding area. The second survey was conducted at five locations at the Project site during the pre-dawn period on April 21, 2012 and focused on nocturnal species such as owls and woodcocks. A third survey focusing on breeding and migration was conducted during the morning of April 21, 2012 at 12 survey locations. Two locations were located off of the Project site along the Bras d'Or Lake shoreline and ten locations were located within the Project site; survey locations can be found in Figure 1 of the avian survey in Appendix B. This survey consisted of 10 minute point count surveys at each of the 12 locations as per Canadian Wildlife Service protocol.

AMEC conducted a summer breeding survey, fall migration survey and a winter resident survey.

Two summer breeding surveys were conducted, one on June 28, 2012 and the other on July 11, 2012. A "point count" survey consisting of ten minutes of silent listening was conducted at nine locations at the Project site, spaced approximately 300 m apart. Species were identified visually or by their characteristic songs and call notes, and the observer recorded numbers and breeding evidence as well as weather conditions and habitat type.

A total of seven surveys were completed during the 2012 fall migration period: August 23, September 1, September 7, September 8, September 19, October 3 and October 12. A transect route was established along the site access road. The surveys took place in the morning or early afternoon, and the route was traversed on foot with frequent listening stops, and all birds seen or heard were recorded. Weather conditions, bird species and numbers, and behavior (in particular, the height of birds in flight around the proposed turbine locations) were noted.

A winter bird survey was conducted on January 10, 2013 to quantify winter resident species focusing on raptors. A transect route was established along the site access road, which was traversed on foot with frequent listening stops, and all birds seen or heard were recorded. Weather conditions, bird species and numbers, and behavior (in particular, the height of birds in flight around the proposed turbine locations) were noted.

AMEC is currently conducting a spring migration survey to add to the existing spring migration data collected by Dillon Consulting Ltd.

3.2.2 Bat Monitoring

The Proponent has engaged the services of AMEC to provide an assessment of potential effects of the proposed Project on resident and migratory bat populations. The initial scoping of the bat monitoring program was conducted in early 2012. During the scoping exercise the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) had listed the Little Brown Bat, *Myotis lucifugus* endangered in an emergency assessment. The Myotis species is common in Nova Scotia, and likely present near the proposed Project site, and therefore the Proponent placed a high level of effort on the scoping of the Bat Monitoring program. The AMEC bat study consisted of a desktop review as well as a 50 day field survey during bat migration season. Full survey results can be found in Appendix C.

Desktop Review

The baseline bat monitoring survey began with a detailed desktop review of existing data. A review of geological mapping of the area was conducted to determine the likelihood of possible bat hibernacula, in the form of natural caves. Nova Scotia's Department of Natural Resources' Mine Openings database was also consulted to determine if there are abandoned mines in the area, which could also serve as hibernacula. As many parts of Nova Scotia including eastern Cape Breton have historically supported various types of mining activities, a review of the geology and mining history of the site can be beneficial in determining the likely presence of natural caves and/or abandoned mines.

Conversations with Dr. Hugh Broader via AMEC, as well as the NSDNR Regional Biologist revealed there are no known bat hibernacula in the immediate area of Hillside Boularderie. The Regional Biologist did indicate there is a small hibernacula in an abandoned mine near Coxheath located approximately 13 km south of the project site. A winter 2012 survey (independent of the Proponent) revealed fewer than 20 individual bats at that location.

Field Study

The field survey consisted of two detection units sited at the same location, the first at ground level and a second at 10 m above ground level. Although two detectors may record the same individuals, the redundancy will enable continued detection in the event that one system fails due to battery depletion, weather events, or animal disturbance. Based on previous acoustic bat surveys by AMEC, it was decided that an aerial detector elevated 10 m above ground level would be set to detect bats along the tree line at the edge of the cleared site at the canopy level. The second ground based system was set to detect bats that forage on low flying insects in cleared areas. The two systems were deployed on August 23, 2012 and remained in operation until October 11, 2012. The detectors were programmed to record all ultrasonic sounds between 7 pm and 7 am. The units were frequently checked (weekly) to download data, check batteries and to verify that the system was intact and functioning properly.

3.2.3 Archaeological

A historic background study was conducted by Davis MacIntyre & Associates Limited in September 2012. 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. A preliminary field reconnaissance of the proposed impact areas was also conducted. The Archaeological Resource Impact Study is included in Appendix D.

3.2.4 Flora & Fauna

The Proponent has engaged the services of AMEC to provide an assessment of potential effects of the proposed Project on habitat and vegetation at the Project site. A desktop review and field study were conducted; the vascular plant survey can be found in Appendix E.

Desktop Review

Prior to conducting field surveys, the various habitats located within the study area were identified using information gathered during a desktop study (i.e. aerial photography and Nova Scotia Forest inventory database, etc.). Information collected during the desktop review was used to develop a field survey strategy to ensure that all habitat types are surveyed during the field visit.

A data request from the ACCDC was also conducted in order to obtain a list of species and risk and/or species of conservation concern previously recorded in the area or having the potential to occur within the area based on known species range maps.

Field Study

Vegetation and habitat surveys were conducted on October 11, 2012 by an AMEC biologist and Mi'kmaq specialist within the study area. All habitat types identified during the desktop survey were visited in the field in order to further describe the vegetation structure and composition. Vegetation surveys consisted of optically controlled meanders through all indentified habitat types within the study area. All plant species encountered during the surveys were recorded.

3.2.5 Mi'kmaq Ecological Knowledge Study

The proponent has engaged the services of AMEC, in conjunction with Norma Brown, a Mi'Kmaq Culture Specialist, 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 MEKS consisted of an initial desktop review and collection of existing data to gain site specific background information. Consultation with First Nations groups and individuals on six separate occasions provided local site specific information about traditional and current use of natural resources. AMEC conducted roundtable discussions in Membertou First Nation on October 25, November 28 and 29, 2012 and March 20, 2013. Discussions were held in Eskasoni on October 24, 2012 and April 8, 2013. Field surveys were conducted to confirm and update information recovered during the desktop study. The full MEKS conducted by AMEC can be found in Appendix F.

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 act, 1994)

"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 EA is designed to focus on the evaluation of the potential interactions between the VECs and socio-economic aspects 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 Project activities and the VEC or socio-economic aspect 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 or socio-economic aspect; and
- *Beneficial impact:* the consequence of a Project activity enhances the specific VEC or socio-economic aspect.

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

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4.0 Environmental Setting

4.1 Biophysical

4.1.1 Geophysical

The HBWF is located on Boularderie Island, which has a peak site elevation of approximately 100 m above sea level. The elevation change across the HBWF site ranges from approximately 5 m above sea level to 100 m above sea level. The Project site is located within the Sydney Coalfield Natural Theme Region, the coalfield lies within a Pictou-Morien Group area of sandstones and siltstones, mantled with sandy to stony till. The undulating landscape features well-drained Shulie soils over stony, sandy loam stills. Along the coast where the terrain is flatter, the soil is classified as imperfectly drained Springhill and poorly drained Economy soils. Bedrock that approaches the surface can be observed as slabby sandstone outcrops especially along the shoreline. There are also occurrences of imperfectly drained Diligence silt clay loams with small areas of well-drained Falmouth soils formed over gypsum, and some Hebert soils formed on outwash sands and gravels (Museum of Natural History, 2013).

4.1.2 Atmospheric

The HBWF is located within the Northern section of the Cape Breton Regional Municipality on Boularderie Island. Climate data was taken from an Environment Canada weather station located in Sidney, approximately 16 km south east of the Project site (Environment Canada, 2012). The data collected from Environment Canada representing climate averages and extremes can be found in Table 4-1.

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

Parameter	Time Period	Data Source	Value
Average Daily Temperature (°C)	Yearly Average (1971-2000)	Environment Canada	5.5
Extreme Maximum Temperature (°C)	August 10, 2001	Environment Canada	35.5
Extreme Minimum Temperature (°C)	February 8, 1994	Environment Canada	-27.3
Average Total Rainfall (mm)	Yearly Average (1971-2000)	Environment Canada	1212.9
Maximum Daily Rainfall (mm)	August 17, 1981	Environment Canada	128.8
Average Total Snowfall (cm)	Yearly Average (1971-2000)	Environment Canada	298.3
Maximum Snow Depth (cm)	February 9, 1992	Environment Canada	123
Prevailing Wind Direction	Yearly Average (1971-2000)	Environment Canada	South
Average Wind Speed (km/h)	Yearly Average (1971-2000)	Environment Canada	18.6
Maximum Gust Speed (km/h)	December 1, 1964	Environment Canada	161

Visibility & Fog

The presence and frequency of fog events at a wind farm site can have a detrimental effect on migratory birds due to collisions during adverse weather conditions. Artificial lighting, particularly work lights inadvertently left on by turbine maintenance crews are also known to have an adverse effect on migratory birds (Kearney, 2012) During adverse weather events, sporadic artificial lighting during dawn and dusk at a wind farms may attract migrating birds, signaling a potential safe area of refuse.

The Project setting is considered rural, with little to no presence of artificial lighting. Light pollution from North Sydney, Sydney Mines and Sydney can 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). 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 in Sydney, Nova Scotia was selected, which is 16 km south-east of the Project site (Environment Canada, 2012). Based on this data presented in Table 4-2, fog can be expected to occur 4.24% 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.

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

Month	Hours with visibility less than 1 km	% of foggy weather*
January	29.8	4.01
February	26.2	3.90
March	46.8	6.29
April	61.1	8.49
May	60.2	8.09
June	38.9	5.40
July	28.9	3.88
August	17.5	2.35
September	8.0	1.11
October	11.8	1.59
November	17.4	2.34
December	24.7	3.32
Annual	**371.4**	**4.24**

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

Wind Regime

Based on the Proponents independent Wind Resource Assessment a wind rose identified in Figure 4-1 indicates the prevailing wind (between May and October 2012) at the Project site location. Wind data was measured with several sets of anemometers and wind vanes mounted on a meteorological mast at varying heights.

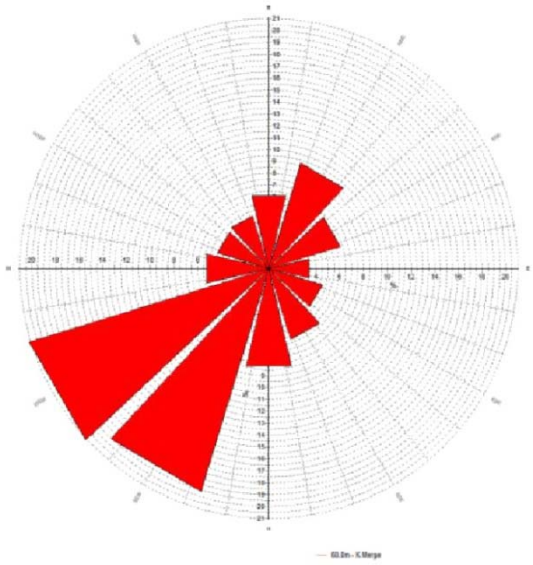


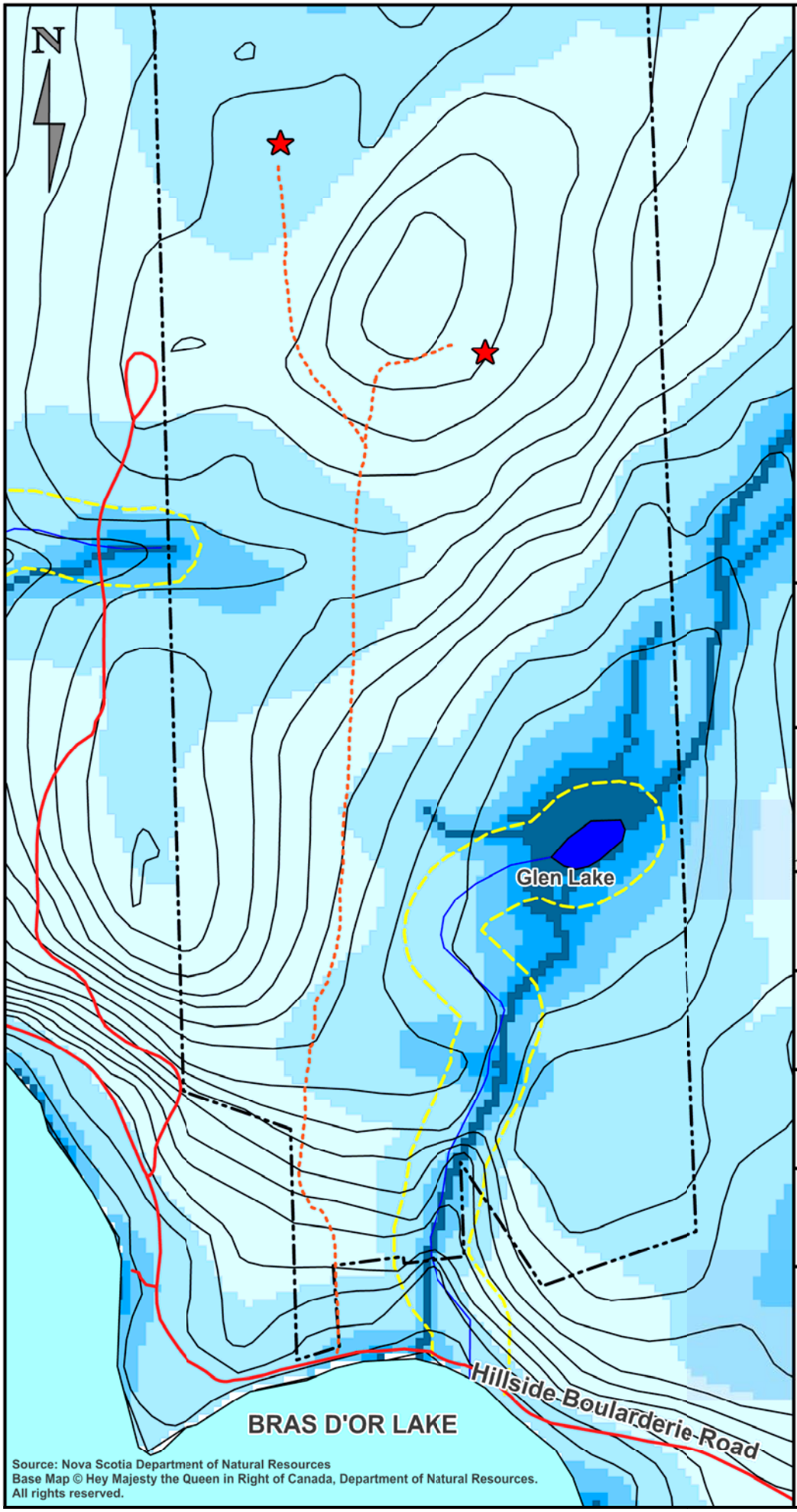
Figure 4-1: Meteorological mast wind rose.

4.1.3 Wetlands and Watercourses

The Project site is located within the Salmon Mira River watershed, which makes up the central east region of Cape Breton Island. Other than being located approximately 1400 m from Bras d'Or Lake, the Project site is not located near any other major surface water features. There is however, Glen Lake, which is located in the south east quadrant of the Project site. Glen lake is approximately 700 m^2 and empties into the Bras d'Or Lakes as shown in Figure 4-2, which displays surface water and groundwater features based on Nova Scotia Department of Natural Resources Wet Area Mapping (WAM) data (Department of Natural Resources, 2007). The WAM layer provides a depth to water table analysis in various increments. This analysis also supports that the only water body to be aware of at the Project site is in fact Glen Lake. The watercourse from Glen Lake draining into Bras d'Or Lake exits the water body flowing south, meandering west and then to the south east where it continues south to its drainage basin.

It is important to note that the map-generated depth values may not actually represent depth to a water table or ground water under all conditions, but they do represent end-of-summer soil wetness values. This relates to the likelihood of there being natural water present at a given depth within the general vicinity of any point of interest. Extensive use has shown that WAM is a very useful tool for

suggesting general water flow patterns and accumulation across the landscape (Department of Natural Resources, 2007).



LEGEND

- Proposed Turbine Location
- Water feature Buffer - 50 m
- Road
- Elevation Contour 5 m
- Project Site
- Watercourse/Waterbody

Depth to Watertable

- 1 to 2 m
- 2 to 3 m
- 3 to 4 m
- 4 to 5 m
- 5 to 5 m

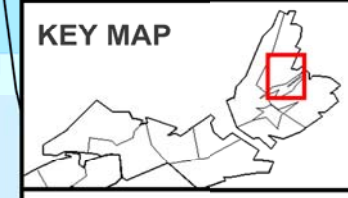
SCALE

0 200 400

metres

1:7,500

KEY MAP



PROJECT

Hillside Boularderie Wind Farm

FIGURE

Figure 4-2

TITLE

Wet Area Map and Access Road

DATE

April 3 2013

natural forces
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

4.1.4 Migratory and breeding birds

An avian study was conducted, consisting of desktop research as well as a field survey. The objectives of this study were to determine:

1. What species make use of the habitat at the Project site;
2. Of the identified species, which may be most susceptible to collision with turbines based on flight and behavior;
3. The peak spring and fall migration periods at the Project site; and
4. Whether any species at risk or species of conservation concern make use of the Project site during migration or breeding.

Prior to conducting avian field surveys, data from the ACCDC was obtained to identify species at risk and species of conservation concern at the Project location. The IBA was consulted to determine whether known areas with significant attributes for birds exist near the Project site as shown in Figure 4-3. Finally, The MBBA and the CBC database were used to compile a list of bird species known or suspected to be breeding in the area.

The field surveys were initiated in April 2012, and encompassed the spring migration period, the summer breeding season, the fall migration season, and a winter resident survey that focused on Raptors. The desktop study and field survey reports can be found in Appendix B. The main findings are presented below:

Desktop

- No biologically significant areas were identified within 5 km of the Project site based on the ACCDC. The Central Cape Breton Highlands area is situated approximately 15 km northwest of the site; this IBA is home to significant numbers of Bicknell's Thrush. The Bicknell's Thrush favours coniferous forest, and so is unlikely to occur on the Project site, which is grass-dominated farm fields and deciduous forest.
- Within a 10 km atlas square in which the site is located a total of 80 species were recorded. Of these species, 21 were confirmed to be breeding in the square based on observed breeding evidence. A further 29 were considered "probably breeders".
- Results of an ACCDC search for rare species observations within a 100 km buffer around the study area show 2910 records of 103 vertebrate species and 166 records of 41 invertebrate species.

Spring Migration

- No species of conservation concern were identified as a result of the spring migratory survey.
- The most abundant species observed during the spring migratory survey were the American Robin, Song Sparrow, Hermit Thrush, White Throated Sparrow, American Crow, American Goldfinch and Herring Gul.

- As observed in the fall migration survey All of the species are known to breed in the region; therefore, it is not believe that the area serves as a significant migration stopover.

Summer Breeding

- The most commonly detected species during the summer breeding surveys were Song Sparrow and American Robin, each with 32 observations, followed by Red-eyed Vireo, Hermit Thrush, American Goldfinch, Ovenbird and Cedar Waxwind, each with more than 20 occurrences through the survey period.
- One federally listed species at risk, the Bobolink, was observed during the summer breeding period. Three regionally rare species according to the ACCDC were also observed: Eastern Wood-pewee, Yellow-bellied Flycatcher and Boreal Chickadee.

Fall Migration

- Fall migration surveys indicated a large number of American Crows (a non-migratory species). Other species observed with some regularity were Savannah Sparrow, Black-capped Chickadee, Bald Eagle and American Goldfinch.
- All of the species observed during the fall migration surveys are known to breed in the region; therefore, it is not believe that the area serves as a significant migration stopover.

Winter Resident

- A winter resident survey identified 9 species: the American Crow, Bald Eagle, Black-capped Chickadee, Boreal Chickadee, Blue Jay, Common Raven, Redpolls, Herring Gull and Red-tailed Hawk.
- Raptors were present in moderate numbers and included Bald Eagles, Red-tailed Hawks, Northern Harriers and, less frequently, the American Kestrel.

During the surveys, the height at which birds in flight were observed was estimated. Of the 199 recorded observations of birds in flight, 182 were below 20 m (91%), 13 were between 20 and 50 m (7%) and 4 birds were observed at heights above 50 m (2%).

4.1.5 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: Deciduous Forest, Field, Disturbed (Dirt Road) and Utility corridor.

Deciduous forest was found to be one of the dominant habitat types within the Project site. This habitat type was primarily located in the western and eastern side of the Project site as well as within a hedge row located in the center of the area between two fields. These areas were dominated by Beech, Sugar Maple and Yellow Birch. The understory in this forest type was primarily dominated by Northern Lady

Fern. Feather Moss is the main component of ground cover. This forest is primarily in a mature succession state however a younger pole age stand was noted along the east side of the Project area. Species composition was similar between the two age classes.

A large portion of the Project area consists of farm fields. These areas are dominated by grass species such as Timothy as well as Clover, Dandelion and Goldenrod. A large portion of field in the center of the area has been recently mowed while the east and west sections have been allowed to grow. Vegetation in the on mowed sections is similar in composition to the mowed section however, structurally it is much taller and a few shrub and young tree species such as White Spruce, Elderberry, Pin Cherry and Wild Rose are present.

A narrow dirt road was noted on the west side of the Project site within the deciduous forest. Vegetation along the road consists of Balsam Fir, Red Maple, Raspberry and Blackberry. The canopy of the surrounding deciduous forest (primarily American Beech) in the northern section of the road completely covers the road resulting in very sparse ground vegetation.

A utility corridor is located along the northern end of the Project site. Vegetation in this area is periodically cut in order to maintain the required clearance distance for the overhead power lines. The vegetation in this area consists of a mix of disturbance species such as Alder, Fireweed, Cinquefoil, Colts Foot, and Goldenrod; along with typical vegetation of the surrounding undisturbed community such as Bunch Berry, Hay Scented Fern and Balsam Fir.

The field survey identified a total of 80 vascular plant species. No plant species listed under the federal Species at Risk Act (SARA) or Nova Scotia Endangered Species Act (NSESA) was encountered during the surveys. The full study can be found in Appendix E.

During the avian species study incidental observations of non-avian fauna were noted. The survey included red squirrel (*Tamaisciurus hudsonicus*), snowshoe hare (*Lepus americanus*), white-tailed deer (*Odocoileus virginianus*), and red fox (*Vulpes vulpes*). Tracks of a second candid species were observed in the winter survey, which may have been either coyote (*Canis latrans*) or domestic dog. Three common butterfly species were noted: Canadian tiger swallowtail (*Papilio canadensis*), red admiral (*Vanessa atalanta*), clouded sulphur (*Colias philodice*). A woolly bear caterpillar, larva of the Isabella tiger moth (*Pyrrharctia 42sabella*), was also observed at the Project site.

The current population of moose in Cape Breton started from the introduction of 19 *Alces andersonii* moose from Alberta in 1947 and 1948. Currently, there are approximately 5,000 moose on Cape Breton Island (NSNDR, 2009). Since the Cape Breton moose species *Alces andersonii* are not an endangered species or a species at risk, no direct moose studies were completed at the Project site.

Through consultation with land owners and local residents, there is evidence of beavers within the Project site near Glen Lake.

4.1.6 Fish and Fish Habitat

As no direct watercourse alteration will be required at the Project site, no studies of fish habitat were completed. Consultation with a biologist familiar with the Project site leads to believe that given the size of Glen Lake and the separation between the Projects activities and the lake fish and fish habitat are unlikely to be affected.

4.1.7 Species at Risk

Plants

A total of 80 vascular plant species were recorded at the Project site during a field survey conducted in fall 2012 by AMEC Biologist, Scott Burley and Mi'kmaq specialist Norma Brown. No plant species listed under the federal SARA or NSESA were encountered during the survey at the Project site.

All species recorded are considered secure in Nova Scotia (ACCDED provincial rarity rank of S4 and S5) although five species could only be identified to the genus level and as such the rarity status of these species could not be determined. Included within the 80 plant species, 16 species recorded in the area are considered non-native to Nova Scotia which can be expected given the dominant land use of the area (i.e. farming).

Birds

During the pre-construction bird surveys, there were four species identified that have recognized statuses with SARA, NSESA or COSEWIC. Table 4-3 provides a list of the species at risk that have been observed at the Project site.

Table 4-3: Identified birds at risk.

Scientific Name	Common Name	Status	Provincial General Status Ranking
Dolichonyx oryzivorus	Bobolink	Threatened (COSEWIC)	Yellow
Contopus virens	Eastern Wood-pewee	Special Concern (COSEWIC)	n/a
Chordeiles minor	Common Nighthawk	Threatened (SARA)	Yellow
Hirundo rustica	Barn Swallow	Threatened (COSEWIC)	Yellow
Empidonax flavivnentris	Yellow-bellied Flycatcher	Conservation Concern (ACCDC)	n/a
Poecile hudsonica	Boreal Chickadee	Conservation Concern (ACCDC)	Yellow

Mammals

Bat monitoring activities revealed for the aerial unit a total of 879 bat echolocation sequences recorded. The number of bat echolocation sequences recorded per night, between August 23rd and October 11th ranged from 0 to 171, and based on analysis, all were made by the *Myotis* species.

Similar results were seen for the ground based unit, and a total of 1135 *Myotis* sequences were recorded. Up to 175 sequences were recorded in a single night near the beginning of the monitoring activities. The number of calls each night was similar for the two detectors, which suggests that the same bats were frequently being detected by both units.

As the fall season progressed, there was a decrease in bat echolocations, which can be expected as typical seasonal behavior of *Myotis* species in Nova Scotia.

The Proponent is aware through conversations with the Department of Natural Resources' Wildlife Division of the high sensitivity and potential risk wind farms may pose to the Little Brown Bat, a Provincial *Yellow* listed, and possibly soon to be *Red* listed species. White Nose Syndrome has been found to occur in bat hibernacula of the *Myotis lucifugus* particularly in New Brunswick and has led to a large reduction of Little Brown Bat populations. As such, a rigorous and comprehensive post-construction monitoring program will be conducted by the proponent to gather further data on *Myotis lucifugus* and other bat species. The complete bat survey report can be found in Appendix C.

Consultation with DNR's regional biologist, and further background research by the proponent revealed there to be little or no Mammalian Species at Risk known to occur in close proximity to the project site. Mainland moose Winter Track & Pellet Group Inventory surveys were not conducted as Moose are not known to frequent the project site; this is based on conversations with NSDNR.

4.2 Socio-economic

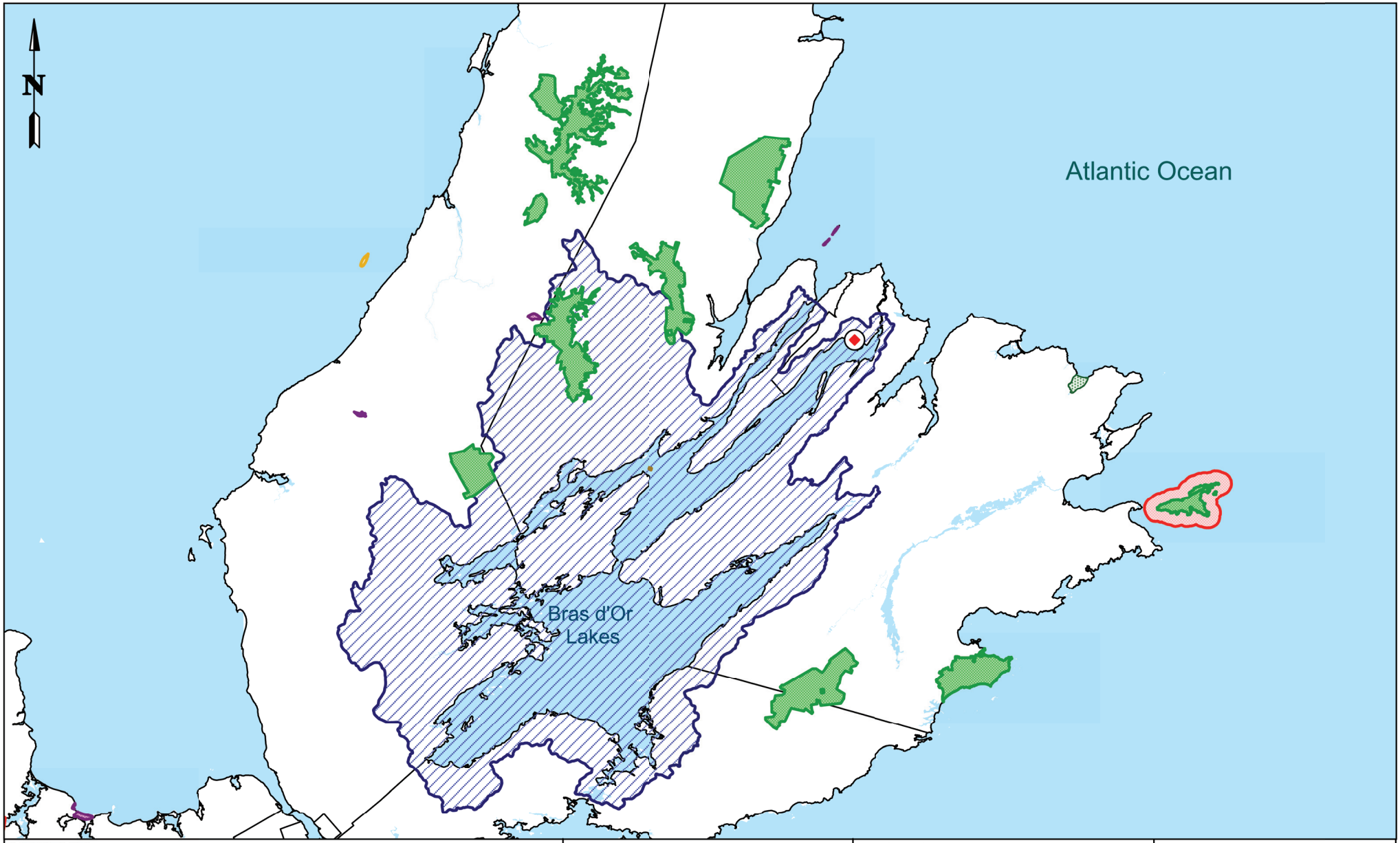
4.2.1 Community

The community of Hillside and Boularderie is located approximately 10 km northwest of North Sydney; it is situated within the Cape Breton Regional Municipality. The CBRM covers a total area of 2,470 m^2 and has a population of approximately 102,000 people (Stats Canada, 2006).

The Project site is located within the Bras d'Or Lake watershed, which is a recognized United Nations Educational, Scientific and Cultural Organization (UNESCO) biosphere reserve (UNESCO, 2011) shown in Figure 4-3. Five Mi'kmaq bands are present in the area that constitute a significant portion of the population, and that occupy a substantial portion of the watershed lands. Waves of European colonists, primarily from France, Scotland and England, capitalized on the natural resources of the area, progressively exploiting forest wood, arable land and mineral deposits (particularly coal, precious metals, aggregate and limestone) in addition to the prolific marine fish that originally drew them across the Atlantic Ocean (UNESCO, 2011).

With an economic depression effecting Cape Breton Island for the last four decades, a massive out-migration of youth has led to non-resident and non-working ownership of much of the coastal land. An emerging group of Mi'kmaq people (whose mean age is half that of the white population and who are more site-attached to the region) is showing leadership and enthusiasm for a new way of making the Bras d'Or "work without destroying its natural essence" (UNESCO, 2011).

In conversation with the land owner, it is known that the land has been used as a resource to support local dairy farming.



LEGEND

- National Migratory Bird Sanctuary
- Wilderness Area
- Provincial Wildlife Management
- Provincial Game Sanctuary
- National Wildlife Area
- Ecologically significant sites
- Bras d'Or watershed & UNESCO Biosphere Reserve
- Forested Area
- Waterbody
- Proposed wind farm

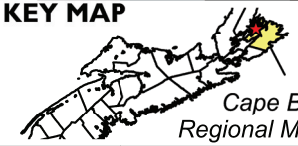
Source: Nova Scotia Department of Natural Resources

SCALE

0 12.5 25
kilometers

1:750,000

KEY MAP



PROJECT
Hillside Boularderie Wind Farm

FIGURE
Figure 4-3

TITLE
Protected Areas

DATE
March 1 2013

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

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 D.

The known archaeological site at Little Bras d'Or includes the "Establishment of Mr. De la Boularderie", which was first settled in 1717 and had been invaded and abandoned in 1747 and again in 1758. Between 1765 and 1767 there were five Acadian families and a few Englishmen still living on Boularderie Island and several sawmills were in operation.

A short gap in recorded settlement on Boularderie Island ends in 1829, when settler Donald McDonaland and his family arrived from Gairloch, Ross-shire, Scotland. Over the next two years only three more settlers joined them. 1823 saw a large influx of immigrants from Gairloch and Loch Carron, Rosshire. Soon Boularderie would be one of the most populated districts in Cape Breton. The land was fertile and more easily cultivated than other land in the area; codfish were abundant, providing an ample resource for fisherman.

The closest mapped cultural activity is some small-scale gypsum mining along the coast as shown in Figure 3.2-4 of the Archaeological Resource Impact Assessment of Appendix D.

4.2.3 Land and Resources Used for Traditional Purposes by Aboriginal Persons

Consultation

The descendants of indigenous settlers are comprised of the five Mi'kmaq bands that constitute a significant portion of the current Bras d'Or population (UNESCO, 2011). The proponent has been in contact with all 5 Mi'kmaq bands and when necessary will continue consultation throughout the Project's activities. Contact has also been made with the Aboriginal Office of Affairs and Kwilmu'kw Maw-klusuaqn Negotiation Office; more detail regarding First Nations consultation is provided in Section 5.3.

MEKS

As part of the MEKS completed by AMEC, a survey of general habitat and culturally significant plant species was conducted. During the plant surveys a total of four dominant habitat types were surveyed. The four habitat types are; deciduous forest, field, disturbed (dirt road) and utility corridor. This is in correlation with the flora survey described in Section 4.1.5. The results of this survey indicate that a total of 24 plant species of edible, medical or other significance to the Mi'kmaq were recorded at the Project site. An additional two species considered useful for other purposes were also recorded. The MEKS is provided in Appendix F and provides a list of all 26 culturally significant plant species encountered at the Project site, along with their traditional use category and habitat in which they were recorded.

Similar to the plant survey, a review of historical use of wildlife and fish resources by Mi'kmaq and wildlife preferences was conducted as a desktop review. This, in combination with the results of the habitat survey made it possible to determine the wildlife species that potentially use the Project site. This study identified a total of eight mammals and three bird species to potentially make use of the Project site. It was noted during the study that the site does not support freshwater or marine habitat, as a result there is no habitat for edible marine or coastal fish, mammal, invertebrate or bird species that rely on these habitats.

AMEC conducted roundtable discussions with key Mi'kmaq informants in both Membertou and Eskasoni. The purpose of the roundtable sessions was to discuss Mi'kmaq knowledge and interest (current and historical use) of the Project area, focusing on the *location* and not the *Project*.

Sessions in Eskasoni were consistent in findings for all informants. Respondents were familiar with the area, but participants at the roundtable were not aware of any direct interaction with the area in many years. The most commonly cited reasons were:

- The area was used for farming so people would not feel comfortable hunting in the area;
- Better hunting areas in the Highlands;
- Too close to Sydney for good hunting; and
- There are fewer hunters today compared to years ago.

The participants in the Membertou discussion were more familiar and knowledgeable with the study site. While they were unable to point to specific areas where hunting took place on the proposed Project site, they indicated the following uses in the area on or near the HBWF site:

- Beaches along the water's edge have been used by Band members for swimming;
- Apple picking;
- Deer hunting along Leitches Creek (approximately 10 km south of Project site);
- Fishing in Roach lake (approximately 10 km south of Project site);
- Salmon and smelt fishing in Ball Creek (approximately 10 km south of Project site);and
- Lobster fishing in the Bras d'Or Lake in the waters near the Project site.

It was stated by one Band member that while people do not extensively hunt in this area because of better hunting in the Highlands and areas closer to the reserve, it is possible that people may want to hunt in the area in the future as game abundances changes in existing hunting areas frequented by Band members.

4.2.4 Noise

Nova Scotia does not currently have any regulations pertaining to maximum sound pressure levels (SPL) required at receptor locations near wind farms; further, the CBRMs Land Use By-law does not specify any restrictions pertaining to SPLs relating to WTG activities. As a best practice effort, the Proponent has employed the *Ontario Noise Guidelines for Wind Farms* as a guideline regarding acceptable noise

emission from the HBWF. The Ontario guidelines present a 40 dB(A) SPL as the maximum exposure level for a noise receptor (Ministry of the Environment, 2008). 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.

A noise assessment was completed for the HBWF 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 71 receptor points were used to represent 71 dwellings within a 2.0 km range of the proposed turbine locations. The model was run using a two turbine layout with no added vegetation layer for conservative results. The closest receptor is located 1003 m from a turbine, this receptor was subjected to a SPL of 37.0 dB(A). The next closes receptor at 1051 m observed a SPL of 35.8 dB(A). A full list of SPL's at the 71 receptors can be found in Appendix G. Table 4-4 shows receptors that observed SPLs above 35.0 dB(A).

Table 4-4: SPL from WTG at receptor locations.

Point of Reception ID	Distance from Receptor to nearest WTG (m)	Maximum Sound Pressure Level under worst case scenario dB(A)
AC	1051	35.8
AE	1099	35.6
AF	1064	35.9
AG	1090	36.1
AH	1003	37.0
AI	1085	35.9
AJ	1118	35.2
AK	1061	35.7
AP	1127	35.0
AU	1122	35.0

4.2.5 Visual

ReSoft Ltd WindFarm software was used to create a photomontage of the HBWF. Two locations were chosen to present a predicted view of the wind farm using both 78 m and 98 m hub heights; the first two are taken from Groves Point Provincial Park and the third and fourth from the Hillside Boularderie Road looking east.

Figure 4-4 and Figure 4-5 present the photomontages for a 78 m hub height and 98 m hub height, respectively, taken from Groves Point Provincial Park. Figure 4-6 and Figure 4-7 present the photomontages for a 78 m hub height and 98 m hub height, respectively, taken from Hillside Boularderie Road. The two locations were chosen based on being a high traffic area and scenic

viewpoints. High resolution images are available on the Project's website: www.hillsideboularderiewindfarm.com.

Figure 4-4: Photomontage of Enercon E-92 at 78 m hub height as seen from the Groves Point Provincial Park located at (UTM Zone 20, NAD 83) 704542 m E, 5123075 m N.

Figure 4-5: Photomontage of Enercon E-92 at 98 m hub height as seen from the Groves Point Provincial Park located at (UTM Zone 20, NAD 83) 704542 m E, 5123075 m N.

Figure 4-6: Photomontage of Enercon E-92 at 78 m hub height as seen from Hillside Boularderie Rd near the pond located at (UTM Zone 20, NAD 83) 703405 m E, 5124066 m N.

Figure 4-7: Photomontage of Enercon E-92 at 98 m hub height as seen from Hillside Boularderie Rd near the pond located at (UTM Zone 20, NAD 83) 703405 m E, 5124066 m N.

4.2.6 Shadow Flicker

The Proponent has undertaken a shadow flicker impact assessment for the HBWF 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 farm development business as the industry standard guidelines. These guidelines, based on astronomic worst case scenario suggest that acceptable levels at 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 stipulate 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. 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 4-5 presents a summary of the results; these receptors may not experience any shadow flicker at all as the model uses very conservative assumptions. The full shadow flicker impact assessment can be found in Appendix H.

Table 4-5: Predicted shadow flicker results.

Receptor ID	Predicted Shadow Flicker at Receptors Astronomical Worst Case		
	Total hrs/yr (hr : min)	Days/year	Max minutes/day (hr : min)
O	4:06	23	0:14
R	4:20	24	0:14
S	3:59	30	0:15
T	4:07	22	0:15
U	4:20	23	0:16
V	4:41	24	0:16
X	5:09	25	0:16
Y	5:25	27	0:16
Z	12:41	63	0:16
AA	3:21	20	0:14
AB	15:26	74	0:17
AC	27:56	98	0:26
AD	8:22	36	0:18
AE	8:28	35	0:19
AF	9:54	39	0:20

4.2.7 Recreation

Regional recreation activities exist in close proximity to the Project site. The Project site is located near Bras d'Or Lake where recreational activities include sailing, kayaking, boating, swimming and fishing. Groves Point Provincial Park is located 2.5 km from the turbine locations along Hillside Boularderie Road. The site is a popular beach location where activities include exploring the area's wildlife, kayaking, sports fishing and swimming; the park also has a picnic area in an open field. The park is open to the public between May and October.

The property under option to lease is used by the land owner for recreational use of all-terrain vehicles but do not have trails specifically constructed for this use, and occasional low intensity farming activities.

4.2.8 Economic Development

The Cape Breton Regional Municipality has approximately 44,000 people employed with an unemployment rate of 16.9%. About 46% of the CBRM workforce is found within the trades, sales and service sectors. Government service, education, and business related occupations also hold a significant portion of the labour force, about 39% (Statistics Canada, 2006). Table 4-6 presents a breakdown of how the workforce in CBRM is distributed. Several small businesses exist in close proximity to the Project site including services, trades and retail.

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% equity contribution of Project costs from Nova Scotian investors. In addition, approximately $3.5 million was spent on local businesses and contractors during the construction phase, as well as an additional $7 – 8 million will be spent on local services and labour during the Projects 20 year operational life. The HBWF Project will generate approximately $6,000 per megawatt per year in municipal tax revenue.

Table 4-6: CBRM Occupations (Statistics Canada, 2006).

Occupation	Number of Jobs
Management occupation	2,895
Business, finance and administration occupations	7,835
Natural and applied sciences and related occupations	1,735
Health occupations	3,880
Occupations in social science, education, government service and religion	3,905
Occupations in art, culture, recreation and sport	735
Sales and service occupations	13,000
Trades, transport and equipment operators and related occupations	7,400
Occupations unique to primary industry	1,640
Occupations unique to processing, manufacturing and utilities	1,205

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5.0 Consultation

5.1 Community Engagement Plan

Open, transparent and comprehensive community engagement is crucial to the success of any development. The Proponent, in consultation with Verterra Group Environmental Strategies Ltd has developed a comprehensive Community Engagement Plan (CEP). The Community Engagement Plan forms an integral part of the proposed HBWF 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 CEP is to outline firm engagement activities the Proponent will commit to throughout the development, construction, and operation of the HBWF. The complete CEP can be found in Appendix I.

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

Public Meetings

On two separate occasions of November 9, 2011 and September 6, 2012, the Proponent engaged the community of Hillside Boularderie and surrounding areas to communicate intentions and receive feedback about the proposed Project by means of open houses.

The first open house was held on November 9, 2011 at the Membertou Trade and Convention Center from 5:00pm – 8:30pm. The meeting was advertised via Canada Post Admail, a service offered that facilitates the distribution of invitations/ flyers to a defined geographic location. A newspaper add was also run in the Cape Breton Post, as well as personal invitation letters to Government and First Nation Stakeholders. The first open house was attended by approximately 50 community members and the meeting lasted approximately two and a half hours. The Proponent handed out questionnaires to attendees of the first public meeting, which 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 and to urge attendees to express any concerns they had regarding the HBWF. The open house format was held as an open discussion where Project information posters were displayed presenting Project information with Proponent representatives present to answer any questions the public had.

The second open house was held on September 6, 2012 at the Bras d'Or Community Hall from 5:00pm – 8:30pm. The open house was advertised via Canada Post Admail as described above; approximately 1,100 invitations were sent out. An announcement was aired on CBC radio providing information regarding the time and place of the open house. Furthermore, an advertisement was put in the Cape Breton Post advertising details regarding the open house. Stakeholders who expressed interest in the Project at the first open house were personally contacted and invited to attend the second open house, and finally, personal invitations were sent to Government stakeholders and First Nations right-holders inviting them to participate in the open house. The second open house was attended by approximately 50 community members and lasted two and a half hours. Again, the Proponent handed out questionnaires as described above and the open house was held as an open discussion with Proponent representatives engaging in conversation with the attendees to address issues and concerns. In summary, although there were a small group of community members who expressed concerns regarding the HBWF, the majority of the attendees were in support of the proposal.

The majority of the attendees at two public meetings were in support of the HBWF proposal. Based on general project questionnaires completed by public meeting attendees, over 80% support wind energy in their community and more than 80% support or are neutral on the HBWF.

Website

The Proponent has set up a Project website for the HBWF. The website: www.hillsideboularderiewindfarm.ca will be updated periodically and used to inform the general public 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;
- Draft and final versions of the Environmental Assessment;
- Construction activity notifications;
- Online questionnaire and comment form (Have Your Say); and
- Media and PR related material.

Additional Consultation

Aside from open house public meetings, the Proponent has met on numerous occasions with community members who had raised concerns at the second public open house held on September 6th, 2012. The proponent has attended 4 smaller group meetings since the first meeting in October 2012. These smaller group meetings were held within the community of Hillside Boularderie with local concerned residents lasted anywhere between 1 – 3.5 hours in length, and covered a multitude of issues including, potential adverse noise effects, shadow flicker impacts on nearby houses, potential adverse effects of the wind turbine on local bird and raptor populations, potential adverse health effects through

infrasound emissions, potential adverse effects on nearby property values, and visual amenity among other concerns.

The proponent has been in contact with the group via email and phone on a regular basis answering questions and providing information on the Project and the formation of the CLC. The Proponent is continuing to meet one on one with the small group of concerned residents in the area, and is committed to resolving the issues identified to the benefit of all parties involved.

Community Liaison Committee

The Proponent is committed to an open and transparent communication with the residents and stakeholders who live in and around the HBWF. In light of this, the Proponent has decided to form a Community Liaison Committee (CLC) to facilitate discussions with community members and address any concerns in an organized and transparent manner. CLC's have been used successfully in the past to facilitate dialogue with community members living near proposed developments. A well known and very successful CLC was formed by the Sydney Tar Ponds Agency and is proving to be a very effective communication tool. The proponent has consulted both with the Sydney Tar Ponds Agency CLC Chairperson, as well as Verterra Group Environmental Strategies Ltd in forming their CLC Terms of Reference document.

The proponent mailed out approximately 1100 expressions of interest in January 2013 to nearby community members seeking participation and representation on the HBWF CLC. The Proponent also placed an ad in the local newspaper, an ad on the radio, as well as several personal invitations meetings with local stakeholders. Unfortunately there was not sufficient interest from the local community to participate in the CLC. The proponent plans to re-advertise in April/May 2013 in the hopes of gaining more interest in community representation on the CLC.

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 year.

Community Investment

The equity finance required for the HBWF will be provided by the Proponent and W4All. Because W4All is a CEDIF, the HBWF will be majority owned by residents of Nova Scotia, through their investment in W4All. In order to raise awareness for the Project, the Proponent held a number of investment and information seminars within communities across the province, presenting to over 500 individuals.

These information seminars took place between December 2012 and February 2013, and whilst they were not directly referenced within HBWF's Community Engagement Plan, they proved to be extremely valuable in raising awareness of renewable energy generation in the province. Additionally, the

Proponent established the W4All website (www.wind4all.ca) which was used to provide information on the Project, and the investment opportunities facilitated by the provinces CEDIF program

The W4All CEDIF offering closed on March 1st 2013, having raised $5.5M from over 400 Nova Scotian investors, many of whom reside within the CBRM. The success of this CEDIF raise supports the Proponents existing data showing a high level of community support for the HBWF.

Issues Resolution

The Proponent has drafted a Complaint Procedure document that is included in this Environmental Assessment. The complaint procedure 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 HBWF development. The complaint procedure can be found in Appendix J.

5.3 Aboriginal Peoples

The aboriginal population has been contacted through right-holder update letters throughout the pre-construction process. Most recent efforts include letters mailed to First Nation Chief's in the region providing an update of the Project status. The Office of Aboriginal Affairs and the Membertou First Nations community office have both been contacted via telephone and email. This was to provide information regarding the public meetings that would be taking place and to extend a personal invite to the Membertou Chief and others interested First Nation community members. Table 5-1: Contact log with First Nation groups. presents a list of contact events with First Nation groups along with topics discussed/communicated.

Table 5-1: Contact log with First Nation groups.

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
August 29, 2012	Office Receptionist	Office of Aboriginal Affairs	Phone Call	Engagement effort with the Mi'Kmaq community
August 29, 2012	Executive Assistant	Membertou	Phone Call	Invitation to public meeting on September 6, 2012
January 3-10, 2013	Donna Foster, Secretary & Treasurer	Bras d'Or First Nation	Email	Seeking contact information for the Bras d'Or First Nation

Date	Person Contacted	Band/Organization	Method of Communication	Content
March 5, 2013	Chief Terrance Paul	Membertou,	Letter	Information update regarding CLC, EA and website
March 5, 2013	Chief Wilbert Joseph Marshall	Potlotek/ Chapel Island	Letter	Information update regarding CLC, EA and website
March 5, 2013	Chief Joseph Wayne Morley Googoo	Waycobah	Letter	Information update regarding CLC, EA and website
March 5, 2013	Chief Norman Francis Bernard	Wagmatcook	Letter	Information update regarding CLC, EA and website
March 5, 2013	Cheif Leyroy D.C. Denny	Eskasoni	Letter	Information update regarding CLC, EA and website
March 5, 20123	Twila Gaudet, Consultation Liaison	Kwilmu'kw Maw-klisuaqn	Letter	CLC, EA and website information
March 5, 2013	Owen Fitzgerald	Unama'ki	Letter	CLC, EA and website information

5.4 Regulatory

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

Municipal Consultation

The Proponent has engaged with members of the CBRM planning department to discuss the planning regime and permitting requirements with respect to the siting of wind turbines. The CBRM land use by-laws permit utility scale wind turbines in compliance with municipal setbacks. The setback by-laws for the CBRM that apply to the HBWF state that WTG's up to 250 feet (including rotor diameter) must have a setback of 575 feet, plus a one food increase in setback distance for every foot above 250 feet. The proposed WTG's have a maximum height of 473 feet (144 m) equating to a setback of 798 feet or 244 m. Properties exempt from this setback by-law include the dwelling of the owner of the property on which

the utility scale wind turbine is being installed or the dwelling of the owner of the property who will be leasing land to the utility scale wind turbine proponent.

In June of 2011 the Proponent made a formal presentation to the CBRM council. This purpose of this presentation was to introduce the Proponent and proposed HBWF Project to Council and Staff. A request for a second presentation was communicated recently to update CBRM Council and Staff on recent community engagement activities and by the Proponent and to outline the economic benefits the development would bring to the CBRM. The Proponent is in close contact with the District 2 Councillor, whose district falls within the special boundaries of the Project, and continues to provide updates on the status of the HBWF development.

The Proponent will continue to liaise with the Municipality throughout the duration of the Project development and construction activities and ensure they are kept up to date.

Provincial Consultation

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

The scoping of this Environmental Assessment document was discussed with the Nova Scotia Department of Environment Environmental Assessment branch (EA branch) in early 2012. The consultation provided valuable information regarding the EA process, Mi'Kmaq Ecological Knowledge Study requirements, general EA document formatting, recent Health Canada studies as well as information regarding the formation of a CLC.

The Cape Breton regional biologist of the Department of Natural Resources was contacted. Discussions included information on the nearby Coxheath Copper Mine bat hibernacula, which is approximately 15 km from the Project site. It was also recommended during the discussion that the Proponent engage in consultation with the Nova Scotia Department of Natural Resources.

The Proponent has consulted with the Nova Scotia Department of Natural Resources Wildlife Division staff throughout the development of the HBWF. The Proponent initiated consultation in the summer of 2012 and has continued consultation throughout the pre-construction process of the Project. Consultation provided a background for further investigating the potential impact the WTGs may have on bird and bat species at risk along with identifying appropriate studies relative to the Project. Focus on regional weather patterns including the incidence of fog and the potential impact WTGs will have on species at risk during fog events was discussed.

The Nova Scotia Department of Transportation and Infrastructure Renewal were consulted regarding permitting for the widening of the site access road entrance on Hillside Boularderie Road.

Prior to COMFIT approval, a heritage screening was conducted in consultation with the Provincial Communities, Culture and Heritage Department. This screening reviewed archaeological and historical

site remains, botany, zoology and palaeontology. It was determined from the heritage screening that an Archaeological Resource Impact Assessment (Appendix D) should be conducted as part of the EA.

The Proponent has also been in contact with the Provincial MLA representing the Hillside Boularderie community and surrounding area and will continue to provide updates on the progression of the HBWF development.

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 development of the HBWF. Environment Canada, NAV Canada and Transport Canada were all contacted regarding the development of the HBWF. Like their provincial counterparts, they have assisted in the scoping and design of this EA. The Proponent will continue to engage Federal regulators throughout the development, construction and operation of the HBWF as appropriate.

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6.0 Analysis

The construction, operation and decommissioning phases of the HBWF Project have the potential to affect physical, biophysical, and socio-economic environment. Identifying the valued environmental components (VEC) 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 is presented in Table 6-1. This presents the potential interactions between the 3 main 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 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/ 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	•								•				•	
Flora and fauna	•	•											•	

	Site Preparation and Construction								Operation and Maintenance			Decommissioning		
	Clearing and Grubbing	Access Road and Laydown Area	Turbine Foundation	Power Pole/ 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
Species at Risk	•	•							•		•		•	
Socio-economic VECs														
Land use	•								•					
Aboriginal resources / uses	•	•	•	•										
Archaeological	•	•	•	•									•	
Recreation and Tourism	•								•					
Vehicular traffic			•	•	•	•								
Telecommunications & Radar									•					
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 and recreation 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 may result if a significant change in particulate matter (fugitive dust) or tail pipe emissions of construction machinery (NO_x, volatile organic compounds, Ozone, CO_x) were determined to be of high concentration in ambient air as a result of project activities.

Boundaries – Spatial boundaries include the Project site for overall 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.

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.	• During dry weather conditions, fugitive dust would be controlled through the application of water.
Local air quality may be affected through tailpipe emissions from construction vehicles and machinery.	• Equipment will comply with emission standards and will be used efficiently by minimizing distances travelled.

Cumulative Effects – There is second proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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. Dwellings in this area rely on well water; therefore ground and surface water are also directly related to human health for this Project. Glen Lake has been identified as a water body approximately 650 m from the closest WTG location and drains via a drainage channel flowing south, down gradient to Bras d'Or Lake. 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 power line, WTG pad and access road might induce a change in hydrology or sediment input into ground and surface water.	• Efforts have been 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 • Activities will comply with the Environmental Management Plan.
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 preformed off-site whenever possible, and at a minimum of 30 m away from surface water and in a contained and safe area.
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 Environmental Management 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 – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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 an unwanted 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 during operation. As a result, ambient noise has been identified as a VEC.

An Australian study, by South Australia Environment Protection Authority and Resonant Acoustics, was conducted to compare infrasound levels in rural and urban environments away from wind farms and in close proximity to wind farms. The purpose of the study was to assess whether or not WTGs have a significant contribution to infrasound. The study measured infrasound in urban and rural environment away from wind farms as well as at two sites during WTG operation and during WTG shut-down periods to provide a background infrasound baseline. The study concludes that the level of infrasound at houses near the WTGs assessed is no greater than that experienced in other urban and rural environments and that the contribution of WTGs to the measured infrasound levels is insignificant in comparison with the background level of infrasound in the environment (Evans, Cooper & Lenchine, 2013).

A significant environmental effect may 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 2.0 km radius from the WTG locations. 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.

Potential Impacts on Ambient Noise	Proposed Mitigative Measures
Elevated sound pressure levels will be observed during operation from the nacelle, which is 98 m above ground level.	• Locating the WTGs 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; • By minimizing grubbing and clearing, increased flora on the Project site will aid in attenuation of noise produced from the WTGs as perceived by local receptors; and • A Community Liaison Committee or similar transparent public input mechanism will be established to resolve Project issues.

Cumulative Effects – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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 cause 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 assessed through computer modeling using conservative inputs as shown in the noise impact assessment. As concluded by the Australian infrasound study, the contribution WTGs add to the measured infrasound levels is insignificant in comparison with the background level of infrasound in the environment (Evans, Cooper & Lenchine, 2013), therefore the Proponent does not expect the HBWF to contribute any significant levels of infrasound to the background infrasound levels of the environment. 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 and unlikely.

Ambient Light

The Project has three attributes 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 may 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 locations. 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 lights 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 and compliance with industry standard guidelines on shadow flicker; and • A Community Liaison Committee or similar transparent public input mechanism will be established to resolve issues regarding the Project.
Lighting during night time construction activities such as turbine installation.	• Construction activities will be limited to the day time when possible. Turbine installation may happen 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 – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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 important as they are an integral aspect of a diverse ecosystem. Dwellings in this area rely on well water; therefore wetlands and watercourses are also directly related to human health because they act as a supply for ground water. Glen Lake has been identified as the only surface water, which drains via a watercourse on the south end of the Lake heading south towards Bras d'Or Lake. No wetlands have been identified in the VEC boundary; further, both WTGs are located on existing cleared farmland. Since wetlands and watercourses are considered as supply for ground water as assessed in Section 6.1, wetlands and watercourses has been identified as a VEC.

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

Boundaries – Spatial boundaries are limited to the Project site, focusing on the watercourse that drains Glen Lake. 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; • Flow retention structures and energy dissipation measures are to be taken; • In areas associated with sensitive water crossings, grubbing shall be minimized by the placement of geo-textile; and • Construction of the access road will attempt to create a 30 m buffer surrounding the wetland.
Construction of access road potentially interfering with Glen Lake drainage water course.	• A 30 m buffer surrounding the construction of the access road will be created to avoid interference with watercourses.

Cumulative Effects – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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 construction of the access road will avoid any potential impacts on Glen Lake, which is approximately 250 m from the proposed access road. In light of this, according to *Nova Scotia's Wetland Conservation Policy* a Wetland Alteration Approval permit will not be necessary (NSE, 2011). No other wetlands or watercourses have been identified; while any effect on wetlands and watercourses will be negative, the significance of residual effects on wetlands and watercourses is predicted to be negligible.

Fish and Fish Habitat

The Project site contains a surface water feature known as Glen Lake with a drainage watercourse that empties into Bras d'Or Lake. Glen Lake and the drainage watercourse do not provide adequate conditions for fish habitat.

A significant environmental effect may result if a considerable change to fish and fish habitat was the result of project activities.

Boundaries – Spatial boundaries for fish and fish habitat focuses on Glen Lake and the watercourse that provides drainage to Bras d'Or Lake. The temporal boundary includes all phases of the Project, mainly focusing on accidents and malfunctions as no other activities can be seen to impact fish and fish habitat.

Potential Impacts and Mitigation Measures – Ground water, surface water, watercourses and wetlands have all been previously assessed in this VEC analysis. This analysis concluded the significance of residual effects on the aforementioned VECs was determined to be negligible. Further consultation with a local biologist has determined that given the separation between the Projects activities and Glen Lake it is unlikely that the Projects activities will impact the lake. As a result of this conclusion, it is determined that there will be no potential impacts on fish and fish habitat. Consequently, no mitigation measures are recommended outside of the proposed mitigation measures for ground water, surface water, wetlands and watercourses.

Cumulative Effects – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – There is no effect on fish and fish habitat expected to occur. Therefore, the significance of residual effects on fish and fish habitat is predicted to be no impact.

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. In consultation with CWS, the proponent is aware that disturbance to migratory and breeding birds prohibited under the *Migratory Bird Convention Act* (CWS, 2007).

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 6-7: 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 site has been redesigned to locate the two turbines in existing cleared farmland to minimize clearing of deciduous forest; and • 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 WTGs.	• 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; • All of the species observed during the fall migration surveys are known to breed in the region; therefore, it is not believe that the area serves as a significant migration stopover; 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 WTGs	• Desktop and field studies conducted suggest that due to the size of the HBWF being a two WTG wind farm, flyways and local flight paths should not be adversely affected by the construction of WTGs; • All of the species observed during the fall migration surveys are known to breed in the region; therefore, it is not believe that the area serves as a significant migration stopover; 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 a WTG.	• Environment Canada climate database has been consulted to predict the rate of fog occurrence; • An annual average of 4% (~14 days) 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 WTGs footprint will cause a loss of habitat for breeding and migratory birds.	• Desktop and field studies conducted suggest that no more than a 5% of the total Project site will be considered a loss of habitat. This is considered likely to have very little 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; • 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; 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 WTGs 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 – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. The only cumulative effect that would be likely to occur would be the barrier effect, causing migrating birds to change their flyways or local flight paths to avoid WTGs. Given the small number of turbines for both projects and large separation of greater than 10 km, 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: Deciduous Forest, Field, Disturbed (Dirt Road) and Utility corridor. 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 addressed as a separate VEC.

A significant environmental effect may 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 6-8: 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 approximately 5% 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 have been 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 – There is one other proposed wind farm approximately 10 km from the HBWF as described Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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 approximately 5%, consequently reducing the fauna habitat by a maximum of 5% as determined by the AMEC desktop and field study in Appendix E. While the construction phase presents potential for negative impact, once the decommissioning phase has started, land reclamation will provide 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 four bird and one bat species were identified at the Project site that are considered a species at risk. Table 6-9 presents the five identified species and of the five, one is listed as endangered, three listed as threatened and one of special concern as classified by COSEWIC. Accordingly, species at risk has been identified as a VEC.

A significant environmental effect may result if a considerable change to species at risk was the result of Project activities.

Table 6-9: Identified species at risk.

Scientific Name	Common Name	Taxonomy Group	Special Status
Myotis lucifugus	Little Brown Bat	Bat	Endangered (COSEWIC)
Dolichonyx oryzivorus	Bobolink	Bird	Threatened (COSEWIC)
Chordeiles minor	Common Nighthawk	Bird	Threatened (COSEWIC)
Hirundo rustica	Barn Swallow	Bird	Threatened (COSEWIC)
Contopus virens	Eastern Wood-pewee	Bird	Special Concern (COSEWIC)
Poecile hudsonica	Boreal Chickadee	Bird	Conservation Concern (ACCDC)
Empidonax flavivnentris	Yellow-bellied Flycatcher	Bird	Conservation Concern(ACCDC)

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

Table 6-10: 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.	• Desktop and field studies have not identified any nesting evidence of species at risk on the Project site; • Desktop and field studies conducted suggest that no more than a 5% of the total Project site will be considered a loss of habitat. This is considered likely to have very little negative 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 WTGs.	• A desktop and field study has been conducted to identify and assess the presence of avian species, it is unlikely that mortality rates will icrease as a result of species at risk colliding with WTGs; 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 WTGs.	• Environment Canada climate database has been consulted to predict the rate of fog occurrence; • An annual average of 4% (~14 days) fog is observed at a weather station in close proximity to Project site; • Given the presence of species at risk and the low fog rate, the impact is to be considered negligible; 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 WTGs 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.
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.
No Potential barrier effect impeding flyways or local flight paths once WTGs are removed.	• N/A – no mitigation measures necessary for a positive potential impact.

Cumulative Effects – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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 minor.

6.3 Assessment of Socio-economic VECs

Land Use

The proposed HBWF makes use of approximately 3 acres of land of the 277 acre parcel on Boularderie Island that is currently used for small scale farming. Aside from the small scale farming activities, the land use is predominantly a residential land parcel, on which the land owners reside. Land surrounding the Project land parcels is primarily used as residential land, and is zoned as Rural CBRM zone and Rural Residential Subdivision zone. There are 139 residential dwellings identified in a 3.5 km radius of the proposed WTG locations. As a result, land use has been identified as a VEC.

A significant environmental effect may result if there were a considerable change to the land use due to Project activities.

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

Table 6-11: Potential impacts and proposed mitigative measures for land use.

Potential Impacts on Land Use	Proposed Mitigative Measures
During construction and operation there is a possibility that there will be a temporary disturbance associated with noise and light, especially if blasting occurs.	• Discussed as a separate VEC under Ambient Noise and Ambient Light.
Disturbance to land used for recreation.	• Discussed as a separate VEC under Recreation.
Small scale farming activities could be affected by WTG footprint.	• Landowner is responsible for renting out land for small scale farming and leasing the WTG footprint will not pose any potential impacts on farming operations.

Cumulative Effects – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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 had significant importance for use of traditional medicine, food, clothing or other living necessities.

A significant environmental effect may 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 6-12: 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 communication with the local Mi'kmaq communities; • The site has been redesigned to locate the two turbines in existing cleared farmland to minimize impact on deciduous forest; and • Location of the access road have been optimized to reduce footprint and to avoid areas of cultural significance.

Potential Impacts Aboriginal Resources / Uses	Proposed Mitigative Measures
Direct impact to Mi'kmaq artifacts during construction activities, such as blasting and excavation.	• If a Mi'kmaq artifact is discovered during construction or any other phase of the Project the KMK will be contacted immediately along with other appropriate individuals/organizations to determine a suitable method of mitigation.

Cumulative Effects – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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 a Mi'kmaq artifact 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.

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 6-13: 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 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 – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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 (2.5 km from WTGs location) is Groves Point Provincial Park, which is used for recreation swimming and as a tourist attraction.

A significant environmental effect may 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 WTGs are located and also considers a 3.5 km radius from the WTGs proposed locations. The temporal boundary includes all phases of the Project including construction, operation and decommissioning.

Table 6-14: Potential impacts and proposed mitigative measures for recreation and tourism.

Potential Impacts on Recreation and Tourism	Proposed Mitigative Measures
Groves Point Provincial Park is located nearby and will potentially be affected by noise during construction and operation.	• The noise impact assessment has predicted a maximum worst case scenario SPL at Groves Point Provincial Park of 27.3 dB(A), well below the recommended industry standard Sound Power Level guidelines; and • A Community Liaison Committee or similar transparent public input mechanism will be established to resolve issues regarding the Project.

Cumulative Effects – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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 27.3 dB (A) would be the maximum observed SPL at the Groves Point Provincial Park under worst case scenario conditions. A SPL of 27.3 dB(A) is considered quiet and can be compared to that of an empty movie theatre (Stevens &

Warshofsky, 1965). As a result, the significance of residual effects on recreation and tourism is expected to be negligible.

Vehicular Traffic

The Project is located on Hillside Boularderie Road, which is located, by road approximately 5.5 km from the Trans-Canada Highway. 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 25 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.

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 6-15: 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 • A Community Liaison Committee or similar transparent public input mechanism will be established to resolve issues regarding the Project.

Cumulative Effects – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, 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 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 communications has been identified as a VEC.

A significant environmental effect may 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 WTGs and neighbouring communication infrastructure. Temporal boundaries include the operation phase of the Project.

Table 6-16: 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 Advisory Board of Canada guidelines. The results of the assessment showed that the turbine will not interfere with the telecommunication links of nearby towers; and • 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

Cumulative Effects – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse effect on telecommunication and radar communications.

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 WTGs are located near the rural community of Hillside-Boularderie on a hill with a WTG pad elevation range of 85 – 95 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 Resoft Ltd. WindFarm software. These photomontages produce a realistic projection of what the WTGs 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 may 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 WTGs are visible. The temporal boundary is the Project operation phase.

Table 6-17: 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 two WTGs.	• The Proponent considered landscape aesthetics when deciding on specific siting of the WTGs; • The paint on the WTGs will be selected so that they do not contrast sharply with the environment; • By-Laws regarding responsible siting of WTGs were followed to minimize the potential impact on the landscape aesthetics during WTG siting; and • A Community Liaison Committee or similar transparent public input mechanism will be established to resolve issues regarding the Project.

Cumulative Effects – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse effect on landscape

Significance of Residual Effects – The perception of landscape aesthetics is a subjective matter. The Proponent recognizes that development of the two proposed WTGs 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 HBWF, 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 HBWF. The Proponent has received communications from the local community regarding concerns for public health issues related to the operation of WTGs such as noise impacts and shadow flicker. Through desktop studies conducted by the Proponent these impacts have been mitigated and the significance of residual effects on ambient light and noise is expected to be negligible and minor, respectively.

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 may 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 WTGs. The temporal boundaries include all phases of the Project.

Table 6-18: 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.	• WTGs are equipped with ice-detection systems on each blade are designed to shut down in the case of ice-buildup; • 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 WTGs.
During extreme weather events, there is the potential for electrical fires within the turbine nacelle through lightning strikes.	• WTGs are 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.	• Approvals from 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 of affect public safety.	• Every effort will be made to ensure that oversized loads are delivered during times of lowest traffic to mitigate traffic jams.

Potential Impacts on Health and Safety	Proposed Mitigative Measures
Shadow flicker may affect human health.	• This potential impact has been addressed in the Ambient Light section.
Noise impact may affect human health.	• This potential impact has been addressed in the Ambient Noise Section.
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 – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. Given the scale of both projects and large separation of greater than 10 km, it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse effect on the health and safety of workers and the general public.

Significance of Residual Effects – The health and safety of the general public and workers involved with the Project is of the utmost importance to the Proponent. By following provincial occupational health and safety regulations, best practice guidelines and by employing contractors with high health and safety standards the Proponent aims to create a safe construction environment. By modeling noise emission and shadow flicker the Proponent has responsibly located the WTGs to industry best practice guidelines; and this would not likely cause negative health impacts. The significance of residual effects on health and safety is expected to be negligible.

Local Economy

Throughout the development, construction, operation, and decommissioning, considerable investment will be made within the CBRM and the broader communities of Nova Scotia. During the development and construction of the Project, it is anticipated that approximately $3.5 million will be invested within the province, with an additional $7 million being invested throughout the Projects 20 year operation.

A significant effect may 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 Project activities.

Potential positive during the development phase of the Project include:

- Employment of experienced professionals within the fields of engineering & environment, law, accountancy and finance;
- Engagement of the Mi'Kmaq of Nova Scotia;
- Option-to-lease payments made to Project landowners;
- Engagement of local consultants, biologists, ecologists, and contractors; and

- Use of local goods and services such as accommodations, restaurants, and gas stations.

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

- Employment of experienced professionals within the fields of engineering & environment, law, accountancy, and finance;
- Construction payments made to Project landowners;
- Engagement of local consultants, biologists, ecologists and contractors;
- Payment of CBRM municipal taxes;
- Engagement of the Mi'Kmaq of Nova Scotia; and
- Use of local goods and services such as accommodations, restaurants, and gas stations.

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

- Anticipated dividend issuances, provided by the W4All CEDIF to its 400+ investors;
- Lease payments made to Project landowners;
- Anticipated annual payment into an educational fund/bursary, distributed yearly by the educational institution;
- Payment of CBRM municipal taxes;
- Use of local goods and services such as accommodations, restaurants, and gas stations; and
- Long term contracts may also be used in the operation and maintenance of the Project.

Cumulative Effects – There is one other proposed wind farm approximately 10 km from the HBWF as described in Section 2.9. The projects may act cumulatively, in a positive manner in providing economic prosperity to the local economy.

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 WTGs due to conditions exceeding the operational design of the WTGs. High winds, extreme temperatures and icing on blades all have the potential to shut down the WTGs. Extreme weather events that could occur within the Nova Scotia, Cape Breton region are listed in Table 6-19.

Table 6-19: Extreme events, associated effects and mitigation.

Weather Event	Effect	Mitigation
Extreme wind	Damage to blades	Automated control system

Weather Event	Effect	Mitigation
		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 WTGs), 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 stationary WTGs, 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 ambient noise, migratory and breeding birds, and little brown bats, while the local economy will see a beneficial impact through municipal taxes, CEDIF and economic spinoff. 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 may be considered where appropriate. A summary of the VEC assessment is presented in Table 6-20, 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 6-20: 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	Negligible
Fish and Fish Habitat	No Impact					
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
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 Requirements

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 upon construction completion.

7.1.2 Bats

Referring to the VEC assessment in Section 6.2 the Project was assessed as having a minor significance of residual effects on species at risk, specifically bats. As a result, a post construction monitoring plan will be implemented upon construction completion.

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. A CLC or similar transparent public input mechanism will be established to resolve issues pertaining to ambient noise levels.

7.2 Management Plan Requirements

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 HBWF 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 1.3.3.

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8.0 Closure

Natural Forces Wind Inc. wishes to develop the proposed Hillside Boularderie Wind Farm with the intent of helping Nova Scotia meet its renewable energy generation targets and in turn, help reduce the potential devastating effects of climate change.

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's 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 various levels of government 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 Hillside Boularderie Wind Farm and are considered as advantages of the Project, these include:

- Increased revenue for the CBRM 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;
- Promotion of the provinces CEDIF program, which facilitates the local ownership of projects such as the HBWF;
- 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;
- Help Nova Scotia meet its renewable energy regulations and targets for 2015 and 2020; and
- Raise awareness of the true benefits of wind energy and help inspire and show people that small community owned wind farms can make a difference in the fight against climate change by reducing green house gasses.

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

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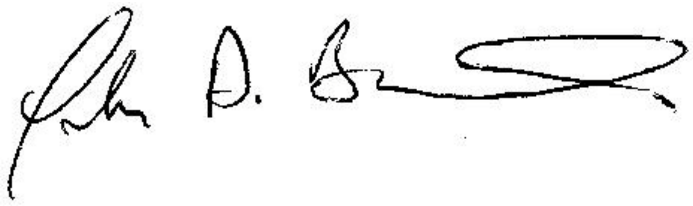
9.0 Company Signature

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:	John Brereton, President of Natural Forces Wind Inc. 
DATE:	April 24, 2013

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