East Bay Hills Wind Power Project

Cape Breton, Nova Scotia

ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT

Proponent

Cape Breton Hydro Inc.

Report Prepared by

McCallum Environmental Ltd.

May 21, 2014

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Environmental Assessment Registration Document

Name of Project: East Bay Hills Wind Power Project

Location: East Bay Hills, Cape Breton Regional Municipality, Nova Scotia

Size of the Project: Up to 50MW

Proponent: Cape Breton Hydro Inc.

Report Prepared by: McCallum Environmental Ltd.

ACKNOWLEDGEMENTS

Cape Breton Hydro Inc. (a subsidiary of BluEarth Renewables Inc.) gratefully acknowledges the contributions to this report by the following:

McCallum Environmental Ltd.
Nortek Resource Solutions
Davis McIntyre & Associates
Membertou Geomatics Ltd.
Boreal Environmental
Unama'ki Institute of Natural Resources
Hatch Energy
Pinchin Leblanc
CBCL Limited
Andrew G. Horn, PhD.

The reader should note that the project area started undergoing assessment in 2008 by CBCL and Pinchin Leblanc and Andrew Horn, PhD. In this 2014 report background information that was collected by those, or others is included, and perhaps without direct reference. This was done because the assessments that provide the basis for conclusions in this report were conducted for the same project lands unless otherwise noted.

EXECUTIVE SUMMARY

Cape Breton Hydro Inc. (a subsidiary of BluEarth Renewables Inc.) is proposing to construct and operate a wind power project with the capacity to generate up to 50 megawatts ('MW') of renewable energy (the "Project"). The Project is referred to as the East Bay Hills Wind Project. The Project is expected to generate power from up to 31 GE-1.68 wind turbines ("WT") each with a nameplate capacity of 1.68 MW.

Headquartered in Calgary, Canada, BluEarth Renewables Inc. ('BluEarth) is a private independent renewable power producer, focused on the acquisition, development, construction and operation of wind, water, and solar projects in North America, with a primary focus in Canada. With the most experienced renewable energy development team in Canada, BluEarth's mission is to be the Canadian renewable energy leader by developing, building, and operating a portfolio that optimizes people, planet, and profit. BluEarth believes it has the power to change the future by demonstrating how to be sustainable and profitable, leaving the world a better place. The Company has a growing portfolio of renewable power generation facilities, including one solar facility as well as an interest in eight hydroelectric facilities, as well as five projects in various stages of development.

In 2011/2012, BluEarth acquired Cape Breton Hydro Inc. ("CBHI") from Cape Breton Explorations Ltd., which had previously proposed the development of a hybrid wind/hydroelectric pump storage power generating facility in the same general location as the currently proposed project. Upon completion of the acquisition, BluEarth confirmed the abandonment of the hydroelectric pump storage component of the facility.

The Project is located on the hills above Lake Uist, located approximately 50 km southwest of Sydney Nova Scotia, on a large parcel of provincial Crown land near East Bay, Cape Breton Island, Nova Scotia.

This Project is considered a Class I undertaking under the Nova Scotia *Environmental Assessment Regulations*. A Class I undertaking is defined as an "electrical generating facility which has a production rating of 2 megawatts or more derived from wind, tides, or waves". As such, the Project is required to register for environmental assessment as identified under Schedule A of the *Environmental Assessment Regulations* (Nova Scotia).

This Project is being developed in response to the Government of Nova Scotia introduction of the *Electricity Reform Act* (*2013)*. It is CBHI's understanding that the Act, and associated regulations will allow for the sale of electrical energy from Renewable Energy, which specifically include wind power**.** The regulations would permit licensed "retail suppliers" (i.e. CBHI) to sell renewable low-impact electricity generated within NS directly to "retail customers" within NS. Furthermore, CBHI is being developed for potential RFPs that may be brought by the Nova Scotia Government.

Between 2007 and 2010, environmental assessment work continued on the Project. Between 2010 and 2014, Cape Breton Hydro Inc. complemented those past studies and the results support the conclusions in this assessment. The following is brief summary of findings:

- The Project Area is approximately 2829 hectares. The lands are mostly disturbed forested areas but does support other habitats including wetlands, disturbed habitats and waterbodies such as ponds and streams. Forests in the Project Area consist mainly of softwood stands (976 ha, 36% of the Project Area) followed by mixedwood (290 ha, 11 %) and hardwood stands (116 ha, 4 %).
- The Project Area has been harvested for timber in the last 10 years (762 ha, 28%). Existing forestry roads within the Project lands encompass 16.85 hectares (0.6%). Total existing disturbance (i.e.

roads + clear-cuts) within the Project lands is 780 hectares (29%). There is no active agricultural land present within or adjacent to the Project Area.

- Land use within the Project area is for timber harvesting and hunting/recreation. No other land uses are present. Adjacent land use is similar, with the exception of an overhead 340 kV power line running adjacent to the southern boundary. All Project lands are owned by the Nova Scotia Department of Natural Resources.

- The total footprint that will result from the Project infrastructure is estimated at 144 hectares. However, 22 hectares of this footprint is existing forestry roads that will be used. Furthermore, 46.48 hectares of proposed infrastructure was moved into clear-cuts to limit further impacts to habitat and future land use. Therefore the total new impact resulting from Project infrastructure is 75.23 hectares. This 75 hectares is only 3% of the total project land area.

- The existing length of forestry access roads on the Project lands is 21,063 metres. An additional 15,284 metres of road will be constructed for this Project. Of this 15,284 metres, 8190 metres is located in clear-cuts to reduce impacts to vegetation and wildlife. Therefore 7094 metres of new linear cut is required.

- In May 2012, a total of thirty-one candidate turbine site locations were assessed. Of the 31 sites assessed, 14 were located in disturbed sites that had been previously logged. These sites were characterized by recent (<10 year) timber harvesting operations, leaving very little canopy coverage, other than the occasional mature legacy tree or wildlife clumps. Five proposed turbine locations were within intolerant hardwood stands, 2 located in tolerant hardwood stands, and 6 were proposed within varying softwood stands. Four candidate turbine sites were located within wetland habitat.

- Since initial assessments were completed in 2012, a detailed design review occurred which took into account environmental constraints. The project team strived to relocate candidate turbine locations from intact forest stands into disturbed areas (i.e. clear-cuts) and from wetland habitats into upland habitat. The candidate turbine locations were reassessed in 2013. Of the 31 candidate turbine locations, 24 are now located in disturbed habitats with the remaining in existing forest stands.

- With the exception of Boreal Felt Lichen, no other rare plant species that were identified during a desktop analysis, or interviews with DNR, were found in the 2012 or 2013 field assessments within the Project footprint. As a result of Boreal Felt Lichen being found within the Project lands during previous surveys for the Port Hawkesbury Mill harvesting operations, a specific assessment was completed for Boreal Felt Lichen. Following identification of Boreal Felt Lichen in the field, a 100 metre setback was imposed as a protection buffer, and no infrastructure is proposed within this buffer.

- Deer wintering habitat is the only species specific significant habitat within the Project area, but the extent of this habitat is limited in the Project area.

- All turbines and proposed access roads are located greater than 100 metres from open water lake boundaries.

- The landscape within the East Bay Hills Wind Power Project area is positioned at a primary watershed divide [Salmon & Mira River, and Grand River] and is generally flat at the top of the plateau. Where topography is flat or at a low slope, wetland formation is prominent given the headwater position and soil types within the development area. Fifty wetlands were identified that lie within or adjacent to proposed project infrastructure. These wetland boundaries were assessed where they intersect with proposed project infrastructure. Studies of the wetlands for species at risk during vegetation surveys did not reveal the presence of species at risk in any wetland encountered. Wherever possible, turbines and access roads have been moved to avoid wetlands. However, due to the terrain and topography within the Project area, all wetlands cannot be avoided. For the Project to proceed, development in some wetlands will have to occur. Extensive field assessment work was completed to identify environmental features and avoidance of such features occurred where feasible, however the characteristics of the Project area do not make complete avoidance possible.

- Bird studies (spring migration, Breeding Birds, Fall Migration) were completed in 2007, 2008 and 2012. Those results indicate that there are no major concentrations of birds that occurred in the Project area. Nonetheless, the area is a migration stop-over for various species of woodland birds. However, these events occur over a wide area of the Highlands and are not unique or confined to the Project area or specific infrastructure areas. Twenty-three rare, sensitive or at risk species were recorded in the Project Area during all monitoring completed within the Project Area from 2007 to 2012. There is matching habitat for bird species such as Rusty Blackbirds, Olive-sided Flycatcher however the primary habitat is not affected by Project infrastructure.

- The East Bay Hills provide habitat for a range of fauna including white-tail deer, red fox bobcat, coyotes, hares, moose, black bear, Raccoon, squirrel, porcupine, and Canada lynx.

- In January 2014, the Unama'ki Institute of Natural Resources (UINR) conducted a Canada Lynx monitoring assessment, according to DNR pre-approved protocols, on the Project Lands. Lynx tracks were only found on two occasions. However an abundance of Eastern Coyote and Snowshoe hare tracks were found over the survey period.

- No evidence of American Marten was found during environmental assessment work. Vegetation assessments conducted during the field work also did not find evidence of mature coniferous forests that would potentially support Marten.

- With the exception of one recorded unknown bat species, all recorded Bat echolocation calls identified during assessments were associated with Myotis species bats (i.e., little brown bat and northern long-eared bat) both recently listed as endangered species in Nova Scotia. Bat activity during the survey was similar at both sites with 11 and 9 calls detected at sites 1 and 2 respectively. Bat activity during the fall survey was higher at site 1 than at site 2. A total of 8 calls were detected at sites 1 versus 2 calls detected at site 2. Over all bat activity in spring averaged 0.24 bat passes per night and in the fall averaged 0.72 at Site 1 and 0.9 at Site 2.

- No significant historic resources were encountered directly within the impact areas of the turbines however due to changes in a turbine layout, in accordance with Special Places standards, it is recommended that some new areas not previously assessed be subjected to a reconnaissance survey to confirm the absence of archaeological material. In addition a road leading between T3 and T28 needs to be moved if necessary, and revisited by an archaeological team to confirm avoidance of archaeological features in this area. All archaeological features are associated with a former logging camp.

- The results of the Mi'kmaq Ecological Study indicate that there are identified Mi'kmaq Traditional Use Activities occurring in the Project Site as well in various locations throughout the Study Area. Based on the information gathered and presented, there is some potential this project could affect Mi'kmaq traditional use in the proposed areas, specifically trout fishing in the area. Although the possible effects of the project could be minimal, considering the number of traditional use activities and the overall size of the proposed project, it is recommended that the proponent communicate with the Assembly of Nova Scotia Mi'kmaq Chiefs to discuss future steps, if required, with regards to Mi'kmaq use in the area.

- CBHI has exceeded all required municipal setbacks from property lines and homes, with the closest home being located over 1400 metres from a turbine. A conformance letter has been received from the Cape Breton Regional Municipality.

- Sound models indicate that the criteria for sound at a receptor of 40 dBA is not expected to be exceeded an all receptors are located further than 1400 metres from the turbines.

- A shadow flicker report was completed and results indicate that "No receptors exceed the recommended limit of 30 hours per year or 30 minutes per day in both the astronomical worst case and the real case scenario. As the predicted annual values of shadow flicker are very low in the real scenario (from 0 to 2.6 hours per year), it can be concluded that the probability of these receptors to observe shadow flicker is also very low."

- No EMI related effects are expected based upon consultation with the required agencies.

- CBHI is confident that the community-at-large support the development of this Project. Past public consultation (since 2012) and 2014 consultation with communities in proximity suggest that community support for this Project is positive. CBHI will continue to conduct public consultation on this Project.

- The reader will note that there is a time lag between spring and fall migration and breeding bird data. Therefore CBHI proposes to updating the spring and fall migration and breeding bird data following approval by NSDOE and prior to construction of the Project. Lynx monitoring and assessment will also continue as per identified protocols. Also, some additional historical resource assessment work on road alignments will also be required in accordance with Special Places standards and as per the recommendations of Davis MacIntyre & Associates. Permitting of watercourse alterations for watercourse crossings and wetland alterations will also be required prior to construction.

The construction and development of this Project should not only be considered important to CBHI, but to the Cape Breton Regional Municipality. This Project represents an investment of approximately $110 million. The Domestic Content Plan for this Project includes over 24% or $27 million of Project capital expenditures will be invested locally in Nova Scotia: This includes:

- Onsite construction labour
- Crane and Equipment Suppliers
- Civil, Geotechnical Engineering and Environmental Consulting
- Electrical design and installation contractors
- Concrete and aggregate supply
- Wind turbine tower supply
- Civil and roads construction contractors

The intent is to fulfill construction and operations contracts/positions with local personnel wherever possible. However, due to the specialized nature of wind turbine delivery, erection, and energization, if local personnel cannot be found, personnel may be required from other municipal, provincial, national, or international firms. It is estimated that 175,000 person – hours of work during the permitting, construction and operation will be required.

CBHI recognizes that the Project will affect the local environment in a number of ways. Negative impacts will include increased fragmentation and access to the Project lands. CBHI has used existing logging roads to the greatest extent possible to help reduce the amount of new impact. However, some impacts from new access road construction will occur. These impacts will be minimized to the extent possible through the mitigation measures proposed.

Furthermore, some mortality of birds and bats is anticipated as a result of turbine operations. The mitigation measures described in Section 5 are meant to reduce the level of mortality.

Impacts to wetlands are expected where avoidance of these features was not possible. . The Project area sits atop a ridge and as such there are numerous isolated wetlands throughout. CBHI will compensate wetland impacts in accordance with provincial requirements.

Some displacement of wildlife will likely occur during the construction phase of the Project. However, this is limited in time and the long-term operations phase of the Project is expected to have minimal displacement-related effects.

CBHI also recognizes positive impacts from the Project. Of course these will include positive financial inputs to local businesses, local contractors and consultants, CBHI, the Cape Breton Regional Municipality, and the Province of Nova Scotia. In anticipation of the 2015 implementation of the Electricity Reform Act, there are potential significant cost savings to businesses throughout the Province.

In a single year, this Project will produce real and measureable Greenhouse Gas Emissions ('GHG') offsets as very small emissions are created. Based on quantification protocols for Wind-Powered Electrical Generation, this Project could produce 0.65 tonnes CO_2e GHG offsets for every mega-watt hour of electricity produced. Given the Project produces measureable electricity, the GHG offsets are measureable. Current estimates using 35% capacity factors for 50 MW estimates that 99,645 tonnes of CO_2 would be offset in a single year. (Alberta Environment, 2008)

All impacts associated with this Project, both positive and negative, are similar to those experienced on other projects previously approved in not only Nova Scotia, but across Canada. Standard construction mitigation methods will be implemented during all phases of the building of the Project to ensure there are no significant impacts of the Project on Valued Ecosystem Components (VEC). CBHI will remain in contact with NSDNR to continue to implement mitigation as necessary. With continued thoughtful consultation, CBHI will be able to meet or exceed all regulatory, environmental, and social requirements prescribed by Nova Scotia.

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ACRONYMS

ACCDC	Atlantic Canadian Conservation Data Centre
AGL	Above Ground Level
AL-PRO	AL-PRO Wind Energy Consulting Canada Inc.
ASL	Above Sea Level
ATV	All-Terrain Vehicle
BFL	Boreal Felt Lichen
BOP	Balance of Plant
BWEA	British Wind Energy Association
CanWEA	Canadian Wind Energy Association
CBC	Canadian Broadcasting Corporation
CBEX	Cape Breton Explorations Limited
CBHI	Cape Breton Hydro Inc.
CLC	Community Liaison Committee
CMM	Confederacy of Mainland Mi'Kmaq
COMFIT	Community Feed in Tariff
COSEWIC	Committee On the Status of Endangered Wildlife In Canada
CWS	Canadian Wildlife Service
dBa	Decibel
DM&A	Davis McIntyre & Associates
DSME	Daewoo Shipbuilding and Marine Engineering
EMI	Electro-Magnetic Interference
EPP	Environmental Protection Plan
GASHA	Guysborough Antigonish Strait Health Authority
GE	General Electric
GHG	Greenhouse Gas
GIS	Geographic Information System
GPS	Global Positioning System
GRP	Glass-fibre Reinforced Plastic
IEC	International Electro-technical Commission
IPP	Independent Power Producers
ISO	International Standards Organization
KMK	Kwilmu'kw Maw-klusagn
KMKNO	Kwilmu'kw Maw-klusagn Negotiation Office
kV	Kilovolt
LIDAR	Light Imaging Detection And Ranging
MEL	McCallum Environmental Ltd.
MET	Meteorological
MORI	Market & Opinion Research International
MW	Megawatt
NSDNR	Nova Scotia Department of Natural Resources
NSE	Nova Scotia Environment
NSESA	Nova Scotia Endangered Species Act
NSPI	Nova Scotia Power Inc.
NSTIR	Nova Scotia Transportation and Infrastructure Renewal
PID	Property Identification Number
PIF	Partners In Flight
PM	Particulate Matter
POR	Point Of Reception

PPA	Power Purchase Agreement
RABC	Radio Advisory Board of Canada
SAR	Species At Risk
SARA	Species At Risk Act
SIA	Sound Impact Assessment
SSHD	Significant Species and Habitat Database
TBD	To Be Determined
TDG	Transportation of Dangerous Goods
TSP	Total Suspended Particulate
UINR	Unama'ki Institute of Natural Resources
UTM	Universal Transform Mercator
VEC	Valued Ecosystem Components
WHMIS	Workplace Hazardous Material Information System
WNS	White Nose Syndrome
WPP	Wind Power Project
WTG	Wind Turbine Generator
ZVI	Zone of Visual Influence

1 BACKGROUND

In November 2007, Cape Breton Explorations Limited ("CBEX") a private company based in Cape Breton that is engaged in the production of electricity from wind turbines, hydro turbines and other renewable sources of energy proposed the development of a hybrid wind/hydroelectric pump storage power generating facility (the "CBEX Project") on the hills above Lake Uist, located approximately 50 km southwest of Sydney Nova Scotia, on a large parcel of provincial Crown land near East Bay, Cape Breton Island, Nova Scotia.

At that time, the CBEX Project proposed the following primary components:

- A reservoir with the capacity of 20,000,000 m^3 in the hills approximately 190 m above sea level and 140 m above Lake Uist;
- Two 50-75 MW hydro reversible pump turbines; and
- Up to 44 wind turbines E 70 x 2.3 MW.

Between 2007 and 2010, environmental assessment work continued on the CBEX Project. During that period, CBEX evaluated feedback from consultation processes, as well as the results of technical engineering studies, and began to consider alternate project configurations, including the removal of the hydroelectric pumped storage component, and also a smaller scale wind component.

In 2011/2012, BluEarth Renewables Inc. ("BluEarth") acquired CBHI from CBEX and the East Bay Hills Project. BluEarth confirmed the abandonment of the hydroelectric pump storage power facility.

2 PROJECT INFORMATION

2.1 Proponent Profile

Cape Breton Hydro Inc., (the "Applicant") is a wholly owned subsidiary of BluEarth Renewables Inc. ('BluEarth'). BluEarth is a private company, with headquarters in Calgary, Alberta, and is focused on commercial scale renewable energy development. (www.bluearthrenewables.com)

Cape Breton Hydro Inc., (the "Applicant") is a wholly owned subsidiary of BluEarth Renewables Inc. ('BluEarth').

Headquartered in Calgary, Canada, BluEarth is a private independent renewable power producer, focused on the acquisition, development, construction and operation of wind, water, and solar projects in North America, with a primary focus in Canada. With the most experienced renewable energy development team in Canada, BluEarth's mission is to be the Canadian renewable energy leader by developing, building, and operating a portfolio that optimizes people, planet, and profit. BluEarth believes it has the power to change the future by demonstrating how to be sustainable and profitable, leaving the world a better place.

The BluEarth Renewables management team has an over 20-year track record major renewable project development and operation across the country including the development and operation of over $2 billion or 1,278 MW (net 1,093 MW) of renewable energy plants and projects. With strong financial backing from our two major investors, the Ontario Teachers' Pension Plan Board ("OTPPB") and ARC Financial (through ARC Energy Fund 6) ("ARC"), BluEarth's combination of experience and access to capital makes BluEarth a top tier developer, that follows through on commitments, and is able to successfully complete projects, from concept through to operations . BluEarth's management team consists largely of the leadership team from a company formerly called Canadian Hydro Developers Inc., which at the time it was taken over in 2009, was the largest dedicated renewable energy company in Canada. Following the takeover of Canadian Hydro, the senior management regrouped to form BluEarth Renewables. The biographies of BluEarth's executive team can be viewed online at http://www.bluearthrenewables.com/about-company/leadership/

The Company has a growing portfolio of renewable power generation facilities, including one operating solar facility as well as an interest in eight hydroelectric facilities, as well as multitude of solar, wind and hydro projects in various stages of development.

BluEarth's focus on the triple bottom line ensures the principles of sustainability – meeting the needs of the present without compromising the ability of future generations to meet their own needs – are systematically integrated into their daily business practices.

CBHI's team that will manage the Project, during all phases include, but is certainly not limited to:

Table 1. CBHI Project Team

Name	Title	Phone	Email
Tom Bird	Lead, Regulatory	519-265-5316	tom@bluearth.ca
Bryan Tripp	Lead, Project Development	519-821-7319	bryan@bluearth.ca
Maurice Hickey	Lead, Eastern Operations	519-216-6486	maurice@bluearth.ca
Jim Pinter, P.Eng	Vice President, Technology & Engineering	403-668-1575	jim@bluearth.ca

2.2 Project Summary

Table 2. Project Summary

General Project Information	CBHI intends to construct and operate the East Bay Hills Wind Project, a wind energy development consisting of up to 31 individual wind turbines, with the capacity to generate up to 50 Megawatts ('MW') of electricity.
Project Name	East Bay Hills Wind Power Project (the "Project")
Proponent Name	Cape Breton Hydro Inc.
Project Location	The Project is located in the East Bay Hills area of Cape Breton above Route 4 on the east side of the Bras d'Or Lakes. The site itself is located on the hills overlooking Lake Uist and in proximity to the administrative boundary between Cape Breton Regional Municipality (CBRM) and the Municipality of the County of Richmond (MCR). The approximate centre of the Project lands are located at 686558.08 m E and 5077758.56 m N.
Municipality	Cape Breton Regional Municipality
Landowner(s)	Provincial Crown – Department of Natural Resources
PIDs	15539059; 15138704; 15340375; 15340318
# Turbines	Up to 31
Turbine Manufacturer	GE Energy
Turbine Model	GE 1.68 – 82.5
Power Rating	1.68 MW
Total Energy Output	Up to 50 MW
Rotor diameter	82.5 m
Blade length	40.3 m
Hub height	80 m
Total Turbine Height	162.5 m

Turbine concept	Gearless, variable speed, variable pitch control
Required Federal Permits & Authorizations	• Department of National Defense Authorization; • Transport Canada; • NAV Canada; • No Navigable Waters permits / approvals required
Required Provincial Permits & Authorizations	The following permits, authorizations and/or approvals will be required for this Project which will allow for the construction and operation of the Project 1. *Environmental Assessment Approval.* Approved pursuant to Section 40 of the *Environment Act* and Section 13 (1)(b) of the *Environmental Assessment Regulations* in Nova Scotia, Canada; 2. Approval to Construct – Culvert(s), Pursuant to Part V of the Environment Act, S.N.S 1994-95, c.1;; *3.* Nova Scotia Transportation and Infrastructure Renewal: *Work within Highway Right of Way Permit;* 4. Service Nova Scotia and Municipal Relations: Special Move Permit for over dimensional and/or overweight vehicles and loads 5. *Wetland Alterations* Pursuant to Activities Designation Regulations, Division I, Section 5(1); 6. *Municipal Development Permits* for individual turbine locations. – Please refer to Appendix XIV. CBRM LETTER

2.3 Need for Project

The Project is being developed in response to the Government of Nova Scotia introduction of the *Electricity Reform Act* (*2013)*. It is CBHI's understanding that the Act, and associated regulations will allow for the sale of electrical energy from Renewable Energy**.** The *Regulations* made under the *Electricity Act* define "renewable low-impact electricity" to mean electricity produced from: solar energy; wind energy; run-of-river hydro; ocean powered energy; tidal energy; wave energy; sustainably harvested biomass; landfill gas, etc.... The regulations would permit licensed "retail suppliers" (i.e. CBHI) to sell renewable low-impact electricity generated within NS directly to "retail customers" within NS. Furthermore, CBHI is being developed for potential RFPs that may be brought by the Nova Scotia Government.

2.4 Project Location

The Project Area (FIGURE 1, Appendix I) is located in the East Bay Hills area of Cape Breton above Route 4 on the east side of the Bras d'Or Lakes. The site itself is located on the hills overlooking Lake Uist and in proximity to the administrative boundary between Cape Breton Regional Municipality (CBRM) and the Municipality of the County of Richmond (MCR). The Project is located in the CBRM. The plateau above Lake Uist ranges between 130 m and 185 m in elevation.

Access to the site is from Salem Road, one of a network of unsurfaced roads providing access to a number of small communities around lakes Uist, Enon and Lomond. Sydney is some 50 km to the northeast and St. Peters some 33 km to the southwest. The First Nation communities in closest proximity to the proposed works are Chapel Island, 18 km to the south, and Eskasoni approximately 25 km to the northwest across East Bay. The Project is situated in a low density populated rural setting.

The Project Area includes the headwaters of the Mira and Grand River watersheds. The western slopes draining into East Bay are steeper and more dissected than those in other parts of the Project Area, including the eastern slopes that drain to the lakes.

2.5 Land Use

The Project Area is approximately 2829 hectares. The lands are mostly forested but does support other habitats including wetlands, disturbed habitats and waterbodies such as ponds and streams.

Land use within the Project area is for timber harvesting and hunting/recreation. Some First Nation cultural use is indicated by the MEKS. No other land uses are evident. Adjacent land use is similar, with the exception of an overhead 340 kV power line running adjacent to the southern boundary.

2.6 Project Schedule

The following milestone schedule outline the typical project schedule which takes into account the final Project development stages such as receiving regulatory approval and execution of a Power Purchase Agreement. It also allows for adequate time to procure the long lead Project equipment such as the wind turbines and the main step-up transformer.

Table 3. Anticipated Schedule

Task	Anticipated Completion Date
Engineering	Q2 2014
Environmental Assessment Approval	Q3 2014
Power Purchase Agreement	Q3 2015
Turbine Purchase Agreement	Q3 2015
Generator Interconnection Agreement	Q3 2015
Geotechnical Assessment	Q3 2015
Commence Construction -Clearing for roads & foundations -Roads -Pour concrete slabs for turbine foundations -Substation & Collection System -Turbine foundations, turbine delivery, erection	Q3 2015Q3 2015 Q3 2015 Q3/Q4 2015 Q2 2016 Q2 to Q4 2016
Anticipated Commercial Operation Date	Q4 2016

2.7 Project Components

2.7.1 Wind Turbines

The Project will consist of up to 31 turbines, each rated at 1.68 megawatts (MW), for a nominal capacity of up to 50 MW in total. Turbines are the GE 1.68-82.5 Model. Each turbine will have either pad-mounted or nacelle situated transformers at each turbine, a 34.5 kilovolt (kV) electrical collector system with both overhead and buried lines, and a 69 kV/138kV wind farm substation that will include a step-up transformer, control building, switchgear, support structures, and a system of access roads to the turbines.

Table 4. Wind Turbine Coordinates (WGS84)

Turbine ID	Easting	Northing		Turbine ID	Easting	Northing
1	683260	5076418		18	686691	5080005
2	682719	5076369		19	686285	5079683
3	682977	5077115		20	685727	5079329
4	683591	5076964		21	684849	5079340
5	684250	5076443		22	685236	5079767
6	684484	5077083		23	685783	5080120
7	685309	5076491		24	685910	5080791
8	685976	5076629		25	686648	5080866
9	685879	5077059		26	687464	5080524
10	685172	5077421		27	687660	5081743
11	685848	5078061		28	688286	5081934
12	685243	5078040		29	688437	5082470
13	684960	5077924		30	688936	5082813
14	685553	5078599		31	689311	5082474
15	686462	5078308		MET 1	689007	5078628
16	686967	5078097		MET 2	685350	5078001
17	686344	5078833		MET 3	687984	5080473

Table 5. Wind Turbine Generator Technical Specifications

Component/Category	Specification
# Turbines	Up to 31
Turbine Manufacturer	GE Energy
Turbine Model	GE 1.68 – 82.5
Power Rating	1.68 MW
Total Energy Output	Up to 50 MW
Voltage output	600 V
Rotor diameter	82.5 m
Blade length	40.3 m
Hub height	80 m
Total Turbine Height	162.5 m
Turbine concept	Gearless, variable speed, variable pitch control
ROTOR	
Type	Upwind rotor with active pitch control

Direction of rotation	Clockwise (from upwind direction)
Number of blades	3
Swept area	5,346 m^2
Blade material	Fiberglass (epoxy resin) integrated lighting protection
Rotational speed	Variable: 9 – 18 rpm
Pitch control	Electric blade pitch control system with battery backup

Wind turbines and supporting structures typically consist of eight key components:

1. tower foundations;
2. three or four tower sections of steel or concrete with service access provided by ladder and/or service person lifts;
3. fibre glass nacelle housing the mainshaft gearbox and generator,
4. three fibre glass or carbon fibre rotor blades;
5. cast iron hub;
6. pad-mounted or internal nacelle mounted transformer;
7. electrical and grounding wires; and
8. buried grounding grid at perimeter of foundation

The nacelle includes bedplate/frame, fibre glass enclosure, rotor hub, mainshaft, gearbox, generator, turbine control equipment, instrumentation, and cooling/heating equipment. These components are located at the top of the tower sections and are connected to the three bladed rotors via a main shaft and hub assembly. Tower foundations may range from three to eight metres in depth depending upon site-specific soil conditions.

A pad-mounted or nacelle situated transformer will be required for each turbine to transform the low voltage electricity created in the nacelle to medium voltage collection system level (i.e., 600 V to 34.5 kV). The pad mounted transformers will be approximately three metres long and wide and about two metres high. The electrical collection system will be comprised of a series of above or below ground power lines and will connect each turbine to the substation transformer.

2.7.2 Lighting

Turbine lighting will meet the design requirements and quality assurance for lights required under *Canadian Aviation Regulations 2010-1* Part VI - General Operating and Flight Rules Standard 621.19 - Standards Obstruction Marking, Section. Transport Canada requires the use of medium intensity flashing red beacon lights.

2.7.3 Access Roads

The access roads (FIGURE 2, Appendix 1) will be upgraded and built to accommodate the size requirements of the crane and the load specifications to support the delivery of turbine and crane components. The final access road surface will be typically 8 m wide along straight sections, but will be wider during Project construction as required to allow adequate access for delivery of turbine components. Ditches and culverts will be added where required to allow for proper drainage. The surface soil and grubbing will be re-located in borrow areas along the road side and graded to prevent erosion and sediment runoff. The ditches will be constructed along the road edge following provincial guidelines and procedures to control for surface water runoff. Crossover culverts or water-bars will be installed under the roads where necessary.

2.7.4 Electrical Collection System

The 34.5 kV medium voltage collection systems will follow access roads for the entire length. The system will be used to take the power from the wind turbines to the substation. The system will consist of one (1) to two (2) x 34.5 kV circuits. The 34.5 kV circuits will consist of both overhead and buried sections. The overhead circuits will consist of a single wooden pole construction from the substation to an area of approximately 50 to 100 metres from the turbine where the overhead section will then connect to an underground cable which will connect to the unit step-up transformer at the wind turbine.

Underground collector lines will be installed either immediately to one side of access roads, just off the graveled surface, or within the road itself (to a depth of approximately 1 m). Where a collector line segment is not located adjacent or within an access road, an approximately 20 m cleared width is required. Construction of collector lines that are not located adjacent to a permanent access road will require the construction of a temporary construction trail to support collector line installation during the construction period. The temporary construction trail will be approximately 6m wide (within the required 20 m cleared width) and designed for temporary construction use only. Temporary trail construction will be limited to grading along the trail route and will not require the installation of a permanent road base.

2.7.5 Substation

The Project substation will be located at Easting 687454; Northing 5075487 will step-up the voltage from 34.5kV to 138kV and will interconnect the wind farm to NS Power's 230kV transmission system.

The substation will consist of a small control building, a main 34.5kV to 138kV step-up transformer, breakers, air disconnect switches, structural steel, protection and control equipment, metering, equipment concrete foundations, and ground grid. The substation will be secured by a chain link fence to restrict access to authorized personnel.

2.7.6 Meteorological Towers

There are two Meteorological ("MET") Towers currently located on the Project Lands. A third may be erected in the near future. These MET towers provide housing locations for meteorological instrumentation and anemometers (devices to measure wind speed) installed at different heights on the mast, and one or two wind vanes (devices to measure wind direction). These are connected to a data logger, at the base of a mast, via screened cables. This system is battery operated using a solar panel for recharge.

In recent years, it has become standard practice to download data remotely, via either modem or a satellite link. This approach has made managing large quantities of data from masts, on a range of prospective sites, significantly more efficient than manual downloading.

2.7.7 Temporary Components

During the construction phases of the project, the following temporary Project components will be required:

1. Storage yard (or multiple storage areas) will be required to store construction equipment, turbines, cranes, shacks, offices, parking and other necessary components. During the construction period trailers or other temporary structures will be brought in for construction support and management;
2. Temporary work space may be required along access roads and at crane pad sites. These temporary work spaces will be used as required (for example as truck turn around areas) and will be reclaimed/restored following turbine erection;
3. Borrow pits may be required to provide necessary fill for access road or crane pad site creation. All borrow pits will be permitted as required;
4. Due to turbine foundation requirements, a temporary cement batch plant may be established within the project lands to supply cement for foundation construction. To date this location has not been determined. It is expected that as turbines are constructed, the batch plant may move to reduce trucking requirements.

2.7.8 Maintenance Office

An operation and maintenance space will be constructed near the Project, or an existing facility may be leased purchased in a near-by town. The building will facilitate the day-to-day operations for the project.

2.7.9 Project Infrastructure Footprint

Table 6. Infrastructure and typical associated dimensions of workspace

Infrastructure and typical associated dimensions of workspace

Infrastructure	Length (m)	Cleared Width (m)	Area (hectares)
Total Cleared Work Space Per Turbine for Construction (required for storage of turbine blades, nacelle, and tower sections during the erection process)	100	100	31 (1 hectare / turbine x 31 turbines)
Access Roads - Existing	21,063	10	21.06
Access Roads* – existing roads that require expansion	21,063	20 (additional width required)	42.12
Access Roads – New	15,284	30	45.85
Substation	200	200	4
		TOTAL AREA	144.03

*Access roads require a final 8 metre wide travel surface, plus 22 metres to allow for room for placement of grubbings, soils, rock, and installation of power poles and lines adjacent to the road.

2.8 Project Activities

2.8.1 Activity Phases

<table>
<tr><th>Phase</th><th>Details</th></tr>
<tr><td colspan="2">Pre-Construction</td></tr>
<tr><td></td><td>• Notification of residents of construction commencement
• Survey turbine site locations in field
• Survey access roads on project lands
• Delivery & set up of temporary facilities – construction offices, workers trailers, temporary washroom facilities, etc.
• Construction equipment delivery</td></tr>
<tr><td colspan="2">Construction</td></tr>
<tr><td>General</td><td>• Clearing and Grubbing of overstory vegetation
• Construction of storage yards
• Construction of temporary work space</td></tr>
<tr><td>Civil</td><td>• Stripping of surface soils along access roads, at turbine locations, at substation, at other required work areas
• Construction of access roads, water crossings
• Construction of temporary work space(s)
• Construction of turbine locations and crane pads
• Installation of erosion and sediment control structures
• Site grading
• Compaction testing of roads
• Excavation of foundations with blasting (as required) and excavator
• Creation of crane pads using excavated material
• Installation of site drainage (aka- weeping tile) at base of turbine foundations
• Installation of re-bar at turbine foundations
• Installation of turbine base
• Pouring of concrete for foundations
• Testing of concrete foundations
• Backfilling of foundations with previously excavated soils
• Reclamation of surplus soils
• Grading of site</td></tr>
<tr><td>Turbines</td><td>• Turbine component delivery
• Crane delivery
• Tower/turbine erection
• Install Turbine Electrical & Padmount Transformers</td></tr>
<tr><td>Collection System</td><td>• Installation of poles and guide wires for overhead (O/H) collection system
• Run overhead wires and associated infrastructure
• Install and connect underground collector system</td></tr>
<tr><td>Sub-Station</td><td>• Delivery of equipment
• Installation of equipment foundations and station ground grid
• Installation of equipment support structures
• Installation of transformer, switch gear, protection and control systems, control building, conduits, wiring, and terminations</td></tr>
</table>

Phase	Details
	• System testing
Operations & Maintenance	
	• Reclamation of subsoils and disturbed surface soils • Weed Control • Re-seeding of disturbed soils • Grading of roads • Road maintenance • Culvert maintenance • Turbine maintenance • Sub-station maintenance • Equipment testing
Decommissioning	
	• De-energize facility • Removal of above ground infrastructure which includes turbine blades, nacelles, tower components, O/H distribution lines, power poles, and other support structures • Removal of crane pads and gravel from access roads • Recontouring of crane pads and access road grades • Reclamation of surface soils • Re-seeding or re-planting • Reclamation monitoring

2.8.2 Staffing Requirements

It is estimated that 175,000 person – hours of work during the permitting, construction and operation will be required. Over 2 years that would be equivalent to 20 persons being employed 12 hours / day for 700 days. However, in a project like this there is typically a large variation in the number of on-site workers day to day, week to week, month to month and is completely dependent upon what stage of construction is occurring. Typical skills required for a project such as this include:

Design & Manufacturing
• Engineers (Aerospace, civil, electrical, electronics, environmental, industrial, materials, mechanical, technicians); • Machinists • Assemblers • Welders • Inspectors • Production Managers
Project Development
• Land managers • Project managers • Engineers • Geotechnical • Archaeologists • Biologists • Technologists

• Regulators
Construction
• Swampers • Labourers • Drivers • Machine operators • Environmental monitors • Engineers • Project managers • Electricians • Welders • Material suppliers
Operation
• Site managers / engineers • Wind energy technicians • Equipment supply technicians • Labourers • Environmental monitors • Land managers • Project managers • Equipment operators

2.8.3 Turbine Site Construction

The erection of a turbine requires a large level work area for safe operation and the following site dimensions will be typical for the project:

Construction of the turbine locations will consist of the following:

- Boundaries will be flagged by surveyors;
- Cutting, de-limbing and decking all salvageable timber, as necessary, using feller buncher, skidders, chainsaws and logging trucks as per DNR or timber lease holder requirements.
- Following removal of overstory vegetation, lands will be brushed with a bulldozer and backhoe to remove non-salvageable wood and brush. Scrub brush will be piled along disturbance boundaries and will have breaks installed to allow for water flow where necessary;
- Turbine sites may require soil stripping and leveling using a two lift soil stripping method in areas where bedrock is not found at or immediately below the surface.
- Drainage patterns will be maintained by installing adequate crossing structures;
- Blasting of uneven surface bedrock and foundation areas will be completed as required. IF REQUIRED, all blasting will be conducted in accordance with the *General Blasting Regulations, N.S. Reg. 77/90*, or any updated versions thereof;
- Following blasting of bedrock, blasted bedrock will be excavated and used for the development of a crane pad on the turbine location. Turbine bases will be excavated to appropriate dimensions (determined by engineering requirements);
- Each turbine base is anticipated to require installation of a support structure using approximately 300 m^3 of cement and re-bar;
- Installation of rebar and other required infrastructure;
- Pouring of concrete;

Concrete for turbine foundations may be supplied by a temporary concrete batch plant located at a strategic location on the project lands. The concrete batch plant will be permitted by the supplier in accordance with Nova Scotia regulations.

2.8.4 Access Road Construction

Construction of access roads will consist of the following:

- Cutting, de-limbing and decking all salvageable timber, as necessary, using feller buncher, skidders, chainsaws and logging trucks as per DNR or timber lease holder requirements.
- Following removal of overstory vegetation, lands will be brushed with a bulldozer and backhoe to remove non-salvageable wood and brush. Scrub brush/grubbings will be piled along disturbance boundaries and will have breaks installed to allow for water flow where necessary. Limbs and non-merchantable material will be chipped, left in brush piles or buried underground for natural decay; depending on the site conditions.
- Bulldozers will push topsoil to the edge of the access road boundary
- Subsoils will be excavated with a backhoe from a trench line that parallels the access road alignment. These subsoils will be placed on the area of travel for the access road.
- Previously removed grubbings and topsoil will be placed into the excavated trench line and the trench line recontoured.
- Subsoils placed on the access road traveling area will be spread out using a bulldozer
- Access roads will the packed with a roller
- Crushed rock may be placed on the road and re-packed with a roller;
- A second and final layer of crushed rock may be placed over top and packed with a roller if required;
- Gravel may be used on the accesses on an as-needed basis during the construction and operational life;
- Culverts will be installed as required to maintain natural drainage according to Nova Scotia Environment and/or Department of Fisheries & Oceans standards;
- All roads will be compaction tested to ensure they meet the compaction requirements for turbine component delivery

2.8.5 Turbine Erection

The erection of turbines is based upon specific site conditions found at each turbine Site. Engineering lift procedures will be required for each turbine and generated by the construction contractor.

- Lifting and construction equipment will be placed on the ground and leveling techniques will be used as required, for the safe operation of equipment;
- Two cranes will be used for each turbine component installation (one main lifting crane and one tailing crane). The main lifting crane will be situated on the leveled crane pad area immediately adjacent to the foundation pedestal. The tailing crane will be located nearby.
- Hydraulic torque wrenches will be used to tighten bolted connections between turbine tower sections.

2.8.6 Equipment Delivery

Transportation routes have not been determined and are subject to Nova Scotia Transportation and Infrastructure Renewal (NSTIR) approval and transportation.

The following types of construction vehicles are expected to be used to construct each proposed wind turbine:

Foundation Construction

- Track Hoe
- Loader
- Roller
- Concrete Trucks
- Concrete Pump Truck
- Tractor Trailer (rebar, anchor bolts& templates)
- Rock Trucks

Access Roads Construction

- Bulldozer
- Grader
- Gravel Haul Trucks

Collection System Installation

- Trackhoe or Trencher
- Tractor Trailers (delivery of cable spools and transformers)

Turbine Erection

- Tractor Trailers (required for delivering crane components to project area WTG components would be delivered using tractor trailers of various lengths, widths and axle configurations required to accommodate the large weights and dimensions of the components.

Component deliveries / turbine include:

- Down Tower Assembly (6 delivery trucks)
- Hub (1 delivery truck per turbine)
- Nacelle (1 delivery truck per turbine)
- Tower Sections (3 delivery trucks per turbine)
- Blades (1 delivery trucks for every turbines, i.e. three blades per truck)

The approximate sizes of trucks required to deliver equipment are listed as follows:

Table 7. Typical Equipment Dimensions

Component	Length of trucks (feet)	Height of trucks (feet)	Approx. Gross Vehicle Weight (lbs.)	Clearance Radius on Turns (feet)
Nacelle	112’ 10”	14’ 8:	197,000	111’ 3”
Hub	78’ 0”	13’ 6”	75,000	48’ 4”
Blade	153’ 11”	13’ 6”	<70,000	133’ 0”
Tower Base	140’	15’	212,000	80’ 5”
Tower Mid	128’ 2”	15’	132,000	75’ 0”
Tower Top	123’ 7”	14’ 6”	112,000	74’ 6”

- During construction, approximately 67 trucks of equipment / turbine may be required to deliver equipment (i.e. turbine parts), materials (i.e. gravel, rock) and personnel to the site.

Assuming the same volume of trucking is required, approximately 2144 deliveries by truck could be required for this Project.

- Two support cranes will be required to offload each of the turbine components at their respective turbine site laydown area(s).
- Tower components will be either erected directly from delivery trailers or stored at each turbine laydown site
- Balance of Plant electrical components may be delivered to a local existing offsite storage yard prior to being delivered to site for installation.

2.8.7 Electrical Collection System

The Collection System will be installed within the Project boundaries, and will mainly consist of above ground utility wooden power poles, spaced approximately 50 metres apart. All power poles will be purchased from a supplier which has treated the poles in accordance with appropriate regulations. Construction of the collection system will consist of the following:

- Surveying of the pole locations;

If necessary, drilling of borehole into bedrock to approximately 5 – 8 metres depending upon subsoil/bedrock conditions;

- Installation of power poles;
- Installation of cross arm supports and pole infrastructure;
- Unspooling and stringing of power lines and fiber optic cable;
- Installation of pole mounted disconnect switches as may be required by the electrical design.

For underground lines, collector cables will be buried to approximately 1m below grade using excavators, trenchers, direct-burial cable installers, reel stands and conductor puller vehicles.

2.8.8 Sub-Station Construction

Construction of the sub-station location will consist of the following:

- Surveying of the site boundaries to above noted dimensions;
- Boundaries will be flagged by surveyors;
- Cutting, de-limbing and decking all salvageable timber, as necessary, using feller buncher, skidders, chainsaws and logging trucks as per DNR or timber lease holder requirements.
- Following removal of overstory vegetation, lands will be brushed with a bulldozer and backhoe to remove non-salvageable wood and brush. Scrub brush will be piled along disturbance boundaries and will have breaks installed to allow for water flow where necessary;
- Sub-station location may require soil stripping and leveling using a two lift soil stripping method in areas where bedrock is not found at or immediately below the surface.
- If necessary, blasting of uneven surface bedrock will be completed as required. All blasting will be conducted in accordance with the *General Blasting Regulations, N.S. Reg. 77/90*, or any updated versions thereof;
- Following blasting of bedrock, blasted bedrock will be excavated and used as part of the substation sub base;
- Installation of equipment foundations and station ground grid;
- Installation of equipment support structures;

- Installation of substation equipment such as the transformer, switch gear, protection and control systems, control building, conduits, wiring, and terminations

2.8.9 Grid Interconnection

The project proposes to interconnect to NSPI via a Network Resource Interconnection Service to line L-6516. The point of interconnection is approximately 54.5km from 2S-Victoria Junction substation and 70.7 km from 2C-Port Hastings substation. The interconnection to L-6516 will be facilitated via a 138 kV three-breaker ring bus and a new 138kV project substation.

Interconnection Feasibility Study Reports were conducted in 2007 and 2012 which indicated the capability for the project to connect to the transmission system. CBHI is in the process of renewing its Interconnection Request with NSPI and the current indication is that there remains sufficient transmission capacity to allow the project to connect to the grid.

At this time, neither a Generator Interconnection Agreement nor PPA are being applied for through NSPI. CBHI is seeking DNR lease approval and Environmental Assessment approval prior to applying for the above noted agreements. CBHI is anticipating that interconnection and PPA requirements will change with the implementation of Electricity Reform Act and as such is awaiting those requirements.

2.8.10 Waste Disposal

All hazardous materials on work sites are controlled under federal and provincial legislation. The legislation requires that employers provide specific information to workers for the safe use, handling, production and storage of hazardous materials on work sites.

There are limited waste by-products created from the wind energy generation process. Some waste will be produced from ongoing maintenance for the turbine facilities (e.g., lube and hydraulic oils). Hazardous waste materials will not be generated in large quantities and will be disposed of through conventional waste-oil and hazardous waste disposal streams as regulated in the province of Nova Scotia.

All solid waste must be properly sorted for recycling, reuse, composting, or landfilling. The segregated materials must be stored in a manner so that they will not degrade, burn, or become buried on site until they are sent to the appropriate, provincially approved waste disposal, recycling, or composting facilities.

Non-hazardous waste will be disposed of through conventional, local waste handling facilities operated by the local municipalities. As appropriate, materials suitable for recycling will be reused and/or recycled.

Controlled products are products, materials, and substances that are regulated by Workplace Hazardous Materials Identification System (WHMIS) legislation. All controlled products fall into one or more of the six WHMIS classes and each has specific handling, transport, storage, and safety requirements.

3 PROJECT SCOPE

3.1 Site Sensitivity

The determination of site sensitivity was undertaken in consultation with the Canadian Wildlife Service (CWS) and the Nova Scotia Department of Natural Resources (NSDNR).

Based on the document Nova Scotia Environment (NSE) *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document* (NSE September 2008), facility size and site sensitivity combine to determine the Level of Concern.

Using the matrix provided in the *Proponents Guide to Wind Power Projects: Guide for preparing an Environmental Assessment Registration Document (*Nova Scotia Environment, 2007, p. 8), the overall level of concern category associated with the Project was determined.

Table 8. Facility Size

Size	Definition
Very Large	Contain more than 100 turbines
Large	Contain 41-100 turbines
Medium	Contain 11-40 turbines
Small	Contain 1-10 turbines

The determination of site sensitivity is based on the characteristics of the region/area (Environment Canada, March 2006). Under this classification, the Project area was anticipated to affect one or more of the following characteristics:

- Site contains one or more landform factors that concentrate birds (*e.g.,* islands, shoreline, ridge, peninsula or other landform that may funnel bird movement) or significantly increase the relative height of the turbines;
- Project will disrupt large contiguous wetland or forest habitat that may be of importance to birds;
- Site is located between habitats where large local bird movements occur, or is close to significant migration staging or wintering area for waterfowl or shorebirds;
- Site contains, or is adjacent to, a small colony of colonial birds, such as herons, gulls, terns, or seabirds.
- Site is subject to increased bird activity from the presence of a large heron, gull, tern or seabird colony located in the vicinity of the site.
- Site is subject to increased bird activity from the presence of an area recognised as nationally important for birds (*e.g.,* a National Wildlife Area, Migratory Bird Sanctuary, Important Bird Area, National Park, or similar area protected provincially or territorially because of its importance to birds); and/or, Site contains species of high conservation concern (*e.g.,* birds known to have aerial flight displays, Partners In Flight/CWS priority species, etc.);
- Containing species of high conservation concern (e.g. species listed as “yellow” under NSDNR’s General Status of Wild Species).

McCallum Environmental reviewed ACCDC databases, NSDNR lists for listed species, and Breeding Bird Atlas grids in proximity to, or overlapping the Project. Those results indicated that either based on habitat potential, or proven or probable breeding evidence, there are 39 birds ranked Yellow or Red by NSDNR in proximity to the Project. (Table 26. Listed Species Know to be in Proximity to Project) Therefore the Project was classified as having a “Very High” potential sensitivity.

Table 9. Project Category

	Site Sensitivity			
Facility Size	Very High	High	Medium	Low
Very Large	Category 4	Category 4	Category 3	Category 2
Large	Category 4	Category 3	Category 2	Category 2
Medium	Category 4	Category 3	Category 2	Category 1

Small	Category 4	Category 2	Category 1	Category 1

Based on the determination of a Medium facility size and the potential for Very High Site Sensitivity, the project category for the purposes of the environmental assessment process was determined to be Category 4, as described below.

Category 4. *Projects in this category present a relatively high level of potential risk to birds, and consequently are likely to require the highest level of effort for the EA. As with category 3 projects, relatively comprehensive baseline surveys will usually be required. In many cases, these can still be completed over the course of one calendar year, unless there are specific factors that require more intensive survey.*

Based on the Category 4 classification, the methodologies for field surveys were established keeping the recommendations noted above in mind.

3.2 Assessment Scope

The EA focuses on specific environmental components called valued environmental components (VECs). VECs are specific components of the biophysical and human environments that, if altered by the project, may be of concern. A valued ecosystem component is important (not only economically) to a local human population, or has a national or international profile. If altered, a VEC will be important for the evaluation of environmental impacts of industrial developments (NSE 2007, updated 2012)

The scope of the assessment for this Project includes: selection and assessment of potential interactions and identification of VECs; identification of environmental effects; and identification of the standards or thresholds that are used to determine the significance of residual environmental effects.

3.3 Spatial and Temporal Boundaries of the Assessment

Assessment of effects was undertaken for the area identified as the Project Area (Figure 1). For the purpose of data collection and the socioeconomic environment, the CBRM was considered. In addition, residences located within a 1.5 km buffer of the Project site were assessed as potential receptors for the purposes of evaluating potential impacts from sound.

The temporal scope of this assessment covers the construction, operation, and decommissioning phases of the Project, and associated activities.

3.4 Site Optimization, Constraints Analysis & Turbine Site Selection

A key aspect of planning a wind power project is the determination of project lands for the development and the subsequent identification of specific turbine locations within these lands.

This section describes how multiple factors were considered in order to determine the project footprint in the Project area. These factors include technical (i.e. wind resource), financial, construction, socio-economic, landowner, biophysical constraints, as well as community and stakeholder feedback (from the draft submission of the registration document).

This section details how CBHI determined turbine and access road locations.

3.4.1 Site Optimization

The determination of the most appropriate location for the Project to minimize overall impact on the landscape. Detailed planning and analysis was completed to determine available lands and to ensure that the turbines were placed within the smallest available footprint. Minimization of the Project footprint allowed CBHI to reduce the impact on the environment and reduce construction and development costs.

The Project was chosen for the following reasons:

1. Appropriate wind regime to make the Project economically viable;
2. Presence of adequate land base for placement of turbines;
3. Existence of network of current road infrastructure to reduce overall habitat fragmentation and reduce overall project costs
4. Relatively level topography and land characteristics to allow placement of turbines as close together as practical to minimize project footprint;
5. Ability to place turbines to meet regulatory setbacks for sound from receptors;
6. Ability to place turbines to meet municipal setbacks from residences;
7. Proximity to the NSPI transmission corridor to connect the Project to the grid without a significant length of interconnection from the substation;
8. No unique or isolated habitat types identified within the Project area;
9. Suitable available land area to allow for adequate setbacks between turbines. Turbines can only be placed a certain distance from each other to limit the wind turbulence they create which can interfere with adjacent turbines. This interference makes each turbine less productive. Furthermore, turbine manufacturers will not allow turbines to be erected if the threshold for turbulence intensity is exceeded.

3.4.2 Constraints Analysis

Once the more general process of site optimization was completed and a Project area confirmed, more detailed and site specific process of constraints analysis was completed. A constraint can be specified as something to *maintain* or something to *avoid*.

Site specific constraints that were used for Project are as follows:

1. Wind Regime: Turbine sites are selected on basis of wind regime specific to the Project lands from validated wind measurements. Collection of site specific data for wind speed and direction being crucial to determining site potential. Once specific turbine site determinations are modeled, considerations of the loss of output due to mutual interference between turbines is factored. Wind regime mapping was used to identify optimal wind resource areas within the land base. This allows for effective placement of the turbines to maximize power generation from the wind resource for the Project based upon expected energy outputs within the modeled wind regimes.
2. Species at Risk (SAR): species at risk locations were taken from known datasets, government databases/sources, or other relevant studies specific to the Project area and setbacks imposed (i.e. 100 metres from Boreal Felt Lichen)
3. Existing Infrastructure: existing roads, transmission lines, or other infrastructure that was available was used to reduce impacts and construction costs;
4. Municipal setback requirements turbine spacing;
5. Provincial setbacks for proximity to residences, which include constraints for noise at a receptor and shadowflicker;

6. Topographical Constraints: Using known data from federal and provincial topographic maps were used to determine optimal locations for turbine placement. Slopes in excess of 15% were eliminated from the available land base due to construction restrictions;
7. Setbacks between turbines. As a general rule, due to wake loss and turbulence from blades while they are in operation, a minimum five (5) times rotor diameter (100 metres) (= 5 x 100 metres = 500 metre) setback distance is required in the prevailing wind direction between turbines, and minimum three (3) times rotor diameter (300m) setback distance is required perpendicular to the prevailing wind direction between turbines. As a starting point for planning purposes, this setback was placed between turbines.
8. Geographic Information System (GIS) mapping of the Project lands was completed using data collected (above) and datasets for landform, land use, topography, watercourses, historical resources, and wildlife. In addition, aerial photography was used to complement the GIS datasets, with the final goal of building a robust, dynamic, and temporally valid constraints map that can be modified as turbine selection is finalized;
    i. Within the GIS datasets the following parameters were mapped:
        1. Project area;
        2. Topography;
        3. Land Use;
        4. Existing infrastructure;
        5. Meteorological Towers;
        6. Residences;
        7. Existing roads;
        8. Existing transmission lines;
        9. Known species at risk locations;
        10. Known heritage sites;
        11. Lakes, ponds or other visible open water bodies;
        12. Watercourses;
        13. Wetlands; and
        14. Property boundaries (PIDs);
        15. Cut blocks where tree removal has already occurred

Once GIS mapping was completed, the following setbacks were used in the development of the Project layout of turbines, access roads, and substation location:

3.4.3 Project Layout Creation

Once constraints analysis was completed:
1. Turbine locations were placed onto the Project map. During this process, numerous turbine locations were moved to comply with known setback requirements while still attempting to optimize wind resources;
2. Existing access was used to reduce the overall requirement for new roads. All existing roads were used to the greatest extent possible;
3. Environmental and field collected data were incorporated into the mapping;
4. GPS coordinates were then used to field verify the turbine locations. Further constraints analysis was completed during field assessments. For example, several turbines were moved to maintain setbacks from wetlands and watercourses that were not identified during the desktop mapping phases, Boreal Felt Lichen ('BFL') assessments were completed to ensure project infrastructure maintained a 100 metre setback from BFL locations, and turbines were moved to cut blocks where appropriate.

5. Using the above noted information, Balance of Plant (BOP) was created (BOP includes all remaining infrastructure requirements such as access roads, distribution lines, substation location, etc…) using the same datasets and field data to ensure regulatory setbacks are maintained for all phases of the Project.

4 ENVIRONMENTAL ASSESSMENT METHODOLOGIES

This chapter details the following key aspects of the environmental assessment methodologies:

A. Biophysical:
B. Sound assessment; and,
C. Electro-magnetic interference assessment.

4.1 Biophysical Assessments

The field components of the biophysical environmental assessment were initiated in 2007 and 2008. Further studies were completed in 2011, 2012, 2013 and 2014.

4.1.1 Wildlife Species and Habitats

Assessment of wildlife, including vegetation, and habitat was completed based on the requirements outlined in the Nova Scotia Environment (NSE) *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document* (NSE September 2008). Development of a priority list of species for each taxonomic group was completed based on a compilation of listed species from the following sources:

1) Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Federal Species-at Risk Act (SARA 2003). All species listed as Endangered, Threatened, or of Special Concern.
2) Nova Scotia Endangered Species Act (NSESA 1999). All species listed as Endangered, Threatened, or Vulnerable.
3) Nova Scotia General Status of Wild Species: All species designated as Species of Conservation Concern (Red or Yellow).

This priority list of species was narrowed by broad geographic area. (Appendix 14**)** The priority list of species was then further narrowed by identifying specific habitat requirements for each species. For example, if a listed NSESA species required open water lake habitat, and no open water lake habitat was present inside the Project footprint, this species would not be carried forward to the final list of priority species for field assessments.

Field surveys were completed in spring 2012 and fall 2013 to assess for all identified priority species at each proposed turbine and access road location. For this survey, a list of all rare species records found within 100 km of the Project area was also assembled prior to the survey being undertaken (from Atlantic Canada Conservation Data Centre- ACCDC data results) to provide additional information regarding the potential presence of priority species within the Project area.

4.1.2 Avian Use

4.1.2.1 Desktop Studies

An important source of information is the Maritimes Breeding Bird Atlas (MBBA) database (Erskine, 1992), which contains a summary of bird distribution and abundance across the Maritime Provinces of Canada. The MBBA data was used to provide a general inventory of breeding birds in the vicinity of the Project Area. The MBBA also provides a list of bird species of special conservation concern which may be present in the Project Area. The Project Area includes parts of three Maritime Breeding Bird Atlas (MBBA) map squares: 20PR77, 20PR87 and 20PR88. In the first breeding bird atlas (1986-1990) (Erskine, 1992), there was limited reports of bird species in each of these squares (25, 71, and 9 species observed respectively) compared with the effort for the second breeding bird atlas (2006-2010) (Lepage, 2009) in which 88, 90, and 71 species were recorded as possible, probable or confirmed breeding in the squares. Observations for the second breeding atlas have recorded more evidence of breeding species that were not recorded in 1986-1990, probably due to the increased effort (number of survey hours) for each of the squares. Survey time totaled 15 hours for the three squares during the first atlas compared to a total of 68 hours during the second atlas (Lepage, 2009).

According to MBBA data, species observed or heard singing in suitable nesting habitat are classified as possible breeders. Species exhibiting the following behaviours are classed as probable breeders:

- courtship behavior between a male and female;
- birds visiting a probable nest site;
- birds displaying agitated behavior; and
- Male and female observed together in suitable nesting habitat.
- Species are confirmed as breeding if any of the following items or activities were observed:
- nest building or adults carrying nesting material;
- distraction display or injury feigning;
- recently fledged young;
- occupied nest located; and
- Adult observed carrying food or fecal sac for young.

A review of the ACCDC database was conducted to obtain a list of provincially rare or sensitive bird species found within a 100 km radius of the Project Area. ACCDC provides information on species and ecological communities that require consideration for their conservation (ACCDC 2012). The ACCDC listing and ranking system is useful since it provides a georeferenced outlook on rare or sensitive species and habitats. The ACCDC list, however, is generated on a radius that is considered to be in excess of the ecological footprint of the Project. A model was therefore employed by the Project Team to determine the likelihood of the presence of the ACCDC ranked bird species within the Project Area. Likelihood of presence was determined by crosschecking the habitat requirements of the ACCDC listed species with the habitat description within the Project Area.

Several species of conservation concern were identified during migration and breeding surveys conducted in 2008. A pair of Rusty Blackbirds was detected at one location, and Olive-sided Flycatchers were located throughout the site. A review of the Maritime Breeding Bird Atlas square summaries (squares 20PR87 and 20PR88) indicate that the Rusty Blackbird is a confirmed breeder, and the Olive-sided Flycatcher is a probable breeder. Other species of conservation concern documented within the project land include the Common Nighthawk (Threatened), Piping Plover (Endangered), Short-eared Owl (Special Concern), Chimney Swift (Threatened), Bicknell's Thrush (Threatened), Bobolink (Threatened) and Canada Warbler (Threatened). These findings confirm the presence of priority species within the project lands.

During the 2007-2008 monitoring efforts, a series of 40 point counts and 20-minute area searches was conducted throughout the Project lands during breeding season, and three hour area searches were completed during the fall migration. While it is preferable to maintain consistent survey efforts for statistical analyses purposes, the results from previous surveys are only available in a descriptive format. As such, previous results cannot be statistically compared with new data, and we have decided to develop a new methodological approach which will be consistent with current CWS protocols and the approaches currently used on other wind power projects in Nova Scotia. Results from previous survey efforts will be used as descriptive background information only, and will not be statistically compared with results from current sampling methods. Surveys completed in 2012 were designed for replicability should post-construction monitoring be required. Some of the following methodologies have been taken from the ***Spring Migration and Breeding Bird Survey of the Proposed East Bay Wind Power/Hydro Project Site*** (Andrew G. Horn, 2008), which can be found in **Appendix 3**.

---Report Summary---

4.1.2.2 Spring Migration 2008

The surveys were planned based on EC's general guidelines (2006a, 2006b), together with EC's more specific comments on this particular project (J. Chardine, pers. comm.). Migration surveys were conducted between 20 April and 4 June, with the most frequent sampling during the peak of migration in late May. Surveys included standardized, 20 minute area searches of the three potential stopover/passage sites identified in the fall preliminary survey (Horn 2007b) and 9 additional sites that were identified as being potential stopover/passage sites for migrants and as being representative of the affected habitats. Also, nocturnal flight call surveys were conducted along Loch Lomond Road from Route 4 to Salem Road. These surveys consisted listening for migrant flight calls during 10 minute point counts at stations spaced every kilometer along the road. This particular route was chosen because it offered an efficiently accessed transect across the plateau where the project will be placed, thus providing a snapshot of the distribution of night migrants passing over the plateau.

4.1.2.3 Breeding Birds 2008

CWS protocols recommend breeding bird searches survey take 4-10 days and include point counts, so given the large size of the present project, at least 10 days were planned for the present survey. Four visits began with 10-minute, unlimited radius point counts completed by 9 AM from 20 of 40 sampling stations that were evenly spaced through the study area: 20 in the area where turbines are proposed and 20 others in the area from Munroe Lake to Loch Lomond. Sampling was rotated so that each point was sampled twice, at least 10 days apart, as recommended by EC (2006a). For each count, distances to detected birds were estimated as 0-50m, 50-100m, and >100m (EC 2006a). Conditions were calm and without precipitation for all counts.

Point counts were followed by area searches for additional species in each habitat type within the project area, with particular attention to more extensive patches of habitat that appeared suitable for rare and/or sensitive species, and using playback to search for relatively secretive raptors (Long-eared Owl, Northern Goshawk) and species of conservation concern (Olive-sided Flycatcher, Bicknell's Thrush, Rusty Blackbird) where appropriate nesting habitat was found.

---End of Report---

4.1.2.4 Breeding Birds 2012

Further breeding bird surveys were completed in June and July 2012 to complement the original data collected within the Project Lands. A combination of point counts and area searches were used to assess the usage of the project lands by breeding birds for nesting, foraging, or raising young. Point counts and area searches were completed with efforts focused on confirmation of breeding status of species at risk, particularly the Bicknell's Thrush, Canada Warbler, Short-eared Owl, Rusty Blackbird, Bobolink, Chimney Swift, Olive-sided Flycatcher, and Common Nighthawk.

The project lands are dominated by re-growth after clear-cut forestry operations. Within this predominant land use, the project lands consist of a mosaic of cover types, ranging from mature softwood stands, clear-cuts and occasional patches of hardwood forest. For the purposes of identifying usage by breeding birds, major habitat types were identified based on canopy cover. The three major habitat types sampled include:

- Hardwood forest (including hardwood dominated mixed stands),
- Softwood forest (including softwood dominated mixed stands),
- Open canopy (this includes clear-cuts and very early successional stage re-growth).

Within each major habitat type, a diversity of micro-habitats exists. This is particularly true in the 'open canopy' habitat type. According to the Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds, 20 point counts per major habitat type are typically required to adequately sample that habitat type. As such, 20 point count locations have been established within each of the softwood and open canopy habitat types. Ten point count locations have been selected within the hardwood stand habitat type, however, due to minimal and fragmented distribution of these stands across the Project area. Point counts and area search locations have been chosen to be representative of the diversity within each major habitat type, for a total of 50 locations. Of these 50 point counts, 14 are located in representative habitat outside of the Project boundary line. These sites were established as reference sites, for post-construction comparisons, should the Project be approved.

All point count surveys were completed in the early morning between dawn (one half hour before sunrise) and about four hours after sunrise. Point counts were only completed when the wind was light, to allow for the observer to hear the birds (3 or less on the Beaufort scale), and were not completed in rainy conditions. Point counts were located at least 100m from any 'edge' habitat to the greatest extent possible. Each breeding bird point count was surveyed twice during the breeding bird survey, once in mid-June and once in late June-early July.

Point counts were ten minutes long, and all species hear or seen were recorded, along with an estimate of the number of individuals of each species. The observer will record estimated distance to each bird (0-50m, 50-100m, 100m+). Birds that were observed flying over without stopping will be identified as "flyovers". Breeding evidence was also recorded when observed. Other information including the date and time of day, weather conditions (temperature, wind speed, % cloud cover, and presence of any precipitation), GPS coordinates of the point count location, and the name of the observer was recorded.

Non-standardized area searches were conducted to complement the list of breeding birds identified during point counts, through intensive searches of habitat hot-spots. Three area search locations have been selected (Western, Central and Eastern). Two three-hour area searches will be completed in each region within the breeding season. Data recorded will include a description of the level of effort and the area searched, a complete list of species observed, number of individuals observed, and breeding evidence observed for each species.

4.1.2.5 Fall Migration 2007

The following methodologies have been taken from the ***Survey for autumn raptor migration at the proposed East Bay wind farm and hydro project*** (Andrew G. Horn, 2007), which can be found in **Appendix 3**. The methodologies have been taken and placed in this section for continuity.

--Report Summary---
Watches for raptors were conducted on September 30 and October 1, between 9:00 and 16:00. These dates were selected because they were during the peak of raptor migration in Nova Scotia (Tufts 1986, E. Mills pers. comm.), and were the first and second days after the passage of a cold front, when accipiters and buteos, respectively, are most likely to migrate (Allen et al. 1996). These days also had winds which would produce updrafts along the west side of the East Bay Hills, and which might make any birds passing over East Bay drift toward the Project area.

During these hours two observers (AGH and Greg Breed) scanned from vantage points selected to collectively provide coverage of the whole Project site, spending approximately one hour at each site. For each raptor seen, they recorded its approximate location, height (0-10 m, 10-50 m, 50-100 m, and 100 m intervals thereafter), flight direction (to nearest 45 degrees), and behaviour (perched, circling, powered flight, gliding, or kiting -- i.e., hanging in an oncoming wind). Birds were identified by AGH using 10X50 binoculars and a 15X-60X spotting scope.

One reason for suspecting raptor migration through the East Bay Hills is the report (NSBS 1996) that, particularly during the migration period, raptors forage along the Glengarry Road, just to the north of the proposed project. Therefore, on October 2nd, we searched along the road from Big Pond to Lochside, an area topographically and ecologically similar to the Glengarry Road. We also used this day to search for possible songbird stopover sites and for other significant habitats in the area in and surrounding the project area, especially habitats suitable for nesting of the uncommon species identified in the desktop report (Horn 2007).

Throughout all observations we kept a cumulative species list of all birds sighted, taking particular note of all apparent songbird migrants, i.e. passerines in large flocks and/or not in seasonally appropriate nesting or wintering habitat. In addition to the above fieldwork, birders were asked whether they knew of any migratory movements through the East Bay Hills, especially of raptors or waterbirds as suggested in the desktop report (Horn 2007), or of nesting species at risk or other notable avian issues related to the project. The birders included three experts with experience throughout the province (Fulton Lavender, environmental consultant from Halifax, Ian McLaren, Dalhousie University professor from Halifax, and David McCorquodale, Cape Breton University professor from Sydney) and two particularly experienced in the Big Pond – Loch Lomond area (John MacInnis of Big Pond and Susann Myers of Halifax, formerly of Louisbourg).

--End of Report---

4.1.2.6 Fall Migration 2012

Further fall migration surveys were completed from September through November 2012 to complement the original data collected within the Project Lands. Fall migration monitoring consisted of two primary survey methods: migration stopover counts, and passage migration counts.

Migration Stopover Count Methodology

Fall migration monitoring was conducted through September until mid-November 2012. Three fixed-width transect have been established to provide a vantage point of major habitat types represented within the Project area. This method is based on a modified standardized area search. Each transect is located along an existing road to allow the observer a clear vantage point for observation. The roads also provide appropriate edge habitat for passing migrants for foraging.

Each transect was surveyed two times per week during migration period (early September through mid-November). The surveys were completed early in the morning (1/2 hour prior to sunrise to 4 hours after sunrise). All birds seen or heard were recorded, with an estimation of the actual distance to the bird (0-50m, 50-100m and 100m+). Transects were not surveyed on very windy or rainy days.

Along each transect, three point count locations have been established (located at 0 m, 250 m, and 500 m). Point count surveys were completed at each location along each transect during the early morning. The point count surveys were 10 minutes long, and the observer recorded all species seen or heard, along with an estimate of the number of individuals of each species.

The observer spent a total of one hour per transect (including time to complete three point counts). General observations including the temperature, visibility, wind speed, date, start and end time and point count were also recorded.

Passage Migration Methodology
Passage migration counts were completed at the location of the western MET tower in order to estimate the number of birds flying through the area. The western MET tower is located at 175 m above sea level on an open hill top. The majority of the Project lands to the north are observable from this vantage point.

Passage migration counts were completed two times per week during the fall migration period, between early September and mid-November. Passage migration was only assessed on days where weather conditions are favourable (no precipitation and light to moderate tail winds). Weather conditions were recorded (temperature, wind speed and direction, sky cover, and precipitation), as well as survey date and time, with observations divided into one hour blocks.

- Complete at the western MET tower;
- Commence survey at approximately 9 am and record bird activity continuously for 6 hours, dividing the observations into one hour blocks;
- Record the species, height, and flight direction of all passing birds;
- Weather conditions will be recorded (temperature, wind speed and direction, sky cover, precipitation).

4.1.3 Bats

No published methodologies exist in Nova Scotia for Bat Survey methods however; the methodologies are adapted from *Bats and Wind Turbines. Pre-siting and pre-construction survey protocols.* May 2006. (Cori Lausen, Erin Baerwald, Jeff Gruver, and Robert Barclay, University of Calgary).

4.1.3.1 Detection

Bats emit ultrasonic signals in order to echolocate. By emitting a series of discrete calls and listening for returning echoes, bats are able to locate objects, including prey items (Vonhof, 2006). Echolocation signals have frequency, duration, and intensity components associated with them (Vonhof, 2006). All bats in Canada produce FM, or frequency modulated, echolocation calls, where the echolocation calls change in frequency over time (Vonhof, 2006).

The signal may be narrowband, where the frequencies sweep over a small range, or broadband, with a large change in frequency over time. Most echolocation calls produced while the bats are searching have a characteristic frequency of maximum intensity, where the majority of energy is placed, usually coinciding with the relatively long "tail" of the FM call. Putting the majority of energy in a small frequency range while searching for prey increases the effective range of the calls. The signal may also include additional harmonics in addition to the fundamental (lowest frequency) harmonic. (Vonhof, 2006)

The repetition rate at which calls are given varies with the activity of the bat and provides a means for discriminating between different behaviours in the field (Thomas and West 1989). Commuting bats or bats searching for prey emit approximately 5-10 calls per second. This rate increases to 100 or more calls per second when a potential prey item has been detected and the bat closes in to attack. This characteristic ‘feeding buzz’ (Griffin 1958) indicates that a bat is foraging in an area (Vonhof, 2006).

Ultrasonic detection involves sampling bats by acoustic means. It is possible to eavesdrop on the vocalizations used during echolocation to detect the presence of bats, assess whether a bat is foraging or commuting, and potentially identify the species emitting the call. Sounds ≥ 20 kHz are termed ultrasonic (beyond the range of human hearing), and the calls of all bat species are restricted to the ultrasonic range. Therefore, we require specialized equipment in the form of ultrasonic bat detectors to monitor them. Unlike netting and trapping, no handling is involved during ultrasonic detection, and therefore disturbance is minimized. However, positive species identification is not usually possible, nor is assessment of age, sex, or reproductive condition. Instead, ultrasonic detectors are used to determine relative levels of bat activity in different habitats (Vonhof, 2006).

4.1.3.2 Data Collection

Echolocation surveys were conducted in the spring and of fall of 2012 within the East Bay Hills study area. Spring surveys were conducted at two sites between from May 12th and June 21st, 2012; however, the number of survey nights was not consistent amongst the survey sites (Table 32). Fall surveys were also conducted at two sites for 11 consecutive days from September 4th to September 14th, 2012. This seasonal timing of the sampled period corresponds to the spring residency period and fall migration periods for species in Nova Scotia.

Bats were/will be surveyed for using AnaBat SD1 Detectors. AnaBats detect ultrasonic bat calls through a transducer (microphone) and record them on a compact flash card for later download and analysis.

AnaBat detectors were/will be calibrated by adjusting sensitivity settings on each unit until a constant 40 kHz tone could be detected at 30 m with a minimum of static interference. We marked that setting on the unit dial for both STI™ (standard) and Hi-mic (designed to boost audio signals through a longer cable for remote mounting) microphones.

Two (2) detectors were/will be deployed at ground level. Although two Meteorological Towers (MET Towers) are present within the Project area, no hoisting equipment was present on the MET Tower, and no acoustic monitoring equipment could be placed above ground level.

All units were/will be placed in a weather proof casing with the microphone protected inside an angled PVC conduit such that the angle of reception to the microphone was approximately 45 degrees to the ground and oriented parallel to the forest edge. Because bats generally echolocate as they fly, microphones sensitive to the frequency of sounds that bats use (ultrasound) can provide a measure of bat activity in an area. Although there are a variety of bat detectors available on the market, currently only one type allows for high capacity storage of echolocation data required for the prolonged monitoring recommended in this protocol. AnaBat with a Compact Flash Storage Zero Crossings Analysis Interface Module (CF-ZCAIM) digitally records echolocation sequences. Sensitivity of the AnaBats can be adjusted, and when deploying the detectors, we adjusted the sensitivity setting of each AnaBat unit based on the laboratory calibration, and further adjusted the setting by hand if static was audible at the calibrated level.

The AnaBat (with the timer function “on”) together with the CF-ZCAIM draw little power, and will operate properly for 2 weeks or more running on an external 24 amp-hour 12-volt battery. However, because AnaBat sensitivity decreases as battery power decreases, the battery were monitored and recharged as necessary. A solar panel was installed to keep the external battery charged. The AnaBat, CF-ZCAIM and battery was stored in a waterproof container to ensure rain did not come in contact with the electronics. Even though the number of bat passes in a monitored area may be small, use of a high capacity (512 MB or larger) flash card was used, because wind noise and other types of interference often trigger the system, resulting in a large number of "noise" files being stored on the card. Each echolocation sequence is represented as a unique file, with year, date, and time of the bat pass comprising the file name.

- Bat detectors were programmed to record calls from 1900 until 0630 daily.

We downloaded data and checked the function of all AnaBat detectors at approximately 1-week intervals during the study period.

4.1.3.3 AnaBat Locations

The detector locations were selected based on regional distribution, topographic position (i.e., ridgetops, level terrain), access permission, adjacent habitats, detector security (i.e., proximity to public roads), and supportive structures (i.e., meteorological (met) tower). During initial AnaBat deployment, AnaBat locations were also chosen based upon proximity to MET Towers.

As no MET towers with bat hoists were available in the Project area, we mounted all AnaBat detectors at ground level. AnaBat detectors were placed, not to determine bat movement through a specific area within the Project (i.e. a valley for example), but to determine numbers of bat passes.

Table 10. AnaBat Deployment Information

AnaBat #	Coordinate NAD83 UTM Zone 20T	Date Deployed	Date Removed
AnaBat 1	689007.98 m E; 5078628.00 m N	May 12, 2012	June 21, 2012
AnaBat 2	685265.50 m E 5078039.96 m N	May 13, 2012	June 21, 2012
AnaBat 1	689007.98 m E; 5078628.00 m N	September 4, 2012	September 14, 2012
AnaBat 2	685265.50 m E 5078039.96 m N	September 4, 2012	September 14, 2012

4.1.3.4 Data Interpretation

Specialized software (*Analook*, Titley Electronics, Ballina, NSW, Australia) was used to construct frequency/time graphs from the bat calls recorded by the AnaBat detectors. For each call, the slope, maximum frequency (*i.e.*, the highest frequency), minimum frequency (*i.e.*, the lowest frequency), and duration were determined, as those variables are believed to be species-specific (Gannon *et al.* 2004). Each variable was then compared with a library of reference calls collected from individual bats that had been identified to species. We defined a *bat call* (call) as a single, recognizable vocalization from one bat and a *bat pass* (pass) as one or more sequential calls, representing calls from a single bat, recorded in a one AnaBat digital file.

We summarized bat activity based on the categories of bats (primarily *Myotis* spp.) and migratory bats (hoary, silver-haired, and red bats). Where echolocation calls could be identified to species, we classified them as

- *Myotis* spp. – primarily *Myotis lucifugus* (MYLU, little brown bat). Other *Myotis* species, including northern long-eared (*Myotis septentrionalis*) likely were also present but their calls cannot be reliably distinguished.
- LACI - *Lasiurus cinereus* (hoary bat);
- LANO - *Lasionycteris noctivagans* (silver-haired bat);
- EPFU - *Eptesicus fuscus* (big brown bat);

- LABO - *Lasionycteris borealis* (Eastern red bat); and,
- UNKN – Records recognized as bat calls, but for which frequencies could not be determined.

The raw acoustic files collected by MEL were then analysed by Boreal Environmental Ltd. (Mr. Derrick Mitchell). The objectives of this Project were:

(1) To provide information on occurrence and relative magnitude of activity level in the proposed development area, based on analysis of acoustic data;
(2) To provide relevant information on resource requirements of local species that might be useful for informing the decision-making process on the proposed development; and,
(3) To make any relevant recommendations based on the results of this Project and any recent developments in the field.

Species were qualitatively identified from echolocation sequences by comparison with known echolocation sequences recorded in this and other geographic regions. In the case of species in the genus *Myotis* (northern long-eared bat and little brown bat), there was no attempt to identify sequences to the species level, as their calls are too similar to be reliably separated. Identifications were accomplished using frequency-time graphs in ANALOOK software (C. Corben, www.hoarybat.com).

4.1.4 Vegetation

The Nova Scotia DNR Forest Ecosystem Classification guide was used to describe vegetation type at each candidate turbine location. This involved a determination of vegetation type based on successional development, tree cover, and dominant species identified in the canopy, shrub, herb, and ground cover layers. Dominant tree species were identified at each potential turbine site, as seral stage is a useful determinant of stand age. Observations of size and abundance of coarse woody debris were noted. Finally, the level of anthropogenic disturbances was described; particularly the presence of logging roads and harvested trees (clear cut or selective harvest, and approximate time since harvest).

Vascular plant surveys were conducted at all candidate sites. As described in the Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSE, Sept 2008), a full vascular plant survey was not completed. The vascular plant surveys focused on identifying general vegetative communities, with particular focus on identifying priority species. The priority list of vegetation species prepared for this project and is provided in Table 15 of this document.

4.1.5 Wetlands & Watercourse Surveys

A desktop review of available topographic maps, appropriate provincial databases and aerial photography was completed to aid in determination of wetland habitat and watercourses on the Project Site. Predicted wetland areas were identified from the NSDNR Sensitive and Significant Habitats Database.

Although few NSDNR mapped wetlands and few shallow water table areas appeared to exist within the Project area based on the desktop review, a large number of wetlands were visually identified during 2012 field surveys. While entire wetlands were not delineated, partial boundaries were delineated where they intersected with proposed access roads or turbine pads. The status of wetlands were confirmed using US Army Corps of Engineers (ACoE) protocols (1987) which include confirmation of hydric soils, hydrophytic vegetation and hydrology inside outside wetland boundaries. ACoE protocols are standard for use in wetland delineation across North America. As much as was possible, turbine and access roads were moved in order to avoid field and desktop identified wetlands.

Watercourse features were mapped using handheld GPS equipment when encountered.

The locations of known sensitive wetland habitats and watercourse features were mapped as shown on Figures 8, 8a, 8b, 8c and 8d (Appendix I. FIGURES).

4.1.6 Herptofauna

Information regarding the Herptofauna in the Project area was obtained from existing information sources (e.g., ACCDC 2012; Gilhen 1984; Gilhen and Scott 1981) and field surveys. Table 36 also lists herpetile species that can reasonably be expected to occur in the Project Area.

4.1.7 Lynx Study

Following numerous discussion with the Nova Scotia Department of Natural Resources (DNR), McCallum Environmental became aware that lynx may be expected to inhabit the Project area. In an effort to determine if lynx are present, and in what quantity, DNR requested that McCallum Environmental propose a monitoring program for lynx at the Project.

On May 24, 2012 a Lynx Monitoring Protocol was submitted to DNR for their review and comment. Following that, a Lynx study was implemented in Winter 2013/2014. The delay in study initiation was that the Project was placed on hold in the summer of 2012. The entire Lynx Protocol is found in *Appendix* V. LYNX MONITORING PROTOCOL.

4.1.8 Boreal Felt Lichen Survey

Following discussions with DNR in Sydney, N.S., McCallum Environmental was provided with GPS coordinates for known Boreal Felt Lichen (BFL) locations within the Project Lands. These locations were apparently identified during surveys completed on behalf of Port Hawkesbury Pulp and Paper prior to logging activities in the area. As not all lands had been searched for BFL, McCallum Environmental completed a BFL survey within 100 metres of proposed turbines and access roads.

Prior to searching for BFL, a habitat model was used which highlights areas predicted to be suitable for this species. The model was created using a GIS layer for all forest stands where Balsam Fir is listed as a primary or secondary species within 80 meters of a wetland. It is further confined forest stands located within 30 kilometers of the Atlantic coast. All areas predicted to be possible habitat for Boreal Felt Lichen as well as areas that looked suitable for Boreal Felt Lichen which are to be altered for turbine pads or new roads were searched thoroughly. This involves inspecting Balsam Fir trees that look appropriate for hosting *E. pedicellatum* within 100 meters of habitat that could be compromised or adjacent to a wetland which could be altered by the proposed project.

Surveys for Boreal Felt Lichen were conducted November 26th, 27th, 28th, December 3rd, 4th and 5th. Conditions for conducting these surveys were good November 27th, 28th and December 3$^{rd.}$ Snow covering the trees hampered, but did not significantly limit, lichen searches on the afternoon of the 26th and again partway into December 4th and 5th.

4.2 Archaeological Resource Impact Assessment

Davis MacIntyre and Associates Limited were retained to complete an archaeological resource impact assessment for the Project in 2007/2008 and update the assessment in 2013/2014. Methodologies are provided in their reports provided in *Appendix* VI. ARCHAEOLOGICAL RESOURCE IMPACT ASSESSMENT

4.3 Mi'kmaq Ecological Knowledge Project (MEKS)

A Mi'kmaq Ecological Knowledge Project was completed by Membertou Geomatics Solutions in 2008, and then updated in 2012. Methodologies are provided in their reports in *Appendix* VII. MI'KMAQ ENVIRONMENTAL KNOWLEDGE STUDY.

4.4 Noise Impact Assessment

Refer to
Appendix VIII. NOISE IMPACT ASSESSMENT for methodologies.

4.5 Electro-magnetic Interference (EMI) Study

Refer to *Appendix X. ELECTROMAGNETIC INTERFERENCE (EMI) STUDY* for EMI study methodologies.

4.6 Shadow Flicker Study

Refer to Appendix IX. SHADOWFLICKER ANALYSIS for study methodologies.

5 VALUED ECOSYSTEM COMPONENTS

5.1 General Spatial Setting

The Project area is situated in Cape Breton in the hills above Route 4 on the east side of the Bras d'Or Lakes. As indicated on Figure 1 (Appendix I) the site itself is located in the hills overlooking Lake Uist and in proximity to the administrative boundary between CBRM and the Municipality of the County of Richmond. Access to the site is from Salem Road, one of a network of unsurfaced roads providing access to a number of small communities around lakes Uist, Enon and Lomond. Sydney is some 50 km to the northeast and St. Peters some 33 km to the southwest. The First Nation's communities in closest proximity to the proposed works are Chapel Island, 18 km to the south, and Eskasoni some 25 km to the northwest across East Bay.

5.2 Geophysical Environment

The plateau above Lake Uist ranges between 130 and 185 m in elevation. At one time heavily wooded, it has been intensively managed by Stora Enso for many years and much of the area is characterized by sequences of cutting and regrowth. On the heights of the hills, there are few stands of mature trees. Along the shores of Lake Uist, the vegetation pattern is less disturbed.

The East Bay Hills (Unit 330b) are a subset of the Fault Ridges of the Avalon Uplands (Keppie, 2000). There are a number of lakes in the region, and many rivers and streams. The uplands in the Project area include the headwaters of a number of watersheds, most notably those of the Mira and Grand Rivers. These headwaters are not particularly productive and contain a number of raised sphagnous bogs. Drainage direction in this region reflects the impacts of glaciation more than the underlying geological structure. The western slopes draining into East Bay are steeper and more dissected than those in other parts of the Project area, including the eastern slopes that drain to the lakes.

5.2.1 Bedrock Geology

The geology of the area is primarily metamorphic and igneous, and the East Bay Hill Faults result in rugged hills and valleys with step scarp slopes.

5.2.2 Soils

The soils are predominantly stony, shallow, and particularly on the steeper slopes, well drained, heavily leached podzols of the Thom group. Sandy-loam soils of the Arichat group are found in areas of undulating, poorly drained terrain, and sphagnous peat deposits are found in areas of poor drainage such as bogs. Low evapotranspiration rates give rise to substantial levels of organic matter in soils where basin depressions or bogs prevent runoff. On the plateau portion of the Project area, the soils are generally imperfectly drained.

5.3 Hydrology / Groundwater

The uplands of the Project Area are the location of the headwaters of the Mira and Grand River systems. A few head-water streams to the north of the Project Area drain into the Bras D'Or Lakes; these include Jim MacDonald's Brook, Irish Cover Brook and MacNeil's Brook.

The fresh water system that might be considered dominant to the northeast of the Project Area is the Salmon River lowland. Tributaries flowing northeast from the Project Area feed into the Salmon and Gaspereaux rivers. Throughout the balance of the Project Area, streams flow into the lake system, *i.e.*, lakes Enon, Uist and Lomond and hence southward into the Grand River.

The East Bay Hills above the lakes are characterized by relatively flat, poorly drained, plateau-like crests. The streams that flow southeast towards Lake Uist and Loch Lomond, including McCuishs Brook and MacDonald Brook, are part of the Grand River watershed.

Details associated with the groundwater resource in the Project area were identified through a review of the NS well logs database (NSDNR- http://www.gov.ns.ca/nse/groundwater/welldatabase.asp). A total of 135 well logs were available for review. General conclusions relating to the groundwater resource in the Project area were derived from this information and are summarized from previously completed reports for this Project area.

The geology of the Project area is extremely variable at each water well described from the drilling processes. Geology consisted of sand, clay, till, or boulders overlaying shale, gravels, boulders, granite, limestone, till. The average depth to bedrock based on drilling data was generally 27feet. Wells appeared to be drilled to an average depth of 102 feet below grade. Information provided on depth of water bearing fractures during drilling activities indicated that the average depth to the shallowest water bearing fractures was approximately 82 feet below grade.

There are no groundwater wells within the Project area. The nearest (drilled) groundwater well used for potable purposes is located approximately 350 m away from the Project area.

5.3.1 Effects of the Project

The Project will not require access to or use of groundwater at this time. If blasting is required, there is a low potential to affect groundwater. If groundwater use is required in the event of a concrete batch plant, permitting for groundwater assessment and withdraw will occur at that time.

5.3.2 Mitigation

As no effects are anticipated, no mitigation will be implemented. However, a pre-construction/pre-blast water well survey will be completed.

5.3.3 Significance

5.3.3.1 Magnitude

The potential effects on groundwater are anticipated to be low magnitude due to no expected impacts.

5.3.3.2 Probability

There is a low probability of effects on groundwater.

5.3.3.3 Geographical Extent

The extent of the potential effect on groundwater would be localized in extent in concentrations significant enough to cause immediate impact.

5.3.3.4 Duration and Frequency

The duration of the effect would be short term and isolated to construction operations.

5.4 Atmospheric Environment

5.4.1 Climate

Weather data was acquired from the Baddeck meteorological station, which is located approximately 35 km north northwest of the Project Area. Based on Environment Canada climate norms or averages for the period of 1971-2000, the average annual temperature in the region is 6.2 ºC, with the average daily maximum and minimum being 10.5 ºC and 1.8 ºC, respectively. The warmest period during the year is typically from June to August (daily mean of 16.8 ºC), while the coldest period is between January and March (daily mean of - 4.5 ºC).

According to 1971-2000 precipitation data at the Baddeck station, precipitation occurs approximately 178.2 days per year and averages approximately 1,501 mm of precipitation throughout the year, where 80 % is rain and the remainder is snow. (Environment Canada, 2012).

5.4.2 Air Quality

Air Quality has been selected as a VEC because of its intrinsic importance to the health and well-being of humans, wildlife, and vegetation both at a Project level, community level, regional, and provincial levels. Air quality will be assessed in the context of Project-related emissions and ground-level concentrations for particulate matter (PM; total suspended particulate (TSP); dust). No major industrial operations are located within the immediate air shed.

A network of ambient air monitoring stations is set up throughout the province to measure ambient concentrations of various air contaminants. The closest air quality monitoring station to the Project Area is located at Sydney (Station 30310). A list of the contaminants monitored at each of these locations, their distance to the Project Area, and annual averages is presented in Table 11.

Table 11. Ambient Air Monitoring Results-Sydney National Air Pollution Surveillance (NAPS) Station

Monitoring Station	Contaminant	Approximate Distance to Project Area	Annual Averages	
			2005	2006
Sydney	O_3 (ppb)	47 km	10	10
	SO_2 (ppb)		3 (7 months)	1.38 (8 months)
	CO (ppb)		0.2 (4 months)	0.3
	NO (ppb)		--	9.25 (8 months)
	NO_2 (ppb)		--	1.75 (8 months)
	$PM_{2.5}$(ug/m^3)(TEOM)		5.25 (8 months)	6
	$PM_{2.5}$(ug/m^3)(BAM)		--	--
	$PM_{2.5}$(ug/m^3)(Dichot)		--	--
	PM_{10}(ug/m^3)(Dichot)		--	--

Based on monitoring results from the most recently published National Air Pollution Surveillance (NAPS) Network ambient air quality monitoring reports for 2005 and 2006 (Environment Canada, 2010), the following general conclusions can be made:

- The monitored concentrations of particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) at the Sydney monitoring station have generally been low;
- None of the monitored concentrations of carbon monoxide exceeded the 1-hour or 8-hour objectives (35,000 $\mu g/m^3$ and 15,000 $\mu g/m^3$, respectively);
- None of the monitored concentrations of nitrogen dioxide exceeded the 1-hour or Annual objectives (400 µg/m3 and 100 µg/m3, respectively);
- None of the monitored concentrations of sulphur dioxide exceeded the 1-hour or 24-hour objectives (900 µg/m3 and 300 µg/m3, respectively); and

In 2005 and 2006 the ambient air quality 1-hour objective for ozone of 82 ppb was not exceeded. This station has recorded overall low levels of contaminants, and given the fact that the ambient air monitoring station is located in Sydney, which include emissions from industrial activities, it can be reasonably estimated that the Project Area is representative of a rural environment where all contaminant concentrations would meet the Ambient Air Quality Objectives.

A comprehensive assessment of the effects of the nitrogen oxides (NO_x and NO_2) emissions from the Project was not conducted as the only emissions associated with the Project are related to vehicle and equipment emissions during construction and operations. No other industrial source emissions are associated with the Project. Greenhouse gases will be removed from the environment from the Project via the displacement of power generation by natural gas and coal fuelled generators within Nova Scotia.

5.4.3 Effects of the Project

The operation of wind turbines does not produce air emissions. However, minor localized air emissions will occur from the periodic use of maintenance equipment over the life of the Project. In addition, personnel vehicles and service providers will travel to and from the substation site during regular business hours. Operations related traffic has the potential to create dust in the immediate vicinity of the facility however; effects are anticipated to be intermittent, short-term in duration and highly localized.

The addition of Project emissions to regional Airshed emissions is not expected to increase predicted maximum ambient concentrations. Therefore, the emissions will not have any adverse effects on the environment. It is concluded that predicted NO_2 ground-level concentrations in the area are dominated by existing baseline-background emissions sources.

As indicated previously, considerable heavy equipment will be used to clear the land thereby increasing the vehicular traffic in and around the Project site. Potential impact sources include fugitive dust emissions, vehicular/ heavy equipment exhaust and emissions from the diesel equipment used during construction.

Apart from this, impacts to air quality from these sources should not appreciably degrade the ambient air quality at the sites. Moreover, the anticipated construction phase for the Project is relatively short.

Blasting associated with pit development (should one be required on site for construction material) or excavations for turbine bases can result in a concentrated plume of particulate matter, but the volume and time duration of such plumes are quite constrained. Even when blasts result in a visible plume, the contribution to 24-hour averages, as in the Air Quality Regulations, will likely be negligible. Nevertheless, a visible plume is often unacceptable to the public and regulators, and control is appropriate. Proper controlled blasting techniques are effective in reduction of the visible plume and other more serious potential effects.

Trucks moving off-site can also impact air quality by transporting mud and material on their tires that is deposited on public roads, where it can become airborne through the mechanical action of passing vehicles and the wind.

In a single year, this Project will produce real and measureable Greenhouse Gas Emissions ('GHG') offsets as very small emissions are created. Based on quantification protocols for Wind-Powered Electrical Generation, this Project could produce 0.65 tonnes CO_2e GHG offsets for every mega-watt hour of electricity produced. Given the Project produces measureable electricity, the GHG offsets are measureable. Current estimates using 35% capacity factors for 50 MW estimates that 99,645 tonnes of CO_2 would be offset in a single year. (50 MW x (24hr x 365 days)*.35 (capacity factor) = 153,300 MWhr/year x 0.65 (tonnes CO_2e offset) = 99,645) According to the Nova Scotia Power database (Nova Scotia Power, 2014), in 2013, total CO_2e emissions from Nova Scotia power plants were 7,572,982 tonnes. The addition of this Project could reduce the Nova Scotia CO_2e emissions by 1.32%.

5.4.4 Mitigation

The anticipated mitigation measures for the potential air quality impacts during the Project involve both operational and engineered interventions. In order to limit the possible emissions, all vehicles and equipment will be turned off when not in use. In addition the vehicles and equipment (generators) will be serviced and maintained in order to reduce any possible emissions.

Water trucks will be used to spray water on the unpaved roads and cleared areas to reduce dust emissions near residences. This will be further enhanced by the eventual upgrading of the road system. Trucks transporting materials will be covered to prevent any loose material from blowing away. Vehicular speeds on the Project site shall be limited to further reduce any possible fugitive dust emissions. Disturbed areas will be re-vegetated as soon as practicable to limit exposed areas of soil.

5.4.5 Significance

5.4.5.1 Magnitude

The potential effects on air quality are anticipated to be low magnitude due to the limited duration.

5.4.5.2 Probability

There is a low probability of effects on air quality due to limited duration.

5.4.5.3 Geographical Extent

The extent of the potential effect on air quality will be localized in extent in concentrations significant enough to cause immediate impact.

5.4.5.4 Duration and Frequency

The duration of the effect would be short term and isolated to construction operations.

5.5 Habitats / Land Use

The Project Area is mostly forested but does support other habitats including wetlands, disturbed habitats and waterbodies such as ponds and streams. Table 12 lists the habitats present in the Project Area and the areas of each habitat type.

Table 12. Habitat Types and Land Use Area

Habitat Type	Total Area (ha)	Unclassified Stand (ha)	Softwood Area (ha)	Mixedwood Area (ha)	Hardwood Area (ha)
Alders	0.3				
Barren	0.1				
Beaver flowage	12.8				
Brush	0.7				
Burn	5.1		5.1		
Cut	730				
Dead	6.7		6.7		
Lake Wetland	6				
Open Bog	29.6				
Partial Cut	31.6				
Plantation	116.5		116.5		
Powerline ROW	1.7				
Prod Forest	1450.9	198.3	847.4	289.5	115.7
Treated	29.8	29.8			
Treed Bog	127.7				
Water	28				
Wetland	102.1				
TOTALS	**2679.6**	**228.1**	**975.7**	**289.5**	**115.7**

Forests in the Project Area consist mainly of softwood stands (976 ha, 36% of the Project Area) followed by mixedwood (290 ha, 11 %) and hardwood stands (116 ha, 4 %). Much of the Project Area (762 ha, 28%) has been harvested for timber in the last 10 years. Existing forestry roads within the Project lands encompass 16.85 hectares (0.6%). Total existing disturbance within the Project lands is 780 hectares (29%). There is no active agricultural land present within or adjacent to the Project Area.

Softwood stands are widespread and reflect the geology of the site with imperfectly drained soils and areas that have been used for forestry in the past. Stands of mixed red (*Picea rubens*) and white spruce (*Picea glauca*) dominate the softwood forests, with lesser amounds of black spruce (*Picea mariana*) and eastern larch *(Larix larcinia*). Black spruce and larch dominate the softwood around wetlands and depressions that are scattered throughout the Project Area.

Mixedwood stands are also found dispersed throughout the Project Area, especially in the central and north-easterly portions. These stands are dominated by intolerant hardwoods such as white birch (*Betula papyrifera*) and combinations of red spruce, white spruce, and balsam fir (*Abies balsamea*).

Wetland habitat in the Project Area includes 102 ha (4%), largely owing to the plateau constraining water in depressions and basins. Most wetlands are small (75 are <2 ha) but a few large wetlands are present mainly along the northern edge of the plateau. The location of the wetlands in the Project Area defines the top of the plateau. Most wetlands in the Project Area are low shrub dominated swamps, dominated by speckled alder (*Alnus incana*) or low shrub marshes characterized by a cover of red maple, balsam fir and black spruce (*Picea mariana*). Some bog habitat is present in the Project Area that are treed or composed of low shrub.

Much of the Project Area (760 ha, 28%) has been harvested for timber, even though the latest forest inventory data (1998) suggests that 54% of the Project area is natural stand (NSDNR GIS Data, 2012). Most of the harvesting appears to have occurred within the last twenty years based on the amount of regeneration in some areas even though the access roads are well maintained and some newer cuts are present. The presence of old woods roads and the 1950’s historical remains of a logging camp suggests that timber harvesting has been conducted in the area for many decades. The intact forested areas are secondary growth forests with species composition typical of Cape Breton Island.

No active agricultural land is present in the Project Area.

5.5.1 Significant Habitats

Significant habitats are those habitats that ensure the continued presence and survival of specific species throughout the landscape. Significant Habitats can include wetlands, deer wintering areas, or other areas that have been identified as habitat for rare species or potential habitat for rare species. (Figure 11 – NS Significant Habitats, Appendix I. FIGURES)

The northern deer wintering habitat within the Project Area is encountered in the steep coulees that fall down northwest and southwest off the plateau, towards the Bras d'Or Lake.

There is no significant migratory bird habitat in the Project Area however a there is a small a small pond/wetland that has been noted for an abundance of migratory birds approximately (Figure 11, Appendix 1) in the database. This wetland is located 4300 metres from the closest turbine.

5.5.1.1 Effects of the Project

The Project activities identified as having the greatest potential impact upon the ecosystems and VECs are predominantly associated with the construction phase, where the permanent infrastructure (lasting the 25 year life of the Project) such as road surfaces, turbine and substation foundations results in a long-term habitat loss. Project activities that have been identified as resulting in impacts on habitat and VECs include:

- Tree cutting, grubbing and clearing;
- Top soil stripping;
- Construction of infrastructure including new access roads, crane pads, turbine foundations and substations;
- Upgrade of existing roads;
- Installation of turbines and electrical infrastructure; and
- Transportation of crews and equipment.

During the operations phase, project activities will include vegetation cutting and clearing (i.e. Vegetation management along transmission corridor and roads rights-of-way) and the periodic transportation of work crews and equipment for routine infrastructure maintenance and operations.

Some of the original impacts resulting from the construction activities will be reduced during the operations phase through the localized regeneration of ecosystems that were subject to temporary disturbances during the construction phase. Where vegetation restoration is required, natural regeneration of native species will be favoured where proven viable in nearby applications, except where other species may be required for erosion control or other purposes.

The operations-related activities having a potential impact upon habitat include those activities resulting in the potential removal (or fragmentation) of habitat through vegetation removal (long-term impacts; > 5 years). These activities are associated with the cutting and clearing of brush during the management of vegetation along the previously-constructed roads and under powerlines. This localized impact is anticipated to occur approximately once every ten years, or as required locally in the interim. The vegetation (brush) clearing and maintenance activities, largely occurring within areas previously cleared or impacted during the construction phase (activities with a low expected impact due to a lack of mature and old forest representation within the impacted ecosystems), are expected to have a negligible incremental impact during the operations phase.

5.5.1.2 Mitigation

The use of existing logging roads and existing cut blocks as much as possible for access to turbine locations will reduce the amount of fragmentation of forests as a result of the Project. This Project area is already highly fragmented based on the presence of significant forestry activity and access road layout on the lands. During the planning stages of this Project and during final turbine siting exercises, special care was given to using existing roads wherever possible to minimize impact on habitat. The network of proposed roads for the turbine sites consist of 64% existing road infrastructure.

5.5.1.3 Significance

5.5.1.3.1 Magnitude

The potential effects of vegetation clearing on habitat are anticipated to be of low magnitude. Furthermore once deer become habituated to turbines and infrastructure, the magnitude of disturbance will decrease.

5.5.1.3.2 Probability

There is a low probability of effects on overwintering habitat for deer as deer are known to habituate to activity.

5.5.1.3.3 Duration and Frequency

The duration of the effect on habitat would be short term and infrequent during vegetation clearing provided buffers are effective. The duration of the effect on habitat would be short term.

5.5.1.3.4 Reversibility

Effects on habitat resources are considered to be generally reversible with re-vegetation and implementation of erosion control measures following project decommissioning. However these effects will not be implemented within a 25 year timeframe.

5.6 Aquatic Habitat / Fish

Surface water drainage is maintained by culverts of various sizes in the existing roads. The locations of culverts and bridges have been determined by surface water drainage and the need for road access to forest stands. To a large extent, surface water flow is maintained by these culverts which have been placed to prevent or reduce erosion and undermining. In some areas, surface water drainage which is interrupted by the presence of the woods roads is directed down-gradient in road side ditches. In most cases, these ditches direct the drainage to a culvert or stream. Such anthropogenic activities have altered the natural habitat of the area and resulted in modifications to natural ecosystems.

The Salmon and Gaspereaux rivers are major tributaries of the Mira River. They flow northeast, away from the project site. Both watersheds have been listed as important habitat for Atlantic salmon (*Salmo salar*) and gaspereau (*Alosa pseudoharengus*). The Salmon River has also been listed as having suitable habitat for a number of freshwater mussel species including the Eastern pearshell (*Margaritifera margaritifera*), Eastern floater (*Pyganodon cataracta*), Eastern elliptio (*Elliptio complanata*) and Alewife floater (*Anodonta implicata*).

The lakes and streams southeast of the Project area, below the plateau of the Project Area, have been designated by NSDNR as significant habitat for several species of concern, including Atlantic salmon, gaspereau, American shad (*Alosa sapidissima*), brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*) and at least two species of freshwater mussels: eastern pearshell and alewife floater. Some of the largest populations of the eastern pearshell in Cape Breton occur in Grand River.

There will be little interaction between the Project and these streams and lakes south of the Project Area. Installation of watercourse crossings in compliance with regulatory requirements will allow for surface water quality and quantity to be maintained to these areas. For the purposes of this document, aquatic life and habitat is assessed within the Project Area only.

5.6.1 Watercourses / Lakes

All turbines and proposed access roads are located greater than 100 metres from open water lake boundaries. The aquatic habitat of the lakes and streams within the Project Area are common for headland areas that have low evaporation rates and high organic content in the soils. The streams that leave the Project Area are high gradient causing the stream morphology to change frequently. There are many raised bogs, and wetlands are associated with many lake edges throughout the Project Area.

There are 9 mapped watercourses crossed either by existing or proposed access roads. Although each watercourse is unique in volume, reach and specific characteristics for habitat, generally all watercourses are between 0.5 - 3m wide and up to 50cm deep. While these watercourse has moderate coarse woody debris, low in-stream vegetative cover is present and overhanging vegetative cover is provided by herbaceous vegetative cover. The substrate is typically a combination of muck and boulders. Fish habitat potential within the watercourses is considered moderate.

All watercourse crossing location characteristics fall within the parameters for either of the two classes identified under Section 11, Sections (2) & (3) of *Minor Works and Waters (Navigable Waters Protection Act) Order*. Therefore, CBHI would be exempt from application for approval under the Navigable Waters Protection Act.

Culverts will be installed and/or upgraded as necessary during construction and new crossings will also be identified on new roads that will be constructed. Any upgrades or new installations will be completed in accordance with the Nova Scotia Environment Watercourse Alteration approval process, and all appropriate applications for alteration will be sought prior to construction or upgrading as required.

5.6.2 Fish

The presence of fish species is thought to be typical of other similar streams in Cape Breton.

5.6.2.1 Atlantic Salmon (*Salmo salar*)

Some of the water bodies in the Project Area are considered habitat for Atlantic salmon but there is limited to no connectivity to downstream areas due to intermittent water flows and steep topography. In 2001 the Inner Bay of Fundy population of Atlantic salmon was designated an endangered species by COSEWIC. The population of Atlantic salmon in the Project Area is not part of the Inner Bay of Fundy assemblage, but is still of concern as all Atlantic salmon populations in the Maritimes have been declining.

To the northeast of the Project Area, the streams flow northwards into the Salmon and Gaspereaux rivers, which are part of the Mira watershed. These rivers have the highest proportion of low gradient stretches, which are least suitable for the production of juvenile salmon. In 2001 and 2002 these rivers were assessed.

The low fry and par densities suggested that egg conservation requirements were not generally met in these rivers, albeit that they are considered suitable salmon spawning habitat.

5.6.2.2 Brook trout (Salvelinus fontinalis)

The Brook trout is designated a Yellow species by NSDNR, meaning that it requires special attention, or protection, to prevent it from becoming at risk. It is typically found in spring fed streams that have many pools and riffles; it is found throughout the Maritime Provinces in waters ranging from tiny ponds to large rivers, lakes and salt water estuaries. The streams and ponds scattered throughout the lower boundaries of the Project area and the Grand River watershed have been designated significant habitat for brook trout by NSDNR.

5.6.2.3 Brown trout (*Salmo trutta*)

Brown trout occur throughout Europe and western Asia and were introduced to Canadian waters in 1890. In sea-run populations, which occur in Atlantic Canada and Quebec, brown trout spend two to three years in freshwater then migrate downstream to spend one or two growing seasons in and around river mouths and estuaries. Most return to their home streams to spawn in the fall and early winter (October to November); they prefer very similar habitats to the native brook trout except that they can tolerate slightly higher water temperatures. They often use the lower reaches of rivers and streams that are unsuitable for brook trout. There is no commercial fishery for brown trout in Nova Scotia, but they have become popular with recreational anglers. Brown trout are found in the lower reaches of the Grand River, but it is unlikely that they would be found upstream within Lake Uist or Loch Lomond due to the passage obstruction at the falls.

5.6.2.4 Gaspereau (*Alosa spp.*)

Gaspereau have been listed by NSDNR as a species of concern (Yellow), but little biological information is available on the species that inhabit many of the rivers within Nova Scotia. Gaspereau comprise two closely related species: alewife (*Alosa pseudolarengus*) and the blueback herring (*A. aestivalis*). The Gaspereaux River, is a major tributary of the Mira River flowing north-easterly from the upper reaches of the Project area, experiences a large gaspereau run. Gaspereau are anadromous and enter streams and rivers from early May to early June. From August to October the young-of-the-year migrate downstream in large schools to live in the estuaries and surrounding coastal areas. Adults over-winter at sea. In the Maritimes, gaspereau spend most of their life growing in salt water. Gaspereau that spawn upriver tend to spawn in May and June when water temperatures are greater than 10^{o}C.

No Gaspereau are expected within the Project boundaries based on the characteristics of watercourses found there.

5.6.2.5 Rainbow smelt (*Osmerus mordax*)

Little is known about the rainbow smelt populations that inhabit the Grand River watershed. Smelt generally spawn from February to June when water temperatures are cooler (4 to 10^{o}C). Landlocked populations, particularly in lake environments, tend to migrate upstream in tributaries, or in some cases spawn along the lake shorelines. Most young smelt stay close to shore, seeking cover within eelgrass beds or muddy bottoms. Larger smelt take advantage of depth during the day for protection, and migrate vertically during the night to feed. It is suspected that the smelt population resident within Lake Uist is land-locked.

5.6.3 Effects of the Project

Provided all standard watercourse alteration mitigation strategies are integrated into design, all necessary NSE approvals are acquired, and crossing structures are sized according to 1:2 year design flow characteristics (temporary structures) and 1:100 year design flow characteristics (permanent structures) effects resulting from Project development should be expected to be limited in duration and scope.

The following potential effects on water resources will result from the proposed Project activities including clearing, road building, and foundation construction:

- changes to drainage patterns from vegetation loss;
- soil disturbance and erosion; and,
- changes to water quality
- Fish and fish habitat could be effected by proposed Project activities associated with roads, stream crossings, vegetation removal and soil disturbance but those effects would be limited to construction duration (1 – 2 days per crossing installation).

Clearing vegetation for the turbine pads, roads and underground electrical collector network may potentially impact surface water flow by increasing the potential for surface erosion and runoff and changing drainage patterns, which may direct flows toward or away from natural drainage channels.

Clearing vegetation in riparian areas may result in the loss of cover (providing shade and habitat for fish), nutrients and bank stability of watercourses. A measurable increase in the rate of runoff into watercourses is not expected from the proposed Project; therefore, no measurable increase in peak flows downstream is anticipated. Tree clearing and site preparation of the proposed Project footprint and new and upgraded stream crossings may temporarily expose soil to wind and rain that may result in erosion of sediment into watercourses, affecting surface water quality. Accidental spills from project equipment could result in the release of hydrocarbons and other harmful substances into nearby watercourses.

5.6.4 Mitigation

- An Erosion and Sedimentation Control plan will be developed as a function of Project approval. The plan will outline those measures necessary to effectively control erosion and sediment release;
- All watercourse installations could be handled under a “blanket approval” given the type of crossings present;
- Watercourse crossing installations typically only take 1 to 2 days per structure, therefore there is a limited duration of impact;
- All temporary and permanent watercourse crossing structures will be designed to meet, and installed in accordance with the requirements of the NS Watercourse Alteration Specifications; and,
- No new turbine pads, roads or electrical distribution equipment is located within 100 metres of a lake.

5.6.5 Significance

5.6.5.1 Magnitude

The magnitude of effects on surface water would be low due to the limited 1-2 day duration per crossing. Soil would be exposed during vegetation clearing for the construction, resulting in potential sedimentation of watercourses that could be transported downstream.

Potential magnitude of effects on fish and fish habitat through loss of riparian habitat during construction and decommissioning would be of low as limited riparian vegetation removal would occur. With the exception of stream crossings, CBHI will limit the removal of riparian vegetation within 30 metres watercourses.

Potential magnitude of effects on fish habitat from degradation of water quality would be low. Sedimentation generated from erosion may degrade fish habitat and affect fish health and behaviour downstream of the proposed Project but only for a 1-2 day time.

5.6.5.2 Probability

Effects to water resources, and potentially fish habitat, from sedimentation associated with vegetation clearing during construction and decommissioning activities are certain, but limited in duration. Soil types in the region, combined with major rainfall events, make the proposed Project area vulnerable to erosion and sedimentation when vegetation is removed. Effects on water quality from accidental spills are unlikely, provided mitigation and setbacks are followed.

5.6.5.3 Geographical Extent

The extent of the potential effects to water resources from sedimentation would be local. Sediment that may enter into streams at the proposed Project site would be transported downstream where it would be diluted and settle out.

5.6.5.4 Duration and Frequency

Related effects on water resources are expected to be short term and somewhat infrequent, and are most likely to occur during construction only. Impacts from erosion and sedimentation would be reduced as the proposed Project footprint is restored. Operations-related effects from site maintenance are anticipated to be short term and infrequent.

5.6.5.5 Reversibility

Effects on water resources are considered to be generally reversible with re-vegetation and implementation of erosion control measures.

5.7 Vegetation

5.7.1 General Description

Vegetation in the Project Area can largely be categorized as falling within Loucks' sugar maple, yellow birch, balsam fir zone; the sugar maple, hemlock, pine zone is also represented in the southern and eastern parts of the region. In areas of imperfect drainage, such as the upper plateau, Eastern Larch (*Larix laricina*), black spruce (*Picea mariana*), red maple (*Acer rubrum*) and alder (*Alnus spp*.) dominate. Numerous treed bogs support the growth of black spruce and larch, sometimes dwarfed by the amount of water in the bog.

In the lower elevation areas, and in the mature stands, sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*) and yellow birch are dominant climax species on well drained hills. White spruce (*Picea glauca*), red spruce (*Picea rubens*), and balsam fir (*Abies balsamea*) are dominant on valley slopes, with black spruce, white spruce, Eastern hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*) in valley bottoms. White ash (*Fraxinus americana*), red maple, aspen (*Populus spp*), white birch (*Betula papyrifera*) are common throughout the entire Project area. A vigorous shrub growth of mountain maple (*Acer spicatum*), beaked hazelnut (*Corylus cornuta*) and hobblebush (*Viburnum alnifolium*) are common to cutovers and insect-killed stands. Managed plantations of pine and spruce are scattered amongst the remaining forested landscape.

In areas of imperfect drainage, such as the upper plateau, larch (*Larix laricina*), black spruce, red maple and alder (*Alnus spp*.) dominate. Numerous treed bogs support the growth of black spruce and larch, sometimes dwarfed by the amount of water in the bog.

Little to none of this habitat is intact anywhere throughout the crown lands that make up the Project Area. Intensive forestry operations over the last 75 years have left the landscape in a state of regeneration. Intact forest is found on the steep hillsides of the plateau, and within the narrow watercourse channels, especially for watercourses running off the plateau towards Bras d'Or Lake. These locations are unsuitable for WTG's and will be avoided by the Project.

5.7.2 Turbine Specific Site Assessments

In May 2012, a total of thirty-one candidate turbine site locations were assessed for vegetation. Of the 31 sites assessed, fourteen were located in disturbed sites that had been previously logged. These sites were characterized by recent (<10 year) timber harvesting operations, leaving very little canopy coverage, other than the occasional mature legacy tree or wildlife clumps. Five proposed turbine locations were within intolerant hardwood stands, two located in tolerant hardwood stands, and 6 were proposed within varying softwood stands. Four candidate turbine sites were located within wetland habitat.

Since initial assessments were completed in 2012, a detailed design and site layout was developed, taking into consideration environmental constraints. The project team strived to relocate candidate turbine locations from intact forest stands into disturbed areas and from wetland habitats into upland habitat. The candidate turbine locations were reassessed in December 2013.

Of the 31 candidate turbine locations, 24 are now located in disturbed habitats. Natural regeneration and planted trees included species such as balsam fir, black spruce, white spruce, larch, pin cherry and white birch. Shrub species such as lambkill, red osier dogwood, mountain ash, black berry, and dwarf red raspberry were common. Herbaceous vegetation and ground cover communities were characterized by goldthread, wintergreen, creeping snowberry, twinflower, lily-of-the-valley, little white violet, mayflower, sphagnum mosses and stiff club moss. Anthropogenic disturbance was high, and these sites were often associated with a network of logging roads and abundant coarse woody debris.

Natural disturbance regimes were apparent in two candidate turbine locations (Refer to Table 13. Site Specific Turbine Habitat Assessments). These intolerant hardwood stands and mixed wood stands were characterised by even-aged, early successional species, indicative of natural disturbance by either fire or spruce budworm. White birch was the dominant hardwood in these locations, with occasional pin cherry, yellow birch, red maple and balsam fir. In some instances, mature legacy trees were present. Evergreen wood fern, ground pine, twinflower, goldthread, starflower, wood sorrel and skunk currant were all frequently observed in the understorey. The shrub layer was sparse in each of these locations.

One candidate turbine location is located in a tolerant hardwood stand, which exists on a hilltop in the northern portion of the project lands. This mature stand is composed of a mixture of yellow birch, sugar maple, American beech, and striped maple. Balsam fir and white spruce occur in small numbers in the understorey. Evergreen wood fern, little white violet, starflower, and lily-of-the-valley were common groundcover in this vegetation type.

Where timber harvesting operations have not yet taken place, the Project lands are dominated by a variety of softwood stands. Four of the candidate turbine locations were characterized by softwood forests or mixed stands. One is located in the SH8 vegetation type, which is a mid-successional vegetation type dominated by balsam fir, with a very sparse understorey and shrub layer. Two of the candidate turbine locations within the wet coniferous vegetation type (WC2). This nutrient poor coniferous forest is characterized by black spruce canopy dominance and by high shrub and sphagnum moss cover. Only one candidate turbine site is located within a mixed wood vegetation type (MW5). This site has an overstory co-dominated by white birch and balsam fir, with a moderate amount of standing coarse woody debris (snags).

Table 13. Site Specific Turbine Habitat Assessments

Turbine	Vegetation Type	Description
1	Disturbed	Site is located in a clear-cut, between two coniferous dominated wetlands (one bog and one treed swamp). The vegetation at the proposed turbine location is typical of disturbed habitat within the Project Area, with 5-year regenerating white spruce, tamarack and pin cherry and occasional white birch and balsam fir. Lambkill is frequent, as is mayflower, stiff club moss, goldthread and raspberry.
2	Disturbed	Site is located in a clear-cut. The vegetation at the proposed turbine location is typical of disturbed habitat within the Project Area, with 5-year regenerating white spruce, tamarack and pin cherry and occasional white birch and balsam fir. Lambkill is frequent, as is mayflower, stiff club moss, goldthread and raspberry.
3	Disturbed	Timber has been harvested and site is cutover, with only a few mature yellow birch remaining. Approximately 5 year old regenerating red maple, white spruce, pin cherry, balsam fir and white birch are present.
4	Disturbed	Timber has been harvested and site is cutover, with only a few mature yellow birch remaining. Approximately 10 year old regenerating red maple, white spruce, pin cherry, balsam fir and white birch are present.
5	Disturbed	Site is located in a clear-cut. The vegetation at the proposed turbine location is typical of disturbed habitat within the Project Area, with 5-year regenerating white spruce, tamarack and pin cherry and occasional white birch and balsam fir. Lambkill is frequent, as is mayflower, stiff club moss, goldthread and raspberry.
6	Disturbed	Site is located in a clear-cut. The vegetation at the proposed turbine location is typical of disturbed habitat within the Project Area, with 5-year regenerating white spruce, tamarack and pin cherry and occasional white birch and balsam fir. Lambkill is frequent, as is mayflower, stiff club moss, goldthread and raspberry.
7	Disturbed	Recent clear-cut, within 5 years. Tree cover and shrub/sapling layer is absent with ground cover comprised of early colonizers and habitat generalists. Cinnamon fern, bracken fern, flat-topped white aster, twin flower, goldthread and bunchberry.

Turbine	Vegetation Type	Description
8	Disturbed	Recent clear-cut, within 5 years. Tree cover and shrub/sapling layer is absent with ground cover comprised of early colonizers and habitat generalists. Cinnamon fern, bracken fern, flat-topped white aster, twin flower, goldthread and bunchberry.
9	Disturbed	Recent clear-cut, within 5 years. Tree cover and shrub/sapling layer is absent with ground cover comprised of early colonizers and habitat generalists. Cinnamon fern, bracken fern, flat-topped white aster, twin flower, goldthread and bunchberry.
10	Disturbed	Young (~5 years) mixed regeneration following timber harvest. Balsam fir, black spruce, white spruce, yellow birch and pin cherry.
11	Disturbed	Roadside location, clear cut with 5-year regenerating white spruce, tamarack and pin cherry and occasional white birch and balsam fir. Lambkill is frequent, as is mayflower, stiff club moss, goldthread and raspberry.
12	Disturbed	Young (~5 years) mixed regeneration following timber harvest. Balsam fir, black spruce, white spruce, yellow birch and pin cherry.
13	Disturbed	Site has been harvested with only mature white and yellow birch remaining. 5 year old regrowth is composed of white birch, white spruce, red maple and balsam fir.
14	Disturbed	Recent clear-cut, within 5 years. Tree cover and shrub/sapling layer is absent with ground cover comprised of early colonizers and habitat generalists. Cinnamon fern, bracken fern, flat-topped white aster, twin flower, goldthread and bunchberry.
15	Disturbed	Roadside location, clear cut with 5-year regenerating white spruce, tamarack and pin cherry and occasional white birch and balsam fir. Lambkill is frequent, as is mayflower, stiff club moss, goldthread and raspberry.
16	Disturbed	Site is located at the edge of a clear cut, next to a stand of young white birch. 5-year regenerating white spruce, tamarack and pin cherry, and occasional white birch and balsam fir. Lambkill is frequent, as is mayflower, stiff club moss, goldthread and raspberry.
17	Disturbed	Site has been harvested with only mature white and yellow birch remaining. 5 year old regrowth is composed of white birch, white spruce, red maple and balsam fir.
18	Disturbed	Site is located in a clear-cut, with a small graminoid swamp located to the east. Tree cover has been removed, and ground cover is typical of disturbed habitats within the Project Area.
19	WC2	Site is located in marginal wetland habitat - unable to clearly delineate wetland boundaries due to snow conditions. Black spruce dominant with some balsam fir. Sphagnum ground cover, with bog rosemary, leather leaf, twinflower, creeping snowberry, lily-of-the-valley, bunchberry and starflower.
20	MW5	White birch and balsam fir are dominant, with occasional red maple, and white spruce. Evergreen wood fern and hay-scented fern are common, along with starflower, wood sorrel and lily-of-the-valley.
21	Disturbed	Site has been harvested with only mature white and yellow birch remaining. 5 year old regrowth is composed of white birch, white spruce, red maple and balsam fir.

Turbine	Vegetation Type	Description
22	Disturbed	Site has been harvested with only mature white and yellow birch remaining. 5 year old regrowth is composed of white birch, white spruce, red maple and balsam fir.
23	Disturbed	Site has been harvested with only mature white and yellow birch remaining. 5 year old regrowth is composed of white birch, white spruce, red maple and balsam fir.
24	Disturbed	Clear-cut habitat, with young yellow birch and balsam fir. Ground cover is typical of disturbed sites within the project area.
25	TH5	Mature hardwood forest, likely 60+ years old. Yellow birch, American beech, sugar maple, white spruce, balsam fir. Starflower, lily-of-the-valley, wood sorrel.
26	WC2	Black spruce, with occasional white spruce, balsam fir and red maple, frequent lambkill and occasional Labrador tea. Wintergreen, goldthread, bunchberry and bracken fern compose the groundcover.
27	SH8	Mature balsam fir stand, with very sparse understorey and shrub layer. Occasional bunchberry, twinflower and goldthread.
28	IH6	Almost exclusively white birch, with some young balsam fir. Previously disturbed, likely by fire or budworm. Groundcover includes evergreen wood fern, skunk currant, lily-of-the-valley, bunchberry, starflower, and goldthread.
29	IH6	Uneven aged, hardwood dominated mixed stand. Overstory is composed of mature (60+ years) white and yellow birch. Immature red maple and balsam fir, with ground pine, goldthread, twinflower, starflower and wood sorrel.
30	Disturbed	Timber has been harvested and site is cutover, with only a few mature yellow birch remaining. Approximately 10 year old regenerating red maple, white spruce, pin cherry, balsam fir and white birch are present.
31	Disturbed	Timber has been harvested and site is cutover, with only a few mature yellow birch remaining. Approximately 10 year old regenerating red maple, white spruce, pin cherry, balsam fir and white birch are present.

A cumulative list of vegetation species was maintained through initial field assessments in 2012 and follow-up assessments conducted in 2014. This species list is provided in Table 14 below. No rare or unique vegetation species were identified in the 2012 or 2013 field assessments.

Table 14. Vegetation species identified within the Project Area.

Latin Name	Common Name	S rank
Abies balsamea	Balsam Fir	S5
Acer pensylvanicum	Striped Maple	S5
Acer rubrum	Red Maple	S5
Acer saccharum	Sugar Maple	S5
Alnus incana	Speckled Alder	S5
Anaphalis margaritacea	Pearly Everlasting	S5
Aralia nudicaulis	Wild Sarsaparilla	S5
Betula alleghaniensis	Yellow Birch	S5
Betula papyrifera	Paper Birch	S5

Latin Name	**Common Name**	**S rank**
Betula populifolia	Gray Birch	S5
Calamagrostis canadensis	Bluejoint Reed Grass	S4S5
Carex arctata	Drooping Woodland Sedge	S5
Carex atlantica ssp. atlantica	Atlantic Sedge	S4
Carex brunnescens	Brownish Sedge	S5
Carex canescens	Silvery Sedge	S5
Carex crinita	Fringed Sedge	S5
Carex folliculata	Northern Long Sedge	S5
Carex gynandra	Nodding Sedge	S5
Carex scoparia	Broom Sedge	S5
Carex trisperma	Three-seeded Sedge	S4?
Chamaedaphne calyculata	Leatherleaf	S5
Coptis trifolia	Goldthread	S5
Cornus canadensis	Bunchberry	S5
Danthonia spicata	Poverty Oat Grass	S5
Dennstaedtia punctilobula	Hay-scented Fern	S5
Doellingeria umbellata	Hairy Flat-top White Aster	S5
Drosera rotundifolia	Round-leaved Sundew	SNR
Dryopteris carthusiana	Spinulose Wood Fern	S5
Dryopteris cristata	Crested Wood Fern	S5
Dryopteris intermedia	Evergreen Wood Fern	S5
Epigaea repens	Trailing Arbutus	S5
Equisetum sylvaticum	Woodland Horsetail	S5
Eriophorum virginicum	Tawny Cottongrass	S5
Fagus grandifolia	American Beech	S5
Fragaria virginiana	Wild Strawberry	S5
Galium palustre	Common Marsh Bedstraw	S5
Gaultheria hispidula	Creeping Snowberry	S5
Gaultheria procumbens	Winterberry	S5
Gaultheria procumbens	Eastern Teaberry	S5
Geum rivale	Water Avens	S5
Glyceria striata	Fowl Manna Grass	S5
Gymnocarpium dryopteris	Common Oak Fern	S5
Hydrocotyle americana	American Marsh Pennywort	S5
Ilex verticillata	Common Winterberry	S5
Juncus brevicaudatus	Short-tailed Rush	S5
Juncus effusus	Soft Rush	S5
Kalmia angustifolia	Sheep Laurel	S5
Ledum groenlandicum	Common Labrador Tea	S5
Linnaea borealis	Twinflower	S5

Latin Name	Common Name	S rank
Linnaea borealis	Northern Twinflower	S5
Lonicera canadensis	Canada Fly Honeysuckle	S5
Lonicera villosa	Mountain Fly Honeysuckle	S4S5
Lycopodium annotinum	Stiff Clubmoss	S5
Lycopodium complanatum	Trailing Clubmoss	S3S4
Maianthemum canadense	Wild Lily-of-The-Valley	S5
Mitchella repens	Partridgeberry	S5
Monotropa uniflora	Indian Pipe	S4
Myrica gale	Sweet Gale	S5
Nemopanthus mucronatus	Mountain Holly	S5
Oclemena acuminata	Whorled Wood Aster	S5
Oclemena nemoralis	Bog Aster	S5
Onoclea sensibilis	Sensitive Fern	S5
Osmunda cinnamomea	Cinnamon Fern	S5
Oxalis montana	Common Wood Sorrel	S5
Phegopteris connectilis	Northern Beech Fern	S5
Picea glauca	White Spruce	S5
Picea mariana	Black Spruce	S5
Plantago major	Common Plantain	SNA
Potentilla simplex	Old Field Cinquefoil	S5
Prunella vulgaris	Common Self-heal	S5
Prunus pensylvanicum	Pin Cherry	S5
Pteridium aquilinum	Bracken Fern	S5
Ranunculus acris	Common Buttercup	SNA
Ranunculus repens	Creeping Buttercup	S5
Rhododendron canadense	Rhodora	S5
Ribes glandulosum	Skunk Currant	S5
Rubus alleganiensis	Blackberry	S5
Rubus hispidus	Bristly Dewberry	S5
Rubus ideaus	Red Raspberry	S5
Rubus pubescens	Dwarf Red Raspberry	S5
Salix discolor	Pussy Willow	S5
Sarracenia purpurea	Northern Pitcher Plant	S5
Scirpus cyperinus	Common Woolly Bulrush	S5
Spiraea alba	White Meadowsweet	S5
Spiraea tomentosa	Steeplebush	S5
Taraxacum officinale	Common Dandelion	SNA
Thelypteris noveboracensis	New York Fern	S5
Thelypteris palustris	Eastern Marsh Fern	S5
Trientalis borealis	Northern Starflower	S5

Latin Name	Common Name	S rank
Tussilago farfara	Coltsfoot	SNA
Typha latifolia	Broad-leaved Cat-tail	S5
Vaccinium myrtilloides	Velvet-leaved Blueberry	S5
Veronica officinalis	Common Speedwell	S5
Viburnum nudum	Northern Wild Raisin	S5

5.7.3 Rare Plants

An environmental screening of rare biota lists for species which may be located within the Project area was conducted from the following:

- Committee on the Status of Endangered Wildlife in Canada (COSEWIC) under the *SARA*;
- Nova Scotia Endangered Species Act;
- Nova Scotia Department of Natural Resources General Status of Wild Species List (NSDNR General Status); and
- Atlantic Canada Conservation Data Centre (ACCDC) list (Appendix 14).

A rare plant modeling exercise was performed to determine the likelihood of presence of rare or sensitive plants within the Project Area. As part of the modeling exercise, all records of vascular plant species listed by the Nova Scotia Department of Natural Resources (NSDNR) as at risk (Red listed) or sensitive to human activities or natural events (Yellow listed) (NSDNR 2009) within a radius of 100 km of the Project site were compiled by means of an ACCDC data search. The habitat requirements of these species were compared to the habitat descriptions compiled for the Project Area to determine if suitable habitat was present for these species. In instances where appropriate habitat was present for a particular species, that species was considered to be potentially present and the suitable habitat in the Project Area was identified as a target for field surveys.

Table 15 (below) is a summary of the floral species at risk or species of concern generated from the list above that have been identified within the Project Area, or thought to be potentially found in the Project Area as a result of known habitat requirements.

Table 15. Summary of Floral Species at Risk or Species of Concern That Potentially Occur in the Project Area (aka Priority Species List)

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Juglans cinerea	Butternut			SNA	7 Exotic	
Adiantum pedatum	Northern Maidenhair Fern				RED	hardwood forest, intervale
Ageratina altissima	White Snakeroot				RED	mixed wood forest, river or stream
Allium schoenoprasum	Wild Chives				RED	Rocky pastures and damp meadows, preferring calcareous soils
Allium tricoccum	Wild Leek				RED	hardwood forest, intervale

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Amelanchier nantucketensis	Nantucket Serviceberry				RED	Pine barrens, pond margins, fields, edges, and thickets
Anemone americana	Round-lobed Hepatica				RED	rocky woods
Anemone canadensis	Canada Anemone				RED	alluvial floodplain, field meadow
Anemone parviflora	Small-flowered Anemone				RED	cliff or talus slope
Antennaria parlinii	Parlin's Pussytoes				RED	hard wood, mixed wood, river or stream
Antennaria rosea	Rosy Pussytoes				RED	Dry, open places, meadows, and open woods
Arabis hirsuta	Western Hairy Rockcress				RED	cliff or talus slope
Arnica lonchophylla	Northern Arnica				RED	cliff or talus slope
Artemisia campestris	Field Wormwood				RED	cliff or talus slope
Astragalus robbinsii	Robbins' Milkvetch				RED	cliff or talus slope, headland
Betula glandulosa	Glandular Birch				RED	barrens, bog
Bistorta vivipara	Alpine Bistort				RED	Moist to wet spruce or mixed woods along shorelines, moist subalpine woods and meadows, alpine meadows, heaths, nutrient-rich sites
Boehmeria cylindrica	Small-spike False-nettle				RED	Moist and shady ground, in deciduous woods, swamps, bogs, marshes, wet meadows and ditches
Botrychium lunaria	Common Moonwort				RED	field meadow, lake or pond shore
Bromus latiglumis	Broad-glumed Brome				RED	alluvial floodplain
Cardamine maxima	Large Toothwort				RED	hardwood forest, river or stream
Cardamine pratensis	Cuckoo Flower				RED	Moist, slightly shady places in meadows and by streams
Carex bebbii	Bebb's Sedge				RED	Wet meadows and stream sides
Carex castanea	Chestnut Sedge				RED	cliff or talus slope, field meadow, swamp
Carex chordorrhiza	Creeping Sedge				RED	bog
Carex digitalis	Slender Wood Sedge				RED	softwood forests

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Carex gynocrates	Northern Bog Sedge				RED	bog, coastal island, swamp
Carex haydenii	Hayden's Sedge				RED	open habitats of bogs/poor fens, moist meadows, and seasonally wet soils
Carex hystericina	Porcupine Sedge				RED	wet prairies, swamps, grassy fens, sedge meadows, calcareous seeps, edges of marshes (sandy & non-sandy), and ditches
Carex laxiflora	Loose-flowered Sedge				RED	forests, mixed wood
Carex livida	Livid Sedge				RED	bog or field meadow
Carex longii	Long's Sedge				RED	wet sandy soils
Carex ormostachya	Necklace Spike Sedge				RED	Moist to dry deciduous, evergreen, or mixed deciduous-evergreen forests, frequently sandy gravel or disturbed soils
Carex peckii	Peck's Sedge				RED	Well-drained openings, usually on calcareous substrates; rocky woods and borders, rock exposures, hemlock woods
Carex pellita	Woolly Sedge				RED	moist to wet prairies and dolomite prairies, prairie swales, sedge meadows, seeps and calcareous seeps, swamps and openings in floodplain woodlands, poorly drained fields, and roadside ditches
Carex plantaginea	Plantain-leaved Sedge				RED	mixed wood forests
Carex prairea	Prairie Sedge				RED	disturbed sites, swamps
Carex rariflora	Loose-flowered Alpine Sedge				RED	beach or coastal shore, bog
Carex rostrata	Narrow-leaved Beaked Sedge				RED	wet meadows, marshes, edges of lakes, ponds, and streams, and other riparian areas
Carex saxatilis	Russet Sedge				RED	lake or pond shore, lakeshore wetland
Carex tenuiflora	Sparse-flowered Sedge				RED	fen and mixed wood forest
Carex tincta	Tinged Sedge				RED	disturbed sites, hardwood forests

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Carex tuckermanii	Tuckerman's Sedge				RED	field meadow, marsh, river or stream
Carex wiegandii	Wiegand's Sedge				RED	bogs and poor fens, disturbed sites, swamps
Caulophyllum thalictroides	Blue Cohosh				RED	alluvial floodplain, hardwood forest, intervale
Ceratophyllum echinatum	Prickly Hornwort				RED	fresh water of lakes, ponds, marshes and swamps
Cinna arundinacea	Sweet Wood Reed Grass				RED	alluvial floodplain
Clematis occidentalis	Purple Clematis				RED	mixed wood forest, river or stream
Coeloglossum viride	Long-bracted Frog Orchid				RED	Alluvial floodplain, bog, coastal island, mixed and softwood forests
Comandra umbellata	Bastard's Toadflax				RED	Occur in plains and foothills in dry or moist soils that are sandy and well drained
Conopholis americana	American Cancer-root				RED	hardwood forest
Cryptogramma stelleri	Steller's Rockbrake				RED	cliff or talus slope, softwood forest
Cuscuta cephalanthi	Buttonbush Dodder				RED	moist thickets, marshes
Cynoglossum virginianum	Wild Comfrey				RED	hardwood forest
Cypripedium arietinum	Ram's-Head Lady's-Slipper		Endangered	S1	RED	found in moderately open forests possessing cool, sub-acid or neutral soils. In Nova Scotia, it is largely associated with gypsum bedrock, and is found in moderately open, mesic woods on outcrops, cliff tops, river banks, moderate to steep slopes and in sinkholes. Forest cover at known sites includes deciduous-dominated, conifer-dominated and mixed stands of young-intermediate to mature forest. Elsewhere in its range, the species is also known from conifer swamps and fens, and open forests on limestone bedrock.

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Cypripedium reginae	Showy Lady's-slipper				RED	bog, swamp
Cystopteris laurentiana	Laurentian Bladder Fern				RED	Cracks and ledges on cliffs, often on calcareous substrates
Desmodium glutinosum	Large Tick-trefoil				RED	hardwood forest, intervale
Diapensia lapponica	Diapensia				RED	cliff or talus slope
Dirca palustris	Eastern Leatherwood				RED	hardwood, mixed wood
Draba glabella	Rock Whitlow-grass				RED	cliff or talus slope
Draba norvegica	Norwegian Whitlow-grass				RED	cliff or talus slope
Draba pycnosperma	Dense Whitlow-grass				RED	cliff or talus slope
Eleocharis fallax	Creeping Spikerush				RED	marsh, lakeshore wetlands
Eleocharis quinqueflora	Few-flowered Spikerush				RED	sparsely vegetated wet habitats found in graminoid fens, shorelines of ponds and small lakes, and occasionally in wet prairie openings
Elymus wiegandii	Wiegand's Wild Rye				RED	field meadow, river or stream
Erigeron compositus	Cut-leaved Fleabane				RED	Rocky embankments and sunny sandy slopes
Eutrochium dubium	Coastal Plain Joe-pye-weed				RED	swamps and other wet habitats with acidic sandy soils
Festuca subverticillata	Nodding Fescue				RED	alluvial floodplain, hardwood forest
Fraxinus pennsylvanica	Red Ash				RED	bogs and seepages or bottomland forests or disturbed and weedy areas or mesic upland forests or mixed forest edges or suburban plantings
Galium boreale	Northern Bedstraw				RED	woodlands, fields, edges of streams and lakes
Galium obtusum	Blunt-leaved Bedstraw				RED	Swamps, swampy grounds, wet areas of prairies, wet woods and thickets, roadside ditches.
Gentianella amarella	Northern Gentian				RED	field meadow, lake or pond shore (possibly)
Goodyera pubescens	Downy Rattlesnake-plantain				RED	hardwood, mixed wood, and softwood forests

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Hypericum majus	Large St. John's-wort				RED	wet meadows, shores, ditches, fens
Juncus alpinoarticulatus	Alpine Rush				RED	Wet meadows, sandy and gravelly, often calcareous shores, fens, and clayey pools over rock
Juncus brachycephalus	Short-headed Rush				RED	This plant grows on calcareous shores, wet fields and in marshes.
Juncus secundus	One-sided Rush				RED	Exposed sites, usually with well-drained sandy soil, often associated with shallow bedrock
Juncus vaseyi	Vasey's Rush				RED	intermittent wetlands of various types, including wet prairies, moist sandy barrens and open marshy flats or swales
Listera australis	Southern Twayblade				RED	Bog, mixed wood forest
Lobelia kalmii	Brook Lobelia				RED	bog, cliff or talus slope, field meadow
Lobelia spicata	Pale-spiked Lobelia				RED	prairies, glades, open woods, bluffs, wet meadows
Malaxis monophyllos	White Adder's-mouth				RED	cliff or talus slope
Osmorhiza depauperata	Blunt Sweet Cicely				RED	woodlands - plains to higher mountain elevations
Osmorhiza longistylis	Smooth Sweet Cicely				RED	rich woods and thickets Eastern N. America; in sun or partial shade
Oxyria digyna	Mountain Sorrel				RED	northern coniferous forest
Oxytropis campestris	Field Locoweed				RED	cliff or talus slope, headland
Parnassia palustris	Marsh Grass-of-Parnassus				RED	more alkaline habitats, such as meadows and in damp calcareous sands on lakeshores. Swamps, lakeshores, bogs
Pedicularis palustris	Marsh Lousewort				RED	field meadow, marsh
Pilea pumila	Dwarf Clearweed				RED	hardwood, mixed wood, river or stream
Pinguicula vulgaris	Common Butterwort				RED	coastal island, cliff or talus slope, river or stream

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Proserpinaca intermedia	Intermediate Mermaidweed				RED	sandy bogs and savannas, and especially along the periphery of sandy, acid ponds, lakes, streams, ditches, and also in wet pine savannas and flat woods, cypress-black gum ponds, swamps, and damp clearings
Ranunculus pensylvanicus	Pennsylvania Buttercup				RED	field meadow
Rhododendron lapponicum	Lapland Rosebay				RED	cliff or talus slope
Rhynchospora capillacea	Slender Beakrush				RED	bogs
Salix candida	Sage Willow		Endangered		RED	bog
Salix reticulata	Net-veined Willow				RED	barrens, cliff or talus slope
Salix uva-ursi	Bearberry Willow				RED	barrens, cliff or talus slope
Salix vestita	Hairy Willow				RED	cliff or talus slope
Sanicula odorata	Clustered Sanicle				RED	alluvial flood plain only
Saxifraga aizoides	Yellow Mountain Saxifrage				RED	cliff or talus slope
Saxifraga cernua	Nodding Saxifrage				RED	seepage areas, moist crevices, and along stream banks, creeks and lakeshores, on moist ledges and in exposed dry sites
Saxifraga oppositifolia	Purple Mountain Saxifrage				RED	cliff or talus slope
Selaginella selaginoides	Low Spikemoss				RED	bog, river or stream
Silene acaulis	Moss Campion				RED	long streams, river terraces, tundra, slopes, ridges, cliffs; on seepage slopes, or dry, or moderately well drained areas; calcareous; gravel, sand, silt, till; with low organic content
Silene antirrhina	Sleepy Catchfly				RED	roadsides, railways, pastures, fields waste grounds, alluvial woods
Solidago hispida	Hairy Goldenrod				RED	Woods and forest edges
Solidago multiradiata	Multi-rayed Goldenrod				RED	Meadows, pastures, disturbed areas, roadsides

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Spiranthes lucida	Shining Ladies'-tresses				RED	Saturated, calcareous, usually gravelly or sandy soils. Typical habitats include stream and river banks or floodplain terraces, fens, and old quarries or gravel pits
Stellaria crassifolia	Fleshy Stitchwort				RED	Fens, fen meadows, meadows, springs, waterside meadow shores that are prone to flooding, seashore kelp banks
Thuja occidentalis	Eastern White Cedar		Vulnerable	S1S2	RED	Cedar is an uncommon tree in Nova Scotia and currently only 32 stands in five counties have been identified. The population is fragmented and comprised of mostly small stands that appear genetically separate from each. Most populations are different from populations in NB and PEI. Almost all of the cedar are located on private land and only one stand is formally protected.
Triantha glutinosa	Sticky False Asphodel				RED	beach or coastal shore, bog, swamp
Vaccinium ovalifolium	Oval-leaved Bilberry				RED	softwood forest
Woodsia alpina	Alpine Cliff Fern				RED	cliff or talus slope
Zizia aurea	Golden Alexanders				RED	field meadow, lake or pond shore, river or stream
Anemone quinquefolia	Wood Anemone				YELLOW	intervale, river or stream
Anemone virginiana	Virginia Anemone				YELLOW	cliff or talus slope, intervale, river or stream
Arabis drummondii	Drummond's Rockcress				YELLOW	cliff or talus slope
Asplenium trichomanes	Maidenhair Spleenwort				YELLOW	cliff or talus slope, river or stream
Betula michauxii	Newfoundland Dwarf Birch				YELLOW	Sphagnum bogs, around pools, and wet peaty meadows
Betula minor	Dwarf White Birch				YELLOW	Acidic rocky barrens, peats and alpine summits of higher mountains.

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Betula pumila	Bog Birch				YELLOW	bog
Botrychium lanceolatum	Triangle Moonwort				YELLOW	field meadow, hardwood forest, swamp
Botrychium simplex	Least Moonwort				YELLOW	beach or coastal shore, field meadow, lake or pond shore, river or stream, swamp
Calamagrostis stricta	Slim-stemmed Reed Grass				YELLOW	bog, cliff or talus slope, lakeshore wetland
Caltha palustris	Yellow Marsh Marigold				YELLOW	field meadow, river or stream, swamp
Campanula aparinoides	Marsh Bellflower				YELLOW	field meadow, river or stream
Cardamine parviflora	Small-flowered Bittercress				YELLOW	coastal island, headland, mixed wood forest
Carex adusta	Lesser Brown Sedge				YELLOW	Dry, open places. [Rocky coastal (non-forested, upland)]
Carex atratiformis	Scabrous Black Sedge				YELLOW	Brooksides, ravines, and damp slopes. [Rocky summits and outcrops (nonforested,upland); Non-tidal rivershore (non-forested, seasonally wet)
Carex capillaris	Hairlike Sedge				YELLOW	calcium-rich, wet habitats, including ledges, talus slopes, ditches, cedar swamps, and bogs
Carex comosa	Bearded Sedge				YELLOW	Marshes, lake shores, and wet meadows
Carex eburnea	Bristle-leaved Sedge				YELLOW	cliff or talus slope
Carex hirtifolia	Pubescent Sedge				YELLOW	upland deciduous woodlands, upland oak savannas, thinly wooded bluffs and slopes, woodland openings
Carex houghtoniana	Houghton's Sedge				YELLOW	Dry to moist sandy or gravelly soils in open, disturbed sites, rocky balds, ledges
Carex scirpoidea	Scirpuslike Sedge				YELLOW	moist meadows, streambanks, rivers, lakeshores and open rocky slopes in the mountains
Carex swanii	Swan's Sedge				YELLOW	Boggy pastures, dry peaty barrens, forests, clearings and the edges of woods.

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Carex tenera	Tender Sedge				YELLOW	wet prairies, swamps, and floodplain woods
Conioselinum chinense	Chinese Hemlock-parsley				YELLOW	coastal island, hardwood forest, headland, marsh, softwood forest, swamp
Crataegus flabellata	Fan-leaved Hawthorn				YELLOW	open woods
Cypripedium parviflorum	Yellow Lady's-slipper				YELLOW	hardwood and mixed wood forest
Draba arabisans	Rock Whitlow-grass				YELLOW	cliff or talus slope
Dryopteris fragrans	Fragrant Wood Fern				YELLOW	cliff or talus slope
Eleocharis flavescens	Yellow Spikerush				YELLOW	lakeshore wetland, swamp
Eleocharis ovata	Ovate Spikerush				YELLOW	sandy freshwater margins, including lakes, ponds and rivers
Eleocharis rostellata	Beaked Spikerush				YELLOW	Saline, limy or brackish marshes. [Non-tidal rivershore (non-forested, seasonally wet); Open wetland, not coastal nor rivershore (non-forested, wetland)]
Empetrum eamesii	Pink Crowberry				YELLOW	barrens, beach or coastal shore, bog, exposed rock or sand, headland
Epilobium coloratum	Purple-veined Willowherb				YELLOW	lake or pond shore, marsh
Epilobium strictum	Downy Willowherb				YELLOW	bog, field meadow
Erigeron hyssopifolius	Hyssop-leaved Fleabane				YELLOW	cliff or talus slope, river or stream
Erigeron philadelphicus	Philadelphia Fleabane				YELLOW	fields, open woods, grassy areas
Eriophorum gracile	Slender Cottongrass				YELLOW	bog, field meadow, lakeshore wetland, swamp
Fallopia scandens	Climbing False Buckwheat				YELLOW	open woodlands in floodplain areas, woodland borders, thickets, riverbanks, ditches, sloping ground along bridges, and fence rows. Moist areas-disturbed sites
Festuca prolifera	Proliferous Fescue				YELLOW	cliff or talus slope
Floerkea proserpinacoides	False Mermaidweed				YELLOW	hardwood forest, intervale
Fraxinus nigra	Black Ash		Threatened		YELLOW	swamp

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Galium labradoricum	Labrador Bedstraw				YELLOW	Bogs, mossy thickets, woods. [Conifer forest (forest, upland)]
Geocaulon lividum	Northern Comandra				YELLOW	bog, coastal island, exposed rock or sand, mixedwood forest
Goodyera oblongifolia	Menzies' Rattlesnake-plantain				YELLOW	hardwood, mixed wood and softwood forest
Goodyera repens	Lesser Rattlesnake-plantain				YELLOW	coniferous swamps and bogs, cool, shady, moist coniferous forests with a mossy understory
Gratiola neglecta	Clammy Hedge-hyssop				YELLOW	marsh, river or stream
Halenia deflexa	Spurred Gentian				YELLOW	edges of moist forest, and wet, forest road ditches
Hedeoma pulegioides	American False Pennyroyal				YELLOW	Dry soil in open woods and fields
Hieracium robinsonii	Robinson's Hawkweed				YELLOW	cliff or talus slope, river or stream
Hudsonia ericoides	Pinebarren Golden Heather				YELLOW	barrens, coastal island, exposed rock or sand
Impatiens pallida	Pale Jewelweed				YELLOW	alluvial floodplain, coastal island, intervale
Juncus dudleyi	Dudley's Rush				YELLOW	wet prairies, prairie swales, fens, gravelly seeps, calcareous springs, and ditches
Juncus marginatus	Grass-leaved Rush				YELLOW	disturbed sites, field meadows, river or stream
Juncus stygius	Moor Rush				YELLOW	bog
Juncus subcaudatus	Woodland Rush				YELLOW	Marshes, edges of streams, and peaty acidic and basic wetlands including fens
Juncus trifidus	Highland Rush				YELLOW	cliff or talus slope
Lactuca hirsuta	Hairy Lettuce				YELLOW	disturbed sites, lake or pond shore, mixedwood forest
Laportea canadensis	Canada Wood Nettle				YELLOW	alluvial floodplain, hardwood forest, intervale, mixedwood forest
Lilium canadense	Canada Lily				YELLOW	field meadow, river or stream

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Myriophyllum verticillatum	Whorled Water Milfoil				YELLOW	Quiet waters of lakes, ponds, streams, and deep marshes, or rooting on muddy shores
Ophioglossum pusillum	Northern Adder's-tongue				YELLOW	field meadow, lake or pond shore, swamp
Panicum tuckermanii	Tuckerman's Panic Grass				YELLOW	Open, moist sandy shores and fields
Persicaria arifolia	Halberd-leaved Tearthumb				YELLOW	swampy, calcareous or fen habitats
Piptatherum canadense	Canada Rice Grass				YELLOW	barrens, exposed rock or sand
Piptatherum pungens	Slender Rice Grass				YELLOW	open areas in dry (or occasionally moist), sandy or very rocky, nutrient-poor soils. Openings in coniferous forests, talus cliffs, and rocky lakeshores
Platanthera flava	Tubercled Orchid				YELLOW	bog, field meadow, lake or pond shore, lakeshore wetland, river or stream, swamp
Platanthera macrophylla	Large Round-leaved Orchid				YELLOW	hardwood, mixed wood and softwood forest
Poa glauca	Glaucous Blue Grass				YELLOW	coastal island, cliff or talus slope
Polygala sanguinea	Blood Milkwort				YELLOW	field meadow, mixed wood forest
Polystichum lonchitis	Northern Holly Fern				YELLOW	cliff or talus slope
Primula mistassinica	Mistassini Primrose				YELLOW	cliffs, rock splash pools
Proserpinaca pectinata	Comb-leaved Mermaidweed				YELLOW	shallow waters of bogs, marshes, swamps, and along the muddy shores and banks of ponds and streams
Pyrola minor	Lesser Pyrola				YELLOW	damp woodlands, heaths, plantations, disused railways, on rock ledges and in sand-dunes
Rhamnus alnifolia	Alder-leaved Buckthorn				YELLOW	bog, field meadow, swamp
Rudbeckia laciniata	Cut-leaved Coneflower				YELLOW	intervale, lake or pond shore
Salix pedicellaris	Bog Willow				YELLOW	bog, lake or pond shore, lakeshore wetland, marsh

Scientific Name	Common Name	SARA	NSESA	S RANK	GS RANK	Habitat Requirements
Saxifraga paniculata	White Mountain Saxifrage				YELLOW	cliff or talus slope
Shepherdia canadensis	Soapberry				YELLOW	cliff or talus slope
Spiranthes casei	Case's Ladies'-tresses				YELLOW	Dry to moderately moist sandy soils, deep to shallow, and sand filled crevices of igneous rock, roadsides and pastures.
Spiranthes ochroleuca	Yellow Ladies'-tresses				YELLOW	barrens, disturbed sites, field meadow, river or stream
Symphyotrichum boreale	Boreal Aster				YELLOW	bogs, fens
Symphyotrichum ciliolatum	Fringed Blue Aster				YELLOW	Open woods and meadows in poor soils
Symphyotrichum undulatum	Wavy-leaved Aster				YELLOW	beach or coastal shore, field meadow, softwood forest
Tiarella cordifolia	Heart-leaved Foamflower				YELLOW	hardwood forest, intervale
Triosteum aurantiacum	Orange-fruited Tinker's Weed				YELLOW	intervale (low tract of land along a river)
Vaccinium caespitosum	Dwarf Bilberry				YELLOW	cliff or talus slope, disturbed sites, field meadow
Vaccinium uliginosum	Alpine Bilberry				YELLOW	barrens, beach or coastal shore, bog, exposed rock or sand, headlands, field meadow
Viburnum edule	Squashberry				YELLOW	hardwood forest, mixed wood forest, river or stream
Viola nephrophylla	Northern Bog Violet				YELLOW	barrens, bog, river or stream
Woodsia glabella	Smooth Cliff Fern				YELLOW	cliff or talus slope, river or stream
Woodwardia areolata	Netted Chain Fern				YELLOW	bog, river or stream, swamp

None of the above noted species identified during the desktop analysis were identified in the 2012 or 2013 field assessments, with the exception of Boreal Felt Lichen. (refer to Section 5.7.3.1 below)

Along the Irish Cove Road, approximately 2 km from Route 4, habitat had been identified as containing species of concern. In the 1990s a Man and Biosphere Reserve, Biodiversity Monitoring Plot, was established in this area by Biodiversity Research Associates (BIODRA); BIODRA was specifically established to undertake this project and involves primarily staff and volunteers from Cape Breton

University and the Nova Scotia Museum. This area was originally listed as a significant old forest area; the Crown land portion was later designated a policy reserve under the NSDNR's old Forest Policy. This area, though valuable, is outside the Project Area and will not be impacted by the Project.

Species listed in this area include dwarf rattlesnake plantain (*Goodyera repens*), lesser pyrola (*Pyrola minor*) and a number of lichens including *Collema furfuraceum*, *Leptogium laceroides*, *Nephroma arcticum* and *Nephroma bellum*. None of these species were identified within the Project Area.

5.7.3.1 Boreal Felt Lichen

Following discussions with DNR in Sydney, N.S., McCallum Environmental was provided with GPS coordinates for known Boreal Felt Lichen (BFL) locations within the Project Lands. These locations were apparently identified during surveys completed on behalf of Port Hawkesbury Pulp and Paper prior to logging activities in the area. As not all lands had been searched for BFL, McCallum Environmental completed a BFL survey within 100 metres of proposed turbines and access roads. Coordinates of BFL that were found are provided in Table 16 (below).

Most of the area covered during had little potential for finding *E. pedicellatum*. Although a great deal of the site has been heavily forested there are still pockets of older growth remaining around some of the proposed turbine/road locations and several trees with Boreal Felt Lichen were located.

Table 16. Boreal Felt Lichen locations

Latin Name	Easting	Northing
Erioderma pedicellatum	687895	5081270
Erioderma pedicellatum	683380	5076537
Erioderma pedicellatum	684341	5077054
Erioderma pedicellatum	686702	5080194
Erioderma pedicellatum	684774	5077965

All *E. pedicellatum* was found on live Balsam Fir trees with the exception of the thallus found near T1 which was on a dead Balsam Fir. Three large *E. pedicellatum* thalli were found on at the edge of a treed swamp between proposed turbine locations T10 and T32. Most of the area had been cut but habitat was appropriate for E. pedicellatum in small pockets.

Habitat surrounding T1 appeared to be excellent for Boreal Felt Lichen and had an abundance of *Coccocarpia palmicola.* Despite this, only one small unhealthy thallus was found approximately 105 meters east of T1.

The proposed road and turbine pad T25, went through a treed swamp with lots of old growth balsam fir. One fractured *E. pedicellatum* thallus was found east of the proposed turbine location, along with *Coccocarpia palmicola* and *Moelleropsis nebulosa*.

Habitat surrounding T28 was mostly cutover, one *E. pedicellatum thalli* was found over 100 meters west. One more tree with Boreal Felt Lichen was found just north of T37 which was already discovered on a previous survey by Tom Neilly.

Three of the five trees hosting Boreal Felt Lichen, (near T1, T25, T28) were not located within areas predicted to be appropriate habitat for *E. pedicellatum* although conditions were ideal for this lichen at all five locations.

Proposed turbine locations T9, T34, T38, T40 and T42 all had old growth Balsam Fir covered in *Frullania asagrayana* and *Coccocarpia palmicola* in appropriate habitat for *E. pedicellatum* within the general area but no Boreal Felt Lichen was found.

Other lichens found on the project site include*; Sphaerophorus globosus, Pseudocyphellaria perpetua, Pannaria rubiginosa, Pannaria conoplea, lobaria scrobiculata, Lobaria quercizens, Lobaria pulmonaria, Parmeliella triptophylla and protopannaria pezizoides.*

Lichens of signifigant interest include *Fuscopannaria ahlneri, Peltigera collina, Platismatia norvegica, Degelia plumbea* and *Sclerophora peronella*. D. plumbea and S. peronella are both species of special concern with COSEWIC. Degelia plumbea is also listed as vulnerable under the Nova Scotia endangered species act.

Table 17. Secondary Lichen Species and Coordinates

Common Name	Latin Name	Easting	Northing
Coccocarpia Lichen	*Coccocarpia palmicola*	688330	5081900
		688263	5081977
		687562	5080556
		687450	5080497
		687451	5080490
		683351	5076457
		683331	5076476
		683297	5076428
		683330	5076475
		683372	5076514
		683426	5077191
		683154	5077036
		683238	5077197
		684870	5076910
		684673	5077845
		686452	5079867
		686376	5079863
Blue Felt Lichen	*Degelia plumbea*	688575	5081827
		687745	5080509
		686670	5080748
		685682	5079316
		686086	5080867
		686176	5080780
Fuscopannaria ahlneri	*Fuscopannaria ahlneri*	684985	5078027
		685017	5078080

Common Name	Latin Name	Easting	Northing
		686652	5079852
		685786	5079350
Textured lungwort	*Lobaria scrobiculata*	685129	5078022
		685416	5076772
		686071	5080431
none	*Moelleropsis nebulosa*	684732	5077944
Matted lichen	*Pannaria conoplea*	688003	5081071
		688207	5081780
Bory Matted lichen	*Pannaria rubiginosa*	688207	5081780
Lead lichen	*Parmeliella triptophylla*	688246	5082054
Tree Pelt lichen	*Peltigera collina*	685368	5078391
		686656	5080743
		685623	5080112
		686086	5080867
		686176	5080871
		686421	5080909
Norwegian Ragged lichen	*Platismatia norvegica*	684539	5077054
		686672	5079851
		686377	5079880
Tibell	*Sclerophora peronella*	685368	5078391
		685783	5078216
Globe ball lichen	*Sphaerophorus globosus*	687945	5081203

5.7.4 Effects of the Project

Construction activities will be limited to the turbine locations and access roads, as well as the substation location. During wetland and watercourse permitting, if other species of concern are identified during any of these assessments mitigation will be employed at that time. However, the Project is not expected to have effects on species of conservation concern.

5.7.5 Mitigation

In order to minimize effects, the following key measures to avoid or minimize effects on rare plants, rare ecosystems, and wetland ecosystems were include:

- Identify and buffer the extent of any known rare plant communities, and other sites identified as sensitive during preconstruction surveys so they may be avoided;
- Continue to complete species at risk surveys during wetland and watercourse alteration permitting;

5.7.6 Significance

5.7.6.1 Magnitude

The potential effects of vegetation clearing on rare plants is expected to be low in magnitude. There is the potential for rare plants and rare ecosystems to be present within the proposed Project area, though none are expected to be impacted.

5.7.6.2 Probability

There is a low likelihood of effects on rare plants, rare and wetland ecosystems as there were no rare plants or ecosystems identified within the footprint of the infrastructure.

5.7.6.3 Geographical Extent

The extent of the potential effect on ecosystems would be within the proposed Project infrastructure, specifically, the area to be cleared for turbines and access roads.

5.7.6.4 Duration and Frequency

The duration of the effect on rare plants and ecosystems would be short term and infrequent during vegetation clearing provided buffers are effective.

5.8 Wetlands

The distribution and abundance of wetlands in the Project Area was determined through a review of the Nova Scotia Wetland Atlas database (NSE 2012 Wetland Inventory) and air photo interpretation. Air photo interpretation, using 1:10 000 scale color air photos taken in 2001, was conducted within the property that comprises the wind farm site and within a 50 m buffer of any proposed Project components, including transmission line route, tower locations or sub-station. This exercise was conducted by an ecologist familiar with the Project area and experienced in delineating wetlands. Wetlands were identified using topographic location and the physiognomy of the plant communities.

Wetlands detected during the air photo interpretation were classified using the Canadian Wetland Classification System (National Wetlands Working Group Canada 1987). This system categorizes wetlands into five general types, bogs, fens, marshes, swamps, and shallow water wetlands based on characteristics of vegetation, substrate and hydrology. In instances where more than one wetland type was present in a particular wetland, the wetland was classified as a wetland complex.

Table 18. Wetland Area and Abundance in the Project Area by Wetland Type

Wetland Type	Wetland Area (Ha)	Proportion of Wetland Cover in Project Area (%)	Number of Wetlands
Bog	117.9	35.7	18
Low Shrub	41.9	12.7	9
Sphagnum	0.03	0.01	1
Treed	75.9	22.9	8
Fen Type	0.02	0.01	1
Graminoid	0.02	0.01	1
Marsh Type	107.7	32.7	50

Wetland Type	Wetland Area (Ha)	Proportion of Wetland Cover in Project Area (%)	Number of Wetlands
Graminoid	21	6.4	11
Low Shrub	86.7	26.3	39
Swamp	99.5	30.1	37
Tall Shrub	6.6	1.9	2
Treed	92.9	28.1	35
Shallow Water Wetland	5.3	1.6	1
Totals	330.5	100	107

The Atlas and air photo interpretation exercise revealed the presence, or potential presence of up to 107 wetlands (330.5 ha) in the Project Area. Wetland types present included low shrub, sphagnum and treed bogs, graminoid and low shrub marshes, tall shrub and treed swamps, and graminoid dominated fen. One other wetland type that was included in the wetland analysis included a small shallow water wetland. The most abundant wetland type in the Project Area are low shrub marshes (26.3 % of wetlands) and they account for 86.7 ha (26 %) of the wetland area. The slightly less numerous treed swamp (35 occurrences) actually account for 92.3 ha (28 %) of the overall wetland area in the Project Area.

Twenty-three (23), or 21 % of the wetlands in the Project Area are relatively small (< 1 ha in size) while the majority of the wetlands are between 1 and 4 ha in area (62 wetlands – 58 %). 27 wetlands (19 %) are between 4 and 20 ha in size and the two largest wetlands, 25 and 44 ha respectively)

The largest wetlands are located in the northwest portion of the Project Area, along the edge of the plateau where large areas of relatively flat terrain are present which allows poorly drained conditions to develop. Wetlands are scattered throughout the Project Area but appear to be concentrated to the northeast portion of the Project Area where most wetlands tend to be small. Each of the wetland types present in the Project Area is discussed below, followed by a description of wetland functions.

In an effort to minimize disturbance and identify areas of potential impact to wetlands, wetland boundaries were delineated (ground trothed) where they intersected with proposed access roads or turbine pads. Complete delineation and functional analyses will be completed as required for wetland alteration permitting process prior to construction. Field verified wetland boundaries are shown in detail on Figure 9, Index A-D. A summary of wetland types is provided in Table 19 below, followed by a description of each wetland type.

Table 19. Summary of field verified wetland types

Index	Access road to	Descriptor	Wetland Type
A	T26	Heading west along collector road	Shrub Swamp
A	T26	Heading west along collector road	Low shrub bog
A	T26	Heading west along collector road	Open graminoid bog (to the south)
A	T26	Heading west along collector road	Mixed wood treed swamp
A	T26	Heading west along collector road	Tall shrub Bog
A	T27	Heading north towards T27	Shrub Swamp
A	T27	Heading north towards T27	Watercourse with treed swamp buffer

Index	Access road to	Descriptor	Wetland Type
A	T27	Heading north towards T27	Treed swamp to the west
A	T27	Heading north towards T27	Open graminoid fen to the east
A	T28	Heading northeast to T28	Mixed wood treed swamp
A	T30	Heading northeast from T29	Tall shrub swamp
A	T30	Heading northeast from T29	Clear-cut treed swamp
A	T30	Heading northeast from T29	Clear-cut treed swamp
B	T18	Directly east of T18	Clear-cut treed swamp
B	T19	Heading southwest from T18	Clear-cut treed swamp and treed bog mosaic - unable to delineate fully in snowy conditions
B	T20	Heading southwest from T19	Shrub bog
B	T20	Heading southwest from T19	Shrub bog
B	T20	Heading southwest from T19	Mixed wood treed swamp
B	T21	Heading west from T20	Tall shrub swamp
B	T21	Directly west of T21	Softwood treed swamp
B	T22	Heading northeast from T21	Clear-cut treed swamp
B	T23	Heading northeast from T22	Mixed wood treed swamp to the north of access road
B	T24	Heading northeast from T23	Treed swamp to the north of access road
B	T24	Heading northeast then north from T23	Tall shrub bog
B	T24	Heading northeast then north from T23	Shrub swamp
B	T24	Heading northeast then north from T23	Shrub swamp
B	T25	Heading east from T24	Tall shrub swamp
B	T18	Heading south from T25	Riparian treed swamp
C	T17	Heading north from collector road & T15	Tall shrub swamp
C	T17	Heading north from collector road & T15	Low shrub bog
C	T13	Heading west from T12	Softwood treed swamp to the north and west
C	T14	Heading north from T12	Riparian treed swamp & tall shrub swamp
C	T8	Heading southwest from main access road	Mixed wood treed swamp
C	T9	Heading north from main access road	Softwood treed swamp to the northwest of T9
C	T7	Heading south from main access road	Riparian mixed wood treed swamp
C	T10	Heading north from main access road	Graminoid swamp
C	T6	Heading west from main access road, along alternate southern route	Riparian treed swamp
C	T6	Heading west from main access road, along alternate southern route	Low shrub bog
C	T6	Directly east of T6	Softwood treed swamp
D	T5	Heading south from T6	Softwood treed swamp

Index	Access road to	Descriptor	Wetland Type
D	T5	Heading south from T6	Graminoid swamp
D	T30	Heading northwest from T4	Clear-cut treed swamp
D	T30	Heading northwest from T4	Open graminoid bog
D	T30	Heading northwest from T4	Clear-cut treed swamp
D	T30	Heading northwest from T4	Clear-cut treed swamp
D	T2	Heading west from T1	Softwood treed swamp to the north of T1
D	T2	Heading west from T1	Riparian shrub swamp to the south of T1
D	T2	Heading west from T1	Clear-cut treed swamp
D	T2	Heading west from T1	Mixed wood treed swamp
D	T2	Heading west from T1	Treed swamp to the northwest of T2

The landscape within the East Bay Hills Wind Power Project area is positioned at a primary watershed divide [Salmon & Mira River, and Grand River] and is generally flat at the top of the plateau. Where topography is flat or at a low slope, wetland formation is prominent given the headwater position and soil types within the development area. Fifty wetlands were identified that lie within or adjacent to proposed project infrastructure. These wetland boundaries were assessed where they intersect with proposed project infrastructure. Complete delineation and functional assessment, including identification of wetland complexes will be completed to support a wetland alteration application approval in advance of project construction. The total proposed wetland impact area per tertiary watershed basin is provided in Table 20 below.

Table 20. Total wetland impact area per tertiary watershed basin

Tertiary Watershed Name	Proposed Wetland Impact area
Grand 11F15_77	0.3 ha
Grand 11F15_71	1.52 ha
Grand 11F15_67	1.29 ha
Mira 11F15_62	0.18 ha
Mira 11F15_59	1.46 ha
Mira 11F15_63	0.16 ha
Grand 11F15_75	0.09 ha

The above represent the total impact area per tertiary basin and therefore the impact per wetland complex is smaller. Therefore all impacts remain below 2 hectares. Studies of the wetlands for species at risk during vegetation surveys did not reveal the presence of species at risk in any wetland encountered. Therefore further work on wetland impacts will be associated with function characteristics.

5.8.1 Wetland Types

5.8.1.1 Bogs

Bogs are peatlands in which the water table is situated at or near the surface. The rooting zone is typically isolated from nutrient rich groundwater resulting in the development of an acidic and nutrient impoverished environment that promotes the growth of sphagnum moss. Sphagnum moss is effective at scavenging available cation nutrients which it replaces with hydrogen ions to maintain an ionic balance. This further increases the acidity of the wetland which greatly reduces decomposition rates leading to the accumulation of peat. Bogs are uncommon in the Project Area and are restricted to 18 of the 107 wetlands however, where the conditions are suitable, they can develop into large habitats such as the two largest wetlands in the Project Area. They are typically restricted to flat low lying areas where groundwater discharge is limited.

Low shrub bog and treed bog are the bog types that are present in the Project Area. Low shrub bog is typically found in the centers of the bogs where conditions are wetter and particularly nutrient deficient. These areas also represent an earlier stage in plant community succession on the bog. The dominant species of this bog type are sphagnum moss (*Sphagnum spp*.), sheep laurel (*Kalmia angustifolia*), pale laurel (*Kalmia polifolia*), leatherleaf (*Chamaedaphne calyculata*), and rhodora (*Rhododendron canadense*).

Treed bog is typically found around the landward margin of the bogs. These areas represent a later stage in plant community succession on the bog and are also situated close enough to sources of groundwater to be somewhat more fertile than the center of the bog. This bog type differs from the low shrub bog mainly in the presence of an open tree canopy composed mainly of stunted black spruce (*Picea mariana*) and American larch (*Larix laricina*).

Sphagnum bog is an entirely closed area of bog that is entirely wet and does not show an intergrade of habitat with dry hummocks that can support low shrubs or trees from growing. The primary vegetation is *Sphagnum* moss. These wetlands show up in aerial photography as large brown patches, especially if the photography was taken during the spring. While it is a common wetland type in this Ecodistrict, there is just one example within the Project Area that could be readily identified as a sphagnum bog. Field investigations in June 2012 may identify more of this type of wetland.

5.8.1.2 Fens

A fen is similar to a bog with one primary exception. Water moves through a fen, either from an outside source, or a groundwater source. This exchange of water raises the pH so that sphagnum moss does not dominate like it does in a bog. Visually, fens are strikingly different from bogs as green ribbons running through the fen where green vegetation is growing along the moving waters' edge.

While no fens were identified intersecting with proposed Project infrastructure, fens are present within the Project Area. Fens within the Project area are typically graminoid dominated, with vegetation such as *Juncus* ssp (rushes), *Eleochris* ssp (spikemosses) and blue joint reedgrass (*Calamagrostis canadense*) are found growing.

5.8.1.3 Marsh

Marshes are mineral wetlands or peatlands that are periodically inundated by standing or slow flowing water. Surface water levels generally fluctuate seasonally. During drier periods declining water levels may expose areas of matted vegetation or mud flats. The surface waters are typically rich in nutrients. The substrate is usually mineral material although well-decomposed peat may occasionally be present. Marshes typically display zones or surface patterns consisting of pools or channels interspersed with patches of emergent vegetation, bordering wet meadows and peripheral bands of shrubs or trees.

Graminoid and Low Shrub marsh are marsh types present in the Project Area, although none were identified to be intersected by Project infrastructure. Graminoid marsh occurs where there is a low lying area around a basin or wetland, such as the edge of a pond, old beaver meadow, or a low gradient stream. Marshes that have developed in anthropogenic basins or in disturbed wetland habitat typically support a mixture of graminoid species including broad-leaved cat-tail (*Typha latifolia*), cottongrass bulrush (*Scirpus cyperinus*) and rushes (*Juncus spp*.). Most fresh marshes support a sparse shrub layer composed mainly of speckled alder (*Alnus incana*) and narrow-leaved meadowsweet (*Spirea alba*). Low Shrub marsh habitat occurs in a variety of locations including riparian areas, anthropogenic (human-made) basins, tracks and at the landward edge of ponds. Plant species composition is highly variable depending on the hydrology and successional status of the marsh. Low Shrub marshes are often found to support a dense sward of alder, black holly (*Ilex veticillata*), and narrow-leaved meadowsweet.

5.8.1.4 Swamp

Swamps are mineral wetlands or peatlands with standing water or water flowing slowly through pools or channels. The water table is generally at or near the surface of the swamp. There is internal water movement from the margin of the swamp or from other sources of mineral enriched waters. If peat is present, it consists mainly of well-decomposed wood, underlain at times by sedge peat. The vegetation typically consists of a dense cover of trees or shrubs, herbs and some mosses.

Two types of swamp are present in the Project Area including coniferous treed swamp (deciduous, coniferous, or mixed wood), and tall shrub swamp. Coniferous treed swamps in this area of Nova Scotia typically have a tree layer composed largely of black spruce and balsam fir with scattered tamarack (*Larix laricina*) and the potential for red maple at the drier edges. The shrub understory of this wetland type is typically composed largely of speckled alder, black holly and mountain holly (*Nemopanthus mucronata*).

Tall shrub swamps typically have a diffuse tree canopy composed largely of red maple, white ash, balsam fir, and black spruce. The shrub understory consists of a moderately dense shrub layer dominated by speckled alder, black holly and narrow-leaved meadowsweet.

5.8.1.5 Shallow Water Wetlands

Shallow water wetlands are characterized by the presence of open expanses of shallow water that are less than 2 m deep in summer and occupy greater than 75% of the surface area of the wetland. Shallow water wetlands typically support a heavy growth of submerged aquatic plants such as pondweeds (*Potamogeton spp*.) or floating leaf aquatic plants such as yellow pond-lily (*Nuphar variegata*) and American water-lily (*Nymphaea odorata*). There is one wetland in the Project Area that has been classified as this type. Shallow water wetlands are generally uncommon and are usually restricted to anthropogenic basins such as fire ponds and impoundments.

5.8.2 Wetland Functions

Wetlands provide a number of functions including water flow moderation, groundwater recharge, shoreline and erosion protection, climate regulation, water quality treatment, nutrient and organic export, carbon sequestration and storage, and biological productivity and support for biodiversity. In instances where wetlands are adversely affected by a development, the functions associated with the affected wetland must be assessed as part of the wetland functional analysis. The wetland functional analysis is used to determine the functional attributes of the potentially affected wetland so that its value can be assessed. This assessment is then used to first determine whether permission to alter the wetland can be granted and second to determine what wetland functions must be recreated as part of a wetland compensation program, should permission to alter the wetland be granted.

While it was not feasible to conduct wetland functional analyses on all wetlands located within the Project Area, in the event that the Project is likely to affect wetland habitat, site specific wetland functional analyses will be conducted by a qualified wetland ecologist for the potentially affected wetlands in the summer of prior to any wetland disturbance. These analyses would be used to support application for Approvals for wetland alteration.

The following provides observations of the functionality of wetlands encountered by Project infrastructure.

5.8.2.1 Adjacent Land Condition and Integrity

Land throughout the Project Area is undeveloped, and in natural condition, with the exception of timber harvesting activities and associated forestry roads. Wetlands encountered throughout the Project Area have natural (although sometimes clear cut) undeveloped buffer zones which facilitate water quality improvement and wildlife habitat. As the Project Area is primarily located on a plateau, and it spans a primary watershed divide, slopes adjacent to wetlands are generally gentle to moderate, with the noteworthy exception of Wetland 18, near the candidate turbine 20, which has steep slopes along the wetland boundary.

5.8.2.2 Documented Important Features

5.8.2.3

No wetlands of special significance are present within the Project Area, and no conservation easements, or compensation agreements apply to wetlands within the site. No calcareous fens, black ash or cedar swamps were identified within the Project Area. The Project Area is not located within a drinking water protected area, nor is it located within a floodplain upstream of or within a populated area. It is not a Federal, Provincial or Municipal area of interest.

5.8.2.4 Hydrologic Condition and Integrity

As the Project Area exists on a primary watershed divide between the Salmon and Mira Rivers primary watershed and the Grand River primary watershed, some of the wetlands within the Project Area will be headwater wetlands, which are the source of first order streams. Many of the wetlands located within the Project Area are geographically isolated treed swamps, as this is the more common wetland type in Nova Scotia. Aside from occasional minor rutting from timber harvesting operations, wetland soils are generally undisturbed, and the water source throughout the Project Area is natural. None of the wetlands within the site are tidal wetlands, and none experience coastal storm surges. Wetlands throughout the Project Area have natural, unaltered hydrologic condition.

5.8.2.5 Water Quality

Wetlands encountered in the Project Area do not have storm water, wastewater or agricultural runoff as the water source. Wetlands encountered offer varying levels of storm water or floodwater attenuation, but none have significant floodwater or storm water inputs. In general, wetlands encountered throughout the Project Area provide water quality improvement functions, with little to no evidence of excess nutrient loading or contamination.

Most wetlands found in the Project Area that are hydrologically linked to downstream freshwater or marine ecosystems can be expected to provide nutrient and organic exportation function to varying degrees. The importance of the function would be related to the size of the wetland and the ability of nutrients and organic matter to flow through the system.

5.8.2.6 Groundwater Interactions

The ability of wetlands to contribute to groundwater recharge is difficult to assess. However, it is possible that some of the small wetlands situated in perched basins near the tops of hills could contribute to local groundwater recharge. The importance of this function in these wetlands would depend on their location.

5.8.2.7 Shoreline Stabilization and Integrity

Some riparian wetlands provide effective protection from shoreline/stream bank erosion. These wetlands are able to absorb energy from fast-flowing water without experiencing extensive damage to vegetation or wetland substrates. No wetlands encountered in the Project Area are identified to provide this function.

5.8.2.8 Plant Community, Fish and Wildlife Habitat and Integrity

None of the wetlands encountered within the Project Area have dominant non-native or invasive species. Some of the wetlands encountered have canopy coverage removed during timber harvesting operations. Aside from timber harvesting, no disturbance of vegetation communities was identified, and the vegetation communities are in high or exceptional condition. The Project Area has a high level of interspersion of wetland types, with several wetlands of each wetland type present within a 1km radius. This high level or wetland interspersion provides valuable wildlife habitat functions, and no significant barriers to wildlife movement across the landscape were identified. In general wetlands encountered within the Project Area provide habitat for amphibians, reptiles and mammals. Those wetlands with open water or associated with fish bearing watercourses may provide habitat for waterfowl, waterbirds and fish.

One pair of Rusty Blackbirds was observed in a wetland between candidate turbine 7 and 8. The Rusty Blackbird prefers black spruce and larch dominated bogs, with a dense shrub and sapling layer. This species is ranked “yellow” provincially (NSDNR, 2012), as Special Concern under SARA, and as Endangered under the NSESA.

The value of a wetland in regards to biological productivity and biodiversity cannot be accurately assessed without conducting site specific surveys; however, there are some general patterns that can be used to help identify wetlands that may have high functionality in regards to biological productivity and biodiversity. Typically, larger and more fertile wetlands support larger numbers of species and are more productive. Uncommon habitat types tend to support greater numbers of rare species than common habitat types. Hostile environments often support highly specialized species that cannot persist in more benign environments and are therefore rare or geographically restricted in their range. Based on these assumptions, several wetlands in the Project Area can be expected to support high species richness, have high potential to support rare species or be highly productive.

5.8.3 Effects of the Project

Wherever possible, turbines and access roads have been moved to avoid wetlands. However, due to the terrain and topography within the Project area, not all wetlands can be avoided. For the Project to proceed, impacts to a small number of wetlands will be required. Extensive field assessment work was completed to try and ensure avoidance occurred, but the characteristics of the Project area do not make complete avoidance possible.

Potential impacts to the wetland systems may result from construction, operation and maintenance of the Project that may result in infilling, encroachment by roads or turbine sites, and removal of vegetation within wetland areas. However, based upon the characteristics of wetlands within the Project area, a reasonable expectation of effects that may be anticipated would be limited to vegetation removal/alteration, wildlife displacement and effects to drainage. As per Table 20 the total extent of wetland impact within the Project boundary is approximately 5 hectares. The 5 hectares represents the total anticipated impact area. Subsequent breakdown per tertiary basin indicates all impacts remain below 2 hectares. Studies of the wetlands for species at risk during vegetation surveys did not reveal the presence of species at risk in any wetland encountered. Therefore further work on wetland impacts will be associated with function characteristics.

However, the following generalized statements can be made with respect to wetland functions:

There is a low likelihood of contamination as the Project requires minimal use of gasoline, diesel, motor oil, and hydraulic oil, all of which is contained according to appropriate regulations. No vehicles transporting large volumes of TDG regulated goods will be present.

Construction-related activities having a potential impact upon wetlands include those resulting in the potential removal (or fragmentation) of habitat through vegetation clearing and removal (long-term impacts; > 5 years). These activities, primarily associated with clearing of vegetation for purposes of constructing permanent infrastructure, include upgrades to existing roads and the building of new roads, crane pads and foundations for turbines and substations. Although the proposed infrastructure largely avoids these areas, the connector roads and collector lines are expected to cross wetland areas. Despite a localized moderate impact rating for the proposed activities the majority of the infrastructure is situated within areas of mesic soil moisture and there is an expected low impact upon the identified wetland ecosystems.

5.8.4 Mitigation

Wherever possible, turbines and access roads have been located to avoid wetlands. However, due to the terrain and topography within the Project area, not all wetlands can be avoided. Extensive field assessment work was completed to try and ensure this occurred, but the characteristics of the Project area do not make complete avoidance possible.

Following Project approval, wetlands that may be impacted will be fully delineated and complete functional analyses and wetland alteration applications submitted to NSDOE for approval for alteration of required wetlands. This will also allow CBHI, in consultation with the NSDOE, to effectively create a compensation plan for wetland impacts. The reason this has not been completed at this stage is that CBHI is looking to ensure that the Project receives environmental approval and energy purchasers prior to proceeding to detailed permitting wetland alterations and compensation planning. This is the same process used by many proponents.

As a function of the wetland alteration application, the following mitigation planning sequence will be used. This is a step-wise approach that achieves wetland conservation through the application of a hierarchical process of alternatives as follows:

1) avoidance of impacts – This step has already been completed to the greatest extent possible;
2) minimization of unavoidable impacts; and,
3) Compensation for residual impacts that cannot be minimized.

5.8.5 Significance

5.8.5.1 Magnitude

The potential effects on wetland ecosystems are anticipated to be low to moderate magnitude. Prior to any site specific impacts to wetlands, full functions assessments will be submitted as a component of the permitting process and CBHI will complete alteration and compensation plans in consultation with DOE.

5.8.5.2 Probability

If a wetland is impacted during construction, and permitted accordingly, the probability of effects on a specific wetland are certain. If avoidance is not possible, alteration and compensation plans will be created in consultation with DOE.

5.8.5.3 Geographical Extent

The extent of the potential effect on wetlands would be within the proposed Project footprint, specifically, the area to be cleared for the proposed Project infrastructure.

5.8.5.4 Duration and Frequency

The duration of the effect on wetland ecosystems would be short term given compensation mechanisms in place with DOE.

5.9 Birds

The Project Area includes parts of three Maritime Breeding Bird Atlas (MBBA) map squares: 20PR77, 20PR87 and 20PR88. In the first breeding bird atlas (1986-1990) (Erskine, 1992), there was limited reports of bird species in each of these squares (25, 71, and 9 species observed respectively) compared with the effort for the second breeding bird atlas (2006-2010) (Lepage, 2009) in which 88, 90, and 71 species were recorded as possible, probable or confirmed breeding in the squares. Observations for the second breeding atlas have recorded more evidence of breeding species that were not recorded in 1986-1990, probably due to the increased effort (number of survey hours) for each of the squares. Survey time totaled 15 hours for the three squares during the first atlas compared to a total of 68 hours during the second atlas (Lepage, 2009). A review of the ACCDC database was conducted to obtain a list of provincially rare or sensitive bird species found within a 100 km radius of the Project Area. A model was employed by the Project Team to determine the likelihood of the presence of the ACCDC ranked bird species within the Project Area. Likelihood of presence was determined by crosschecking the habitat requirements of the ACCDC listed species with the habitat description within the Project Area.

The Project Area contains a prominent plateau, which creates a ridgeline land feature that may concentrate birds during migration. It is possible that migrating flocks of birds will fly along the north or west side of the Project Area, following the edge of the plateau. Bird survey information collected for this Project indicates that the plateau may not be land feature that concentrates birds during migration (Horn, 2007). During fall migration surveys in 2007 and 2012, no significant movement of raptors, or migratory birds were noted. The Project Area itself is predominantly forested, although it is approximated that 90% of the entire Project Area has been disturbed by forestry activity at some point in the last several decades (e.g., clear cut, gravel pit, roads).

5.9.1 Spring Migration 2008

Spring migration surveys were conducted over 11 days between mid-April and early June, 2008. The majority of surveys occurred during the peak of migration in May. There was no evidence of a migratory peak of passage in any of the species or groups.

The majority of birds observed were small flocks of warblers, recorded throughout the Project Area and were flying or residing below 50 metres. Waterfowl observations were rare and no evidence of waterbirds migration was observed. The plateau land feature dominates the Project Area but was not found to be a strong channel for migrants. A possible explanation could be that there is little land mass to the north of the Project Area where birds could be flying towards, or from. The results indicate that small flocks of migrating passerines may move through the Project Area, their location and numbers likely dependant on prevailing wind conditions.

The East Bay Hills are not known to be a major migration pathway through the province (Horn 2007a). With little land to their north and no topographic features (e.g. ridges or peninsulas) that would strongly channel migrants, the hills are not geographically situated or configured as expected of such a site, nor were migrants frequently found on either this or a previous fall survey (Horn 2007b)

The present survey suggests that, on some days, small flocks of migrating passerines pass through parts of the project area, their location and numbers likely depending on prevailing winds.

5.9.2 Breeding Season 2008

Breeding surveys consisted of point counts followed by standardized area searches for additional species in each habitat type within the Project Area. A total of 84 bird species were recorded during these surveys (Horn, 2008, *Appendix* IV. BIRD STUDIES).

A variety of raptors were recorded in the Project Area during the breeding season, without firm evidence of breeding, although Bald Eagle (*Haliaeetus leucocephalus*), Osprey (*Pandion haliaetus*), Northern Harrier (*Circus cyaneus*), Northern Goshawk, Red-tailed Hawk (*Buteo jamaicensis*), American Kestrel (*Falco sparverius*), and Merlin (*Falco columbarius*) are suspected of breeding in or near the Project Area. No raptor nests were found in the Project Area in either 2008 or 2012.

In 2008, 343 individual birds were counted during spring and breeding surveys. The average number of individuals / count was 6.9 birds / point count/day.

Northern Goshawk are listed as “yellow” by NSDNR but do not have any federal status under *SARA*. They have been assessed as Not at Risk by COSEWIC. This species is the largest of the Accipiter group of raptors and is a mature forest specialist. It hunts on the wing and takes prey items as small as squirrels and as large as crows and snowshoe hares. The Project Area has very limited mature forest, and that being restricted to steep watercourse gullies where construction of the Project will not interfere with those stands of trees.

Notable observations among other bird groups included several species of conservation concern and included: Common Nighthawk (*Chordeiles minor*), Canada Warbler (*Wilsonia canadensis*), Olive-sided Flycatcher, Rusty Blackbird, Gray Jay (*Perisoreus canadensis*), and Boreal Chickadee (*Poecile hudsonica*).

Common Nighthawk is not recorded within the ACCDC data base search, and was not observed during migration or breeding bird studies but has been listed as a Probable breeder within the MBBA squares that make up the Project Area. Common Nighthawk is listed as Threatened under *SARA*, and as Threatened under the *NS ESA*.

The Canada Warbler is ranked “yellow” provincially (NSDNR, 2012), “threatened” by COSEWIC (COSEWIC 2008), and “endangered” by the NSESA. This species uses a wide range of deciduous, coniferous and mixed forests, with a well-developed shrub layer and a structurally complex forest floor. It is most abundant in moist, mixed forests. It also occurs in riparian shrub forest on slopes and in ravines, in stands regenerating after natural and anthropogenic disturbances and in old-growth forests with canopy openings and a well-developed shrub layer (COSEWIC, 2008).

Olive-sided Flycatcher is also ranked “yellow” provincially (NSDNR, 2012) and Threatened under SARA and the NSESA. This flycatcher species prefers to nest in boreal forests (*i.e.,* spruce and fir forests) adjacent to bogs or other wet habitat. This species was observed during breeding bird surveys for this Project in 2008, and is listed as a Probable breeder in the MBBA squares that make up the Project Area. There is matching habitat within the Project Area although it is confined to wetland habitat in the Project Area and is not expected to be disturbed by Project construction or operation.

Rusty Blackbird is also ranked “yellow” provincially (NSDNR, 2012), as Special Concern under SARA, and as Endangered under the NSESA. Rusty Blackbird tend to breed in wet shrubby habitat characterized by forested wetlands, riparian edges of slow-moving streams, peat bogs, sedge meadows, marshes, swamps, beaver ponds and pasture edges. This species was observed during breeding bird surveys for this Project in 2008, and is listed as a Confirmed breeder in the MBBA squares that make up the Project Area. There is matching habitat within the Project Area, however, Rusty Blackbird breeding habitat is confined to wetland habitat in the Project Area and is not expected to be disturbed by Project construction or operation.

Boreal Chickadee is a "yellow" listed species (NSDNR, 2012) but the species has not been assessed by COSEWIC and has no status under *SARA*. The Boreal Chickadee occurs almost entirely in coniferous forests, but is found to a lesser extent in mixed woodlands. The forest habitats utilized by Boreal Chickadees are often damp, well-shaded coniferous woods. This habitat is found within the Project Area.

Gray Jay is a "yellow" listed species in Nova Scotia (NSDNR, 2012) but does not have any *SARA* status and has not been assessed by COSEWIC. Gray Jays are widespread species in boreal and sub-alpine forests, and frequently approach people for food.

Habitats for these rare or sensitive species do exist in the Project Area, although given the small numbers recorded during the surveys and the extent of fragmented habitat in the Project Area, it is not anticipated that the Project Area provides important habitat for these species. Further assessments to confirm breeding status for species of conservation interest were conducted in 2012 follow-up surveys within the Project Area with the updated turbine layouts and project scope.

5.9.3 Breeding Season 2012

Breeding season surveys were conducted in 2012, including a series of fifty point counts, and three area searches. A total of 60.25 hours (1455 minutes) of survey effort was conducted between June 14, 2014, and July 12, 2012, in an effort to identify breeding bird usage of the Project Area. Table 21 identifies survey dates, weather conditions, species richness, and abundance of bird observations.

Table 21. Breeding Season survey efforts, 2012.

Date	Cloud cover	Temperature Range	Wind	# of Individuals	# of Species	Search effort (mins)
Point count surveys						
14-Jun-12	Clear - light	12-18˚C	Light	95	26	100
17-Jun-12	Clear - light	8-12˚C	Light	102	30	100
18-Jun-12	Overcast - clear	8-14˚C	Light	175	36	120
19-Jun-12	Thin fog - clear	7-14˚C	Calm - light	126	28	100
21-Jun-12	Partially cloudy	12-14˚C	Calm	88	25	80
01-Jul-12	Clear - light	15-25˚C	Calm - light	116	25	100
04-Jul-12	Light fog - clear	15-22˚C	Calm - light	80	22	80
05-Jul-12	Cloudy - clear	16-20˚C	Light - moderate	91	30	80
08-Jul-12	Clear	17-22˚C	Calm - moderate	103	25	100
10-Jul-12	Clear	15-20˚C	Calm - moderate	81	27	80
12-Jul-12	Clear	16-20˚C	Light	55	23	30
Area search surveys						

Date	Cloud cover	Temperature Range	Wind	# of Individuals	# of Species	Search effort (mins)
23-Jun-12	Fog - cloudy	11-15˚C	Light	59	18	210
26-Jun-12	Fog - cloudy	14-16˚C	Light - moderate	53	16	195
12-Jul-12	Clear	20-25˚C	Light - moderate	26	10	80
			Total	1250	61	1455

A total of 1250 individuals representing 61 species were observed during the breeding season; the three most abundant of which were the White-throated Sparrow (165 individuals, 13.2%), Dark-eyed Junco (98 individuals, 7.8%) and Magnolia warbler (95 individuals, 7.6%). Over 93% of species identified are passerines, or songbirds, with very few waterbirds, shorebirds or raptors identified. No Owls were identified during the breeding season.

Throughout the breeding season, any breeding evidence was noted, as defined by the Maritime Breeding Bird Atlas. A total of thirteen species are identified as confirmed breeders, based on observations made during field surveys. The species with confirmed breeding status are the Black-capped Chickadee, Black-throated Green Warbler, Common Grackle, Common Yellowthroat, Dark-eyed Junco, Golden-crowned Kinglet, Gray Jay, Hairy Woodpecker, Lincoln's Sparrow, Mourning Warbler, Spruce Grouse, Swamp Sparrow, and White-throated Sparrow. Twenty-six species were identified as probable breeders, while 22 species were only identified as possible breeders. Table 22 below provides details of species identified, along with their abundance, highest breeding evidence, and conservation status. This data is shown graphically in terms of relative abundance of species in Figure 1.

Table 22. Results of breeding season bird surveys in 2012

Code	Species	Abundance	Highest Breeding Evidence	Conservation Status
ALFL	Alder flycatcher	29	Probable	
AMCR	American Crow	5	Possible	
AMGO	American Goldfinch	15	Possible	
AMRE	American Redstart	3	Probable	
AMRO	American Robin	45	Probable	
BAWW	Black-and-white warbler	12	Probable	
BBWO	Black-backed woodpecker	4	Probable	DNR Yellow
BCCH	Black-capped chickadee	17	Confirmed	
BHVI	Blue-headed vireo	18	Probable	
BLBW	Blackburnian warbler	3	Possible	
BLJA	Blue jay	7	Possible	
BOCH	Boreal chickadee	23	Probable	DNR Yellow
BRCR	Brown creeper	5	Probable	
BTNW	Black-throated green warbler	22	Confirmed	
BWHA	Broad-winged hawk	1	Possible	

Code	Species	Abundance	Highest Breeding Evidence	Conservation Status
CEDW	Cedar waxwing	3	Possible	
COGR	Common Grackle	6	Confirmed	
COLO	Common Loon	10	Probable	DNR Red
COYE	Common Yellowthroat	81	Confirmed	
DEJU	Dark-eyed junco	98	Confirmed	
DOWO	Downy woodpecker	2	Possible	
GCKI	Golden-crowned kinglet	14	Confirmed	DNR Yellow
GRAJ	Gray jay	19	Confirmed	DNR Yellow
GRYE	Greater yellowlegs	8	Probable	DNR Yellow
HAWO	Hairy woodpecker	8	Confirmed	
HETH	Hermit Thrush	85	Probable	
LEFL	Least flycatcher	1	Possible	
LISP	Lincoln's sparrow	50	Confirmed	
MAWA	Magnolia warbler	95	Probable	
MODO	Mourning dove	1	Possible	
MOWA	Mourning warbler	24	Confirmed	
NAWA	Nashville warbler	14	Probable	
NOFL	Northern flicker	9	Probable	
NOPA	Northern parula	2	Possible	
OSFL	Olive-sided flycatcher	14	Probable	Threatened (COSEWIC, SARA, NSESA), DNR Red
OVEN	Ovenbird	19	Probable	
PAWA	Palm warbler	35	Probable	
PIGR	Pine grosbeak	8	Possible	DNR Red
PUFI	Purple finch	1	Possible	
RBNU	Red-breasted nuthatch	3	Possible	
RCKI	Ruby-crowned kinglet	40	Probable	DNR Yellow
REVI	Red-eyed vireo	69	Probable	
RTHA	Red-tailed hawk	3	Probable	
RUBL	Rusty Blackbird	2	Probable	SC (COSEWIC & SARA), Endangered in NSESA, DNR Red
SAVS	Savannah sparrow	1	Possible	
SOSP	Song sparrow	21	Probable	
SPGR	Spruce grouse	13	Confirmed	
SWSP	Swamp sparrow	7	Confirmed	
SWTH	Swainson's thrush	25	Probable	
TEWA	Tennessee warbler	1	Possible	DNR Yellow

Code	Species	Abundance	Highest Breeding Evidence	Conservation Status
TRES	Tree swallow	2	Possible	DNR Yellow
UNBI	unidentified bird	5	Possible	
UNDU	unident. Duck	1	Possible	
UNWO	unident. Woodpecker	7	Possible	
WISN	Wilson's snipe	1	Probable	DNR Yellow
WIWR	Winter wren	1	Probable	
WTSP	White-throated sparrow	165	Confirmed	
WWCR	White-winged crossbill	2	Possible	
YBFL	Yellow-bellied flycatcher	36	Probable	
YRWA	Yellow-rumped warbler	21	Probable	
YWAR	Yellow warbler	8	Possible	
Total:	61	1250		

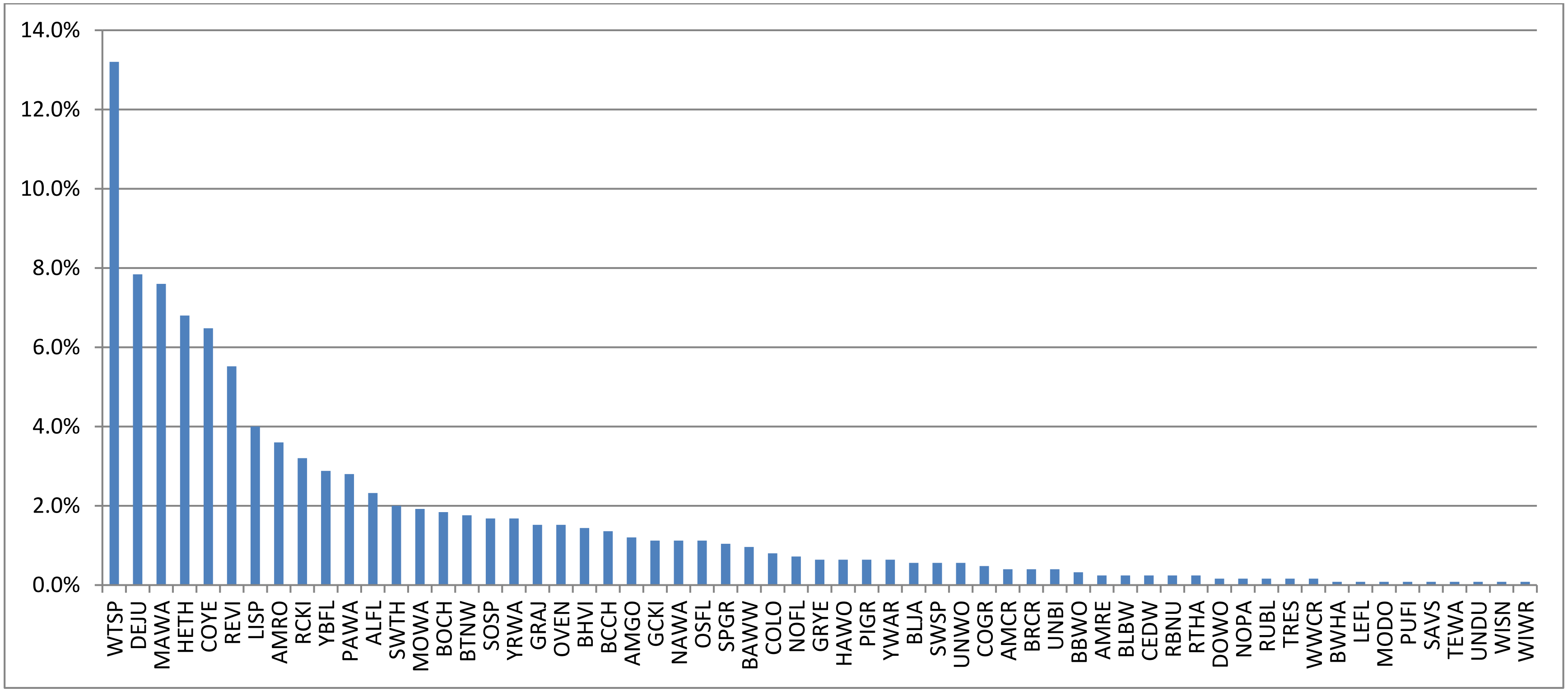


Figure 1. Relative abundance of species observed during breeding season monitoring, 2012. Species codes are provided in Table 16.

Results from point count surveys were analyzed based on major habitat type. For this analysis, area search data was omitted, as habitat or location specific data for each observation is not available (the main purpose of the area search survey is to complement the species list, rather than providing quantifiable, location specific data). The majority of the habitat within the Project Area is composed of coniferous forest or disturbed habitat. Twenty point counts were established within each of these habitat types. Deciduous forest is less frequent; however, so only ten point count locations were established within this habitat type. Figure 2. Species richness and abundance by habitat type. below shows the total number of species identified within each major habitat type, along with relative abundance, which was calculated based on number of individuals per point count location in an effort to correct for the fewer number of point count surveys conducted in deciduous forest.

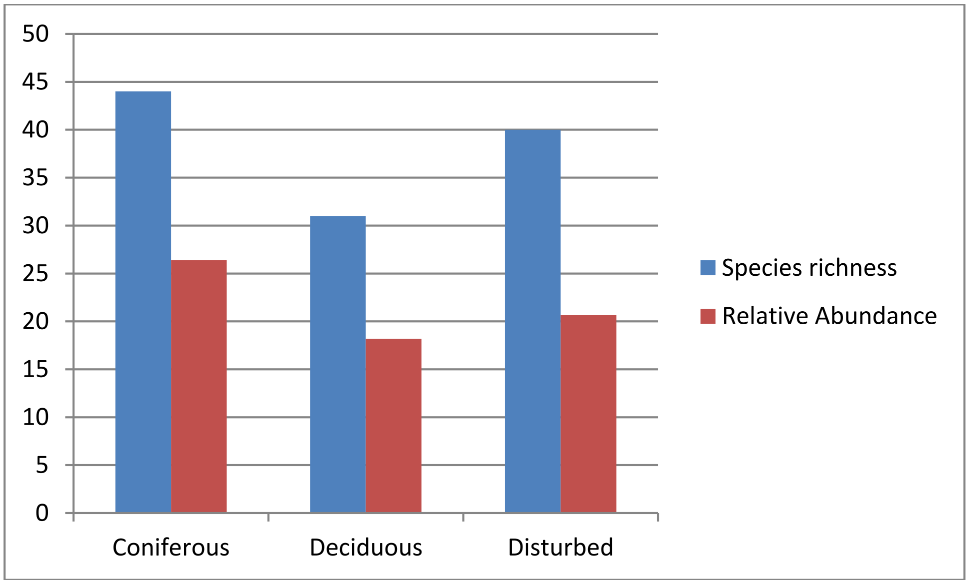


Figure 2. Species richness and abundance by habitat type.

All of the species identified are native species expected to be found in this area of Nova Scotia and the province in general, and within the typical and common habitat associated with the Project and surrounding landscape.

5.9.4 Fall Raptor Survey 2007

From a desktop perspective, this site was originally thought to be potentially important for bird migration, especially raptors during fall (Horn 2007a). Upon field verification in October 2007, very few raptors were observed including Bald Eagle, Red-tailed Hawk, Northern Harrier, and an American Kestrel. The single observation of a raptor considered to be migrating was that of an Osprey. The raptors were noted on the windward edge of the plateau (facing Bras D'Or Lake) however a family group of Red-tailed Hawk were consistently observed in the centre of the Project Area. A few small groups of passerines were noted at two migration stops along the Bras D'Or Lake and one on Loch Lomond Road. The composition of the flocks indicated a typical mixed assemblage of migrating songbirds. Two species of conservation concern and listed as Yellow under NS DNR General Status included the Rusty Blackbird and the Boreal Chickadee. The Boreal Chickadee does not have any *SARA* status, but the Rusty Blackbird is a *SARA*-listed Species of Special Concern.

No waterfowl species were observed during fall migration in the Project Area, however four species were predictably seen outside the project area along the Bras D'Or Lake shore including, American Black Duck, Pied-billed Grebe, Red-breasted Merganser and Ring-necked Duck. None of these species were observed in flocks and are not sensitive or rare in Nova Scotia.

As indicated in Appendix B (Horn, 2007b and 2008), the survey data suggests that the Project Area is not a major "corridor" or stopover site for waves of migrants arriving or leaving the province. The counts generally show no evidence of major peaks of arrival or departure. Neither was there evidence of major raptor flights over the Project Area in fall. Habitats throughout the Project Area are thoroughly degraded by logging that any further impact of the wind energy project on habitat continuity would be comparatively trivial. However, the absence of birds in the Project area during the observation period does not preclude birds in nightly transit through the area.

5.9.5 Fall Migration Monitoring 2012

During fall migration, a total of 95 hours and 52 minutes of survey effort was completed. This survey effort consisted of 69 hours of passage migration watch counts, and 26 hours, 52 minutes of migration stopover transect surveys, resulting in the identification of 1324 individual birds, representing 51 species. Table 23 below provides a summary of daily survey effort, weather conditions, species abundance and richness.

Table 23. Fall migration monitoring survey efforts, 2012.

Date	Cloud cover	Temperature	Winds	# of individuals	# of Species	Survey effort (mins)
Migration transect surveys						
03-Sep-12	Clear	11-18˚C	Calm-light	108	20	157
05-Sep-12	Cloudy	15-18˚C	Calm	98	26	151
13-Sep-12	Clear - thin fog	12-20˚C	Calm - moderate	75	18	151
14-Sep-12	Thin fog - clear	13-20˚C	Calm	98	21	146
17-Sep-12	Clear	11-16˚C	Moderate - gusts	66	17	138
26-Sep-12	Clear	12-17˚C	Calm - moderate	88	18	137
04-Oct-12	50-100% cloudy	14-16˚C	Calm - moderate	39	12	130
09-Oct-12	Cloudy	8-10˚C	Light - calm	40	12	124
13-Oct-12	Cloudy	5-7˚C	Moderate - gusts	15	7	113
17-Oct-12	Clear - cloud	8-10˚C	Moderate	30	13	120
19-Oct-12	Clear	0-14˚C	Calm	45	13	125
07-Nov-12	Clear	0 - 1˚C	Calm - light	35	10	120
Passage Migration counts						
04-Sep-12	Clear - 40% cloud	16-22˚C	Moderate	33	12	360
08-Sep-12	Cloud	17-24˚C	Calm - light	89	16	360
12-Sep-12	Clear - 40% cloud	17-20˚C	Moderate	132	19	360
25-Sep-12	Cloud - clear	12-18˚C	Moderate	28	11	360
29-Sep-12	Cloud	12-14˚C	Moderate - gusts	19	8	270
02-Oct-12	50-70% cloud	14-17˚C	Moderate - gusts	20	9	360
04-Oct-12	Partial cloud	14-17˚C	Moderate	22	7	360
09-Oct-12	Cloud	12-14˚C	Moderate	21	8	360
14-Oct-12	Cloud	6-7˚C	Moderate - gusts	21	8	300
18-Oct-12	75-10% cloud	8-10˚C	Moderate - gusts	19	8	360

Date	Cloud cover	Temperature	Winds	# of individuals	# of Species	Survey effort (mins)
25-Oct-12	Cloud	4-6˚C	Moderate	154	9	330
03-Nov-12	Cloud	10-13˚C	Moderate	29	10	360
			Total	**1324**	**51**	**5752**

The American Robin was the most abundant species observed during fall migration, accounting for 15% of all individuals observed (198 individuals). Boreal and Black-capped Chickadees were the second and third most abundant during fall migration, with 101 individuals (7.6%) and 87 individuals (6.6%) observed, respectively. Unidentified birds accounted for 8.8% (117 individuals) of all observations during fall migration. Small passerines or songbirds (such as warblers, sparrows, and finches) account for 93% of the unidentified birds (the remaining 7%, or 8 individuals include 4 ducks, 3 woodpeckers, and 1 grouse). Ornithologists rely heavily on audible cues like songs or calls to identify these songbirds. During fall migration, songbirds are more difficult to identify, because they are not as vocal as they are during breeding season. Table 24 provides a summary of species identified during fall migration, along with their abundance and conservation status. These results are shown graphically as relative abundance (% of all individuals identified) in Figure 3.

Table 24. Results of fall migration bird surveys in 2012

Species Code	Species	Abundance	Conservation Status
AMCR	American crow	6	
AMGO	American goldfinch	54	
AMKE	American kestrel	12	
AMRO	American robin	198	
AMWI	American widgeon	4	
BAEA	Bald eagle	4	
BAWW	Black-and-white warbler	2	
BCCH	Black-capped chickadee	87	
BHVI	Blue-headed vireo	13	
BLJA	Blue jay	37	
BOCH	Boreal chickadee	101	DNR Yellow
BRCR	Brown creeper	1	
BTNW	Black-throated green warbler	2	
CAGO	Canada goose	15	
CEDW	Cedar waxwing	75	
CHSP	Chipping sparrow	2	
COLO	Common loon	3	DNR Red
CORA	Common raven	22	
CORE	Common redpoll	6	
COYE	Common yellowthroat	42	
DEJU	Dark-eyed junco	68	
DOWO	Downy woodpecker	2	
FOSP	Fox sparrow	1	

Species Code	Species	Abundance	Conservation Status
GCKI	Golden-crowned kinglet	68	DNR Yellow
GRAJ	Gray jay	75	DNR Yellow
HAWO	Hairy woodpecker	9	
HETH	Hermit thrush	2	
LISP	Lincoln's sparrow	18	
MAWA	Magnolia warbler	3	
NOFL	Northern flicker	29	
NOHA	Northern harrier	2	
PAWA	Palm warbler	26	
PIGR	Pine grosbeak	7	
PISI	Pine siskin	10	DNR Yellow
PIWO	Pileated woodpecker	1	
RBNU	Red-breasted nuthatch	5	
RCKI	Ruby-crowned kinglet	9	DNR Yellow
RECR	Red crossbill	1	
REVI	Red-eyed vireo	5	
RTHA	Red-tailed hawk	5	
RUGR	Ruffed grouse	9	
SAVS	Savannah sparrow	1	
SHHA	Sharp-shinned hawk	1	
SOSP	Song sparrow	23	
SPGR	Spruce grouse	1	
SPSA	Spotted sandpiper	1	
SWSP	Swamp sparrow	1	
UNBI	Unidentified bird (Warbler sp.)	117	
WTSP	White-throated sparrow	75	
WWCR	White-winged crossbill	20	
YRWA	Yellow-rumped warbler	43	
Total	**51 species**	**1324**	

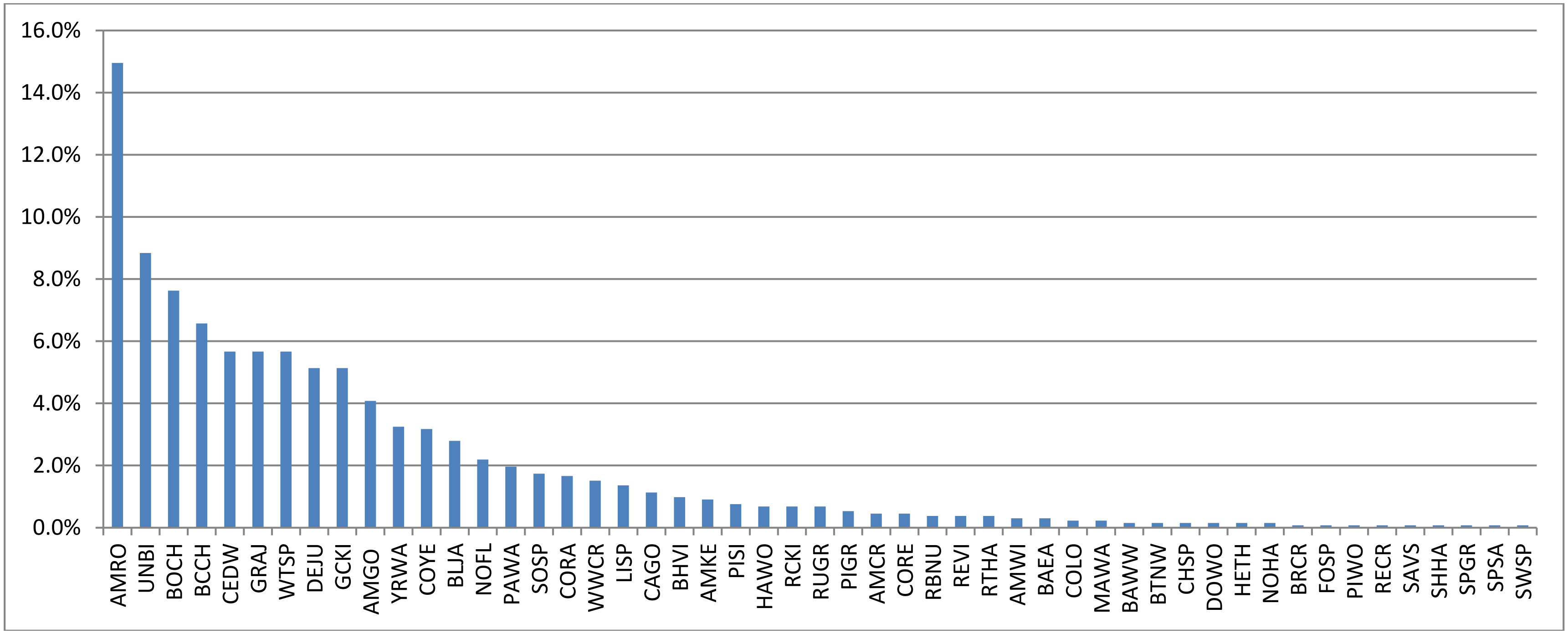


Figure 3. Relative abundance of species identified during fall migration, 2012.

As of September 3, 2012, fall migration was well underway for many species such as Northern Flicker, vireos, warblers, and sparrows. Waterfowl were few; however the Rear Irish Cove Lakes were used by Canada Goose and American Widgeon in September. The 8 geese on October 25 may have been headed for the same lakes or possibly the Bras d'Or. Common Loons were heard twice from the general direction of Middle Cape Lakes, consistent with the breeding survey results.

Five raptor species (Bald Eagle, Northern Harrier, Sharp-shinned Hawk, Red-tailed Hawk, and American Kestrel) were detected though numbers were low. Red-tailed Hawks (5) and American Kestrel(12) likely had bred in or near the project area. As long as there were plenty of sparrows, warblers, and insects such as grasshoppers kestrels tended to stay at least a few days, last seen October 9. Therefore the true numbers could be fewer for both species.

Northern Flicker (26) were seen in good numbers not just in the Project location but also along roadsides in the rest of Cape Breton in September. Black-backed Woodpecker was not detected though they were likely breeding in the area. Also in September, vireos, Ruby-crowned Kinglet and Hermit Thrush completed their migration through the area. On October 8 and 12, two flocks (size 30, and 45) Cedar Waxwing used the area, feeding on the plentiful blueberries and other shrub fruits. American Robin were seen regularly the whole season with flocks totalling 130 the morning of October 25.

Common Yellowthroat, Yellow-rumped Warbler and Palm Warbler were the most common warblers passing through, which is not surprising given the appropriate habitats. The Project Area consists of many open damp, boggy areas surrounded by a variety of shrubs, mixed stands, and conifers of different ages along with regenerating clear-cuts. Most species were passed by early October with two Yellow-rumped and one warbler "species" likely a Yellow-rumped last seen October 9 and 13.

Large numbers of sparrows made ample use of the open habitat all September and October. Their timing coincided with sparrow migration in the rest of Cape Breton. White-throated Sparrow (70) and Dark-eyed Junco (65) were most numerous. Pine Siskin were detected only once, a flock of ten October 9. They were also seen in large numbers in nearby areas (Salmon River Rd.) the same day.

White-winged Crossbill started moving in around the second half of October. A single Red Crossbill was observed on November 7. American Goldfinch were regularly seen throughout the fall season.

Resident birds were as expected. Ravens (at least one pair with a large territory), American Crows, Blue Jays, several families of Gray Jay, Boreal and Black-capped Chickadees, Golden-crowned Kinglet, Hairy Woodpecker, Spruce and Ruffed Grouse were all detected until the end of fall migration monitoring, and are expected to be year-round residents within the Project Area.

5.9.6 Data Analysis 2007-2008

During both the spring and breeding bird sample dates the number of individuals observed by date fluctuated, with the most number of individuals identified on June 4th. (Table 25)

Table 25. Number of individual birds observed by date.

Sampling Date	Species Richness	# of individuals Observed
April-20-08	17	75
May-13-08	21	82
May-18-08	32	234
May-19-08	14	45
May-24-08	17	35
May-25-08	28	150
May-26-08	40	370
June-03-08	22	37
June-04-08	63	619
June-17-08	44	390
June-18-08	45	317

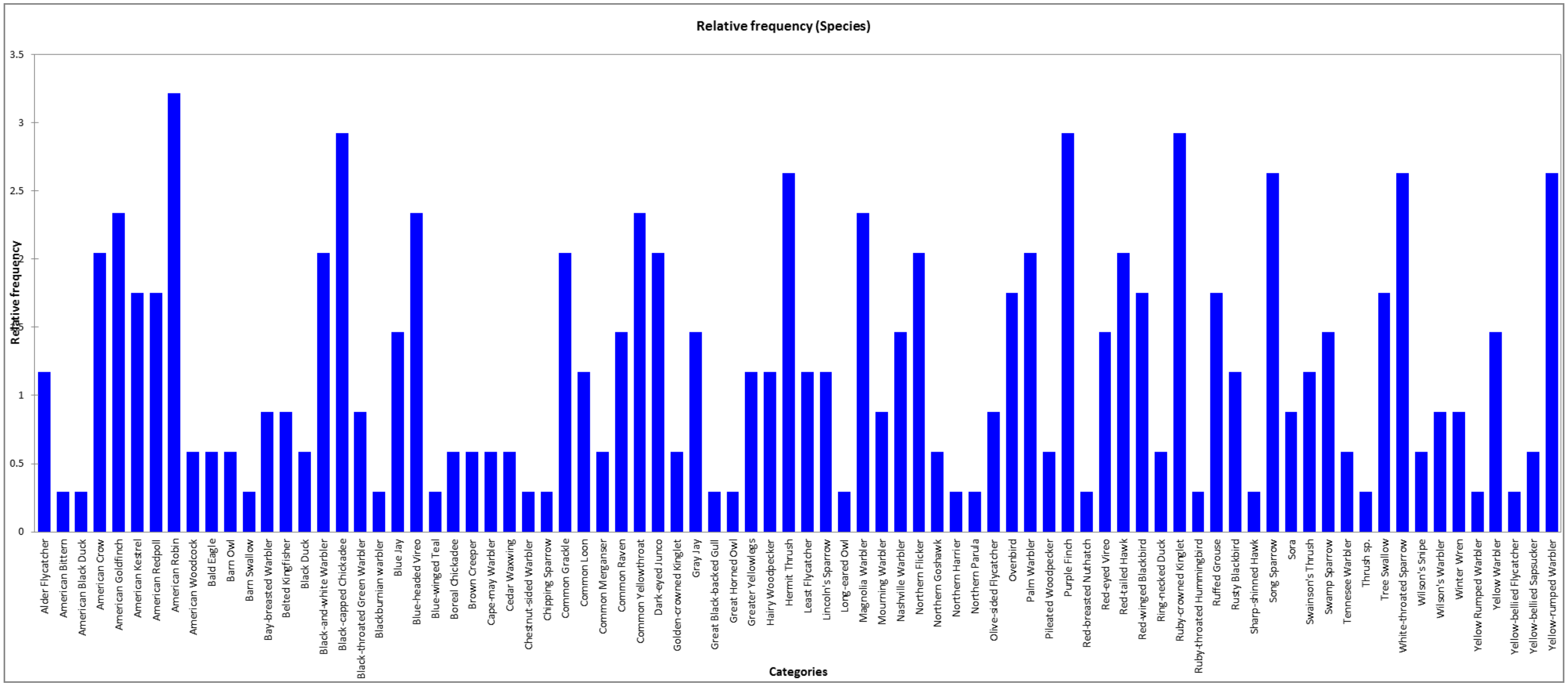


Figure 4. Relative Frequency of Bird Species observed during 2007-2008 surveys.

The relative frequency of individual species indicates that of the 84 species identified, the American Robin occurred most frequently. 21 different species occurred with the same lowest relative frequency of 0.292 and included American Bittern, American Black Duck, Barn Swallow, Blackburnian Warbler, Blue Winged Teal, Chestnut Sided Warbler, Chipping Sparrow, Great-blacked back gull, Great horned owl, Long-eared owl, Northern harrier, Northern Parula, Red Breasted Nuthatch, Ruby-Throated Hummingbird, Sharped-shinned Hawk, Yellow Rumped Warbler, Yellow-bellied Flycatcher, and Yellow-bellied Sapsucker.

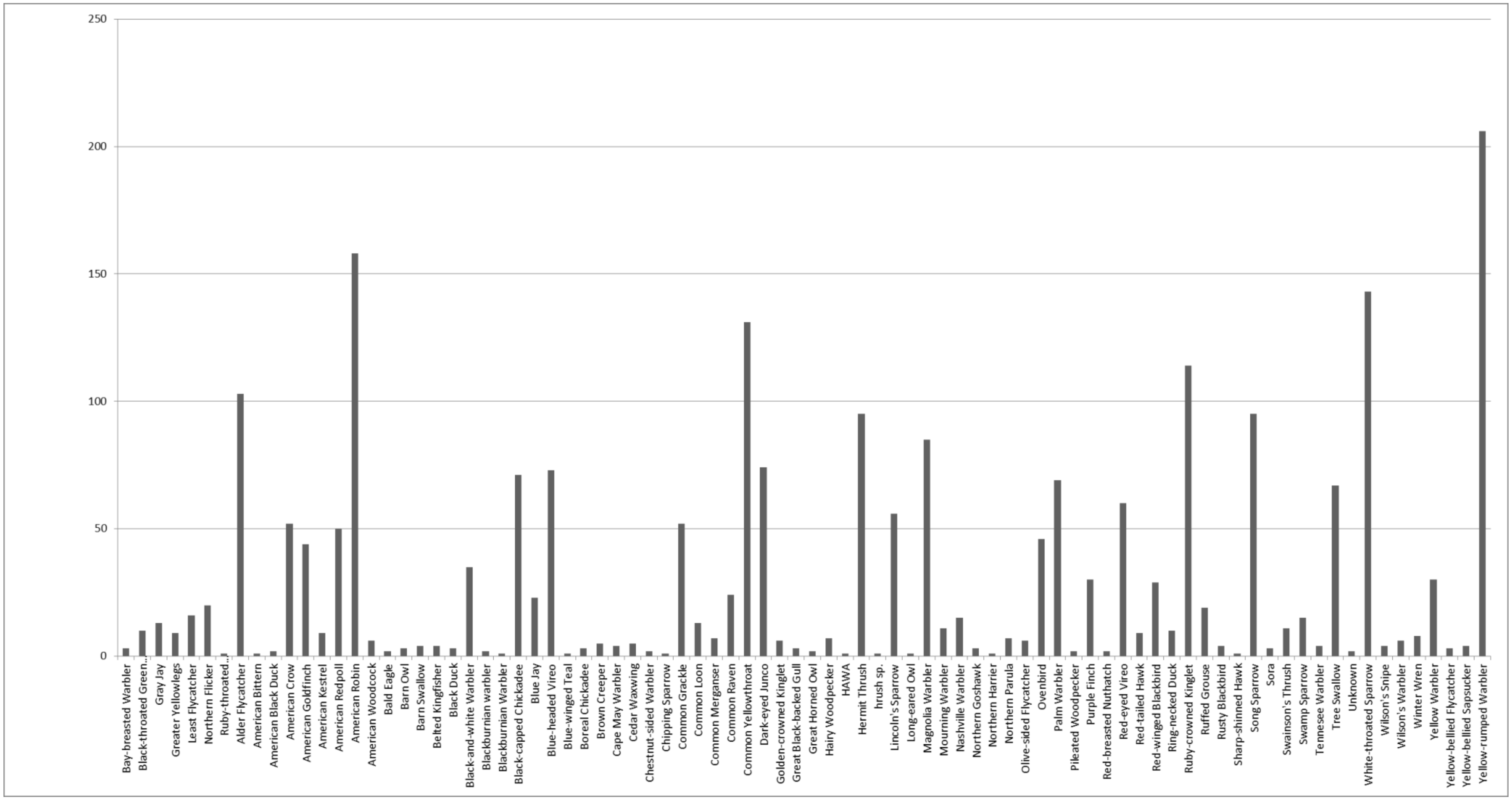


Figure 5. Number of individual species observed during 2007-2008 surveys.

The total number of individual birds of any species counted during the 2007 and 2008 surveys is presented in Figure 5 above. The most abundant species were the American Robin, Yellow Rumped-Warbler, White-throated sparrow, and Common Yellowthroat.

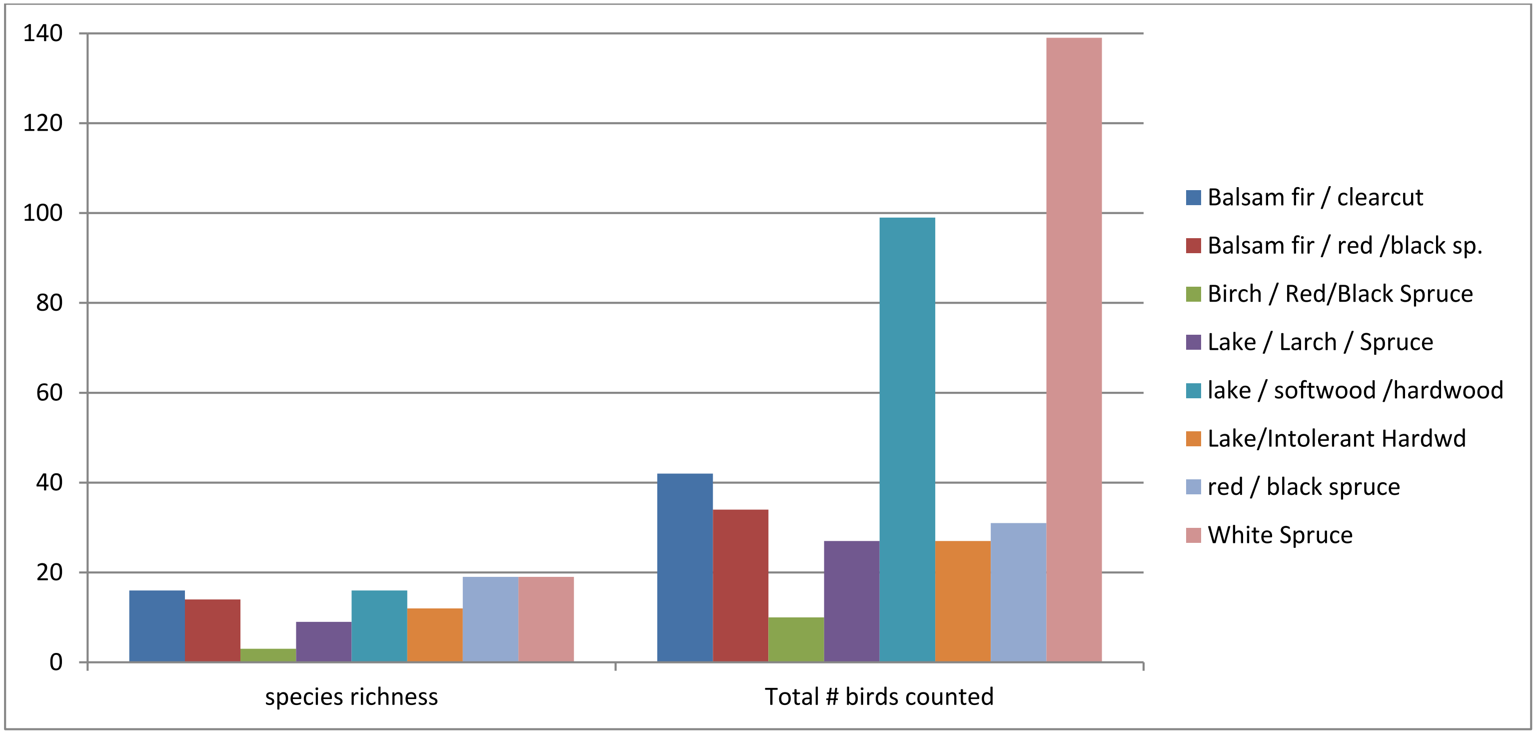


Figure 6. Species richness and Total Birds by Habitat Type, 2007-2008.

Assessments of bird use by habitat type indicates that spruce habitat types (White Spruce; Red/Black Spruce) support the greatest level of species richness. The total number of birds counted by habitat type shows that White Spruce dominated habitat has the highest number of birds. However, in contrast to species richness, the second highest level of bird use was found adjacent to Lake/softwood/hardwood stands.

5.9.7 Rare, Sensitive, and at Risk Birds

McCallum Environmental reviewed ACCDC databases, NSDNR lists for listed species, and Breeding Bird Atlas grids in proximity to, or overlapping the Project. Those results indicated that either based on habitat potential, or proven or probable breeding evidence, there are 39 birds ranked Yellow or Red by NSDNR in proximity to the Project.

Table 26. Listed Species Know to be in Proximity to Project

Species	COSEWIC	SARA	NSESA	NSDNR	Highest Breeding Evidence
Blue-winged Teal				RED	POSSIBLE
Northern Pintail				RED	
Common Loon	NAR			RED	PROBABLE
American Bittern				YELLOW	PROBABLE
Northern Goshawk				YELLOW	POSSIBLE
Piping Plover	E	E	Endangered	RED	
Killdeer				YELLOW	
Greater Yellowlegs				YELLOW	PROBABLE
Willet				RED	PROBABLE
Wilson's Snipe				YELLOW	PROBABLE
Short-eared Owl	SC	SC		RED	
Common Nighthawk	T	T	Threatened	RED	PROBABLE
Chimney Swift	T	T	Endangered	RED	PROBABLE
Black-backed Woodpecker				YELLOW	
Olive-sided Flycatcher	T	T	Threatened	RED	PROBABLE
Eastern Wood-Pewee	SC		Vulnerable	YELLOW	PROBABLE
Eastern Phoebe				YELLOW	POSSIBLE
Eastern Kingbird				YELLOW	
Gray Jay				YELLOW	CONFIRMED
Tree Swallow				YELLOW	CONFIRMED
Bank Swallow	T			RED	CONFIRMED
Cliff Swallow				RED	CONFIRMED
Barn Swallow	T		Endangered	YELLOW	CONFIRMED
Boreal Chickadee				YELLOW	CONFIRMED
Golden-crown Kinglet				YELLOW	CONFIRMED
Ruby-crown Kinglet				YELLOW	CONFIRMED
Eastern Bluebird	NAR			YELLOW	CONFIRMED
Bicknell's Thrush	T	T	Vulnerable	RED	
Gray Catbird				RED	
Tennessee Warbler				YELLOW	CONFIRMED
Cape May Warbler				YELLOW	PROBABLE

Species	COSEWIC	SARA	NSESA	NSDNR	Highest Breeding Evidence
Bay-breasted Warbler				YELLOW	PROBABLE
Blackpoll Warbler				YELLOW	PROBABLE
Canada Warbler	T	T	Endangered	RED	POSSIBLE
Wilson's Warbler				YELLOW	PROBABLE
Rose-breasted Grosbeak				YELLOW	
Bobolink	T		Vulnerable	YELLOW	PROBABLE
Rusty Blackbird	SC	SC	Endangered	RED	CONFIRMED
Pine Siskin				YELLOW	CONFIRMED

Rare, sensitive or at risk species that were recorded in the Project Area during all monitoring completed within the Project Area from 2007 to 2012 are listed in Table 27 below, with breeding status identified, as recorded during the 2012 breeding season.

Table 27. Bird Species at Risk and Species of Conservation Interest identified during 2007-2008, and 2012 surveys

Species	COSEWIC Listing	SARA Listing	NSESA Listing	DNR Listing	Total Identified during all 2007-08 surveys	Breeding season 2012	Fall migration 2012
Rusty Blackbird	SC	SC	E	R	3	2 *Pr	0
Olive-sided Flycatcher	T	T	T	R	6	14 *Pr	0
Barn Owl	E	E		Accidental	5	0	0
Blue-winged Teal				R	1	0	0
Common Loon				R	13	10 *Pr	3
Long-eared Owl				R	1	0	0
Pine Grosbeak				R	0	8 *Po	0
American Bittern				Y	1	0	0
Bay-breasted Warbler				Y	3	0	0
Black-backed Woodpecker				Y	0	4 *Pr	0
Boreal Chickadee				Y	3	23 *Pr	101
Cape-may Warbler				Y	4	0	0
Golden-crowned Kinglet				Y	6	14 *Co	68
Gray Jay				Y	13	19 *Co	75
Greater Yellowlegs				Y	9	8 *Pr	0
Northern Goshawk				Y	3	0	0
Pine Siskin				Y	0	0	10
Ruby-crowned Kinglet				Y	114	40 *Pr	9
Tennessee Warbler				Y	4	1 *Po	0

Species	COSEWIC Listing	SARA Listing	NSESA Listing	DNR Listing	Total Identified during all 2007-08 surveys	Breeding season 2012	Fall migration 2012
Tree Swallow				Y	67	0	0
Wilson's Snipe				Y	4	1 *Pr	0
Wilson's Warbler				Y	6	0	0
Yellow-bellied Flycatcher				Y	11	0	0

*Po = Possible breeder, Pr = Probable breeder, Co = Confirmed breeder

The Olive-sided Flycatcher is ranked "yellow" by NSDNR, and Threatened under SARA and the NSESA. This flycatcher species prefers to nest in boreal forests (*i.e.,* spruce and fir forests) adjacent to bogs or other wet habitat. This species was observed during breeding bird surveys for this Project in 2008, and is listed as a Probable breeder in the MBBA squares that make up the Project Area. In 2012, the Olive-sided Flycatcher was observed on 12 occasions (14 individuals) between June 16 2012 and July 10 2012. It is identified as a probable breeder because it was observed in breeding habitat performing territorial calls, however, no nest, young, or agitated behaviour was observed. There is matching habitat within the Project Area although it is confined to wetland habitat in the Project Area and is not expected to be disturbed by Project construction or operation.

Rusty Blackbird is also ranked "yellow" provincially (NSDNR, 2012), as Special Concern under SARA, and as Endangered under the NSESA. Rusty Blackbird tend to breed in wet shrubby habitat characterized by forested wetlands, riparian edges of slow-moving streams, peat bogs, sedge meadows, marshes, swamps, beaver ponds and pasture edges. This species was observed during breeding bird surveys for this Project in 2008, and is listed as a Confirmed breeder in the MBBA squares that make up the Project Area.

Two Rusty blackbirds (presumed pair) were seen during an area search on the morning of June 26, 2012. The birds were calling and flying about the north half of a narrow body of quiet water, more a stream widened by beaver activity (lodge present), that feeds the MacDonald Brook and on into Lake Uist. The water at the time appeared to be less than 50m wide by ~ 175m long oriented north/south. It is surrounded by boggy spruce, larch, tall and shorter shrubs. This is ideal Rusty blackbird habitat. A band of mature spruce, mosses, standing deadwood on somewhat higher ground runs parallel to the east. The general area beyond is logging cutover with several remnant patches and strips of conifers and mixed growth. The Rusty Blackbirds were observed approximately 300m northwest of T08, 350m SE of T09, and 460m NE of T07. Other species seen in the vicinity include Golden-crowned kinglet (pair in mature spruce), Red-eyed vireo, Magnolia warbler, Yellow-rumped warbler, Nashville warbler, Common yellowthroat, Palm warbler, Lincoln's sparrow, Swamp sparrow(several), White-throated sparrow, and Dark-eyed junco.

There is matching habitat within the Project Area, however, Rusty Blackbird breeding habitat is confined to specific wetland habitat in the Project Area that is not expected to be disturbed by Project construction or operation.

5.9.8 Effects of the Project

There are no major concentrations of birds that occurred in the Project area during the autumn and migration. Nonetheless, the area is a migration stop-over for various species of woodland birds. However, these events occur over a wide area of the Highlands and are not unique or confined to the Project area or specific infrastructure areas.

Birds that breed and forage in the vicinity of the proposed WTGs during operations may suffer direct mortality due to collisions with the turbine blades, or meteorological towers. In 2010/2011 mortality studies were completed at the Glen Dhu Wind Power Project, which is located approximately 200 km west of the East Bay Hills Project. The mortality levels from that project were estimated using the formula recommended by the Canadian Wildlife Service. Bird mortality levels were determined based on carcass searches with adjustments made to account for searcher efficiency and scavenging rates. The total adjusted mortality at Glen Dhu Wind Energy was 4.59 birds per turbine. (John Kearney, February 2012). These findings almost identical to the Canadian Wildlife Service's average mortality expectations of 4.6 birds killed per turbine (plus or minus 0.48 with 95% confidence interval).

The Canadian Wildlife Service (CWS) maintains a database as a joint initiative of Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources. The database is intended to be a living tool that summarizes Canadian wind farm data collected and submitted to date, demonstrating our growth in understanding the effects of wind power on birds and bats, and evaluating survey methods and environmental effects assessment. (Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources, August 2012)

That CWS current report presents uncorrected results from available studies, primarily conducted between 2006 and 2010. It represents the findings of approximately 239 months of post-construction monitoring activity around 779 turbines at 24 different sites in Alberta, British Columbia, Newfoundland, Nova Scotia, Ontario, Prince Edward Island and Saskatchewan. (Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources, August 2012)

Across Canada, a total of 945 bird casualties were found representing 129 different species. Passerines were most commonly found, representing 70% of all bird fatalities. Raptors represented 7% of all birds found. Waterbirds, including waterfowl, represented 4% of all bird fatalities. (Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources, August 2012)

"Seasonal fatality results were reported as number of casualties found per turbine, for each month. This summarizes the numbers of animals <u>found</u> during post construction monitoring surveys across all sites, and allows for comparison among months/across seasons. At wind farms in Canada, most of the bird carcasses were found from April through October. An examination of bird mortalities suggests a slight reduction in fatalities in June, possibly attributed to a decrease in bird movements outside of the migration season. 21% of all casualties were reported in April and May and 51% between the months of August and October. There were very few fatalities reported in winter and early spring (between November and March), a period when relatively few birds are present." (Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources, August 2012)

"The overall pattern of fatalities was largely driven by passerines, which represented the majority of casualties. The fatality pattern for raptors and other non-waterbird species matched the pattern of passerines. No pattern was detected in waterbird fatalities across the year. The numbers of reported raptor and waterbird casualties were relatively low at most sites." (Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources, August 2012)

It is important to note that steady burning flood lights have played a crucial role in almost all the multi-fatality events reported at wind power projects in the U.S. At the Laurel Mountain AES facility in West Virginia, the fatalities were not caused by collision with turbines. (Friesen, December 2011) Rather, the birds succumbed after being attracted to eight floodlights surrounding a battery storage unit. The birds, migrating at low altitude in conditions of high wind and thick fog, became disoriented by the dusk-to dawn lighting at the battery substation, and either slammed into the building or circled around it to the point of exhaustion (Friesen, December 2011). Standardized mortality searches at turbines throughout the facility immediately after the fatality event confirmed that no multi-bird fatality events had occurred anywhere but at the brightly illuminated battery storage unit. No further multi-bird fatality events occurred at the substation after the floodlights were extinguished (Friesen, December 2011). Steady burning flood lights around an electrical substation and three adjacent turbines were also implicated in the fatality events at the Mountaineer facility in 2003 (Friesen, December 2011).

Avian collision fatality data from studies conducted at 30 wind farms across North America were examined to determine how many night migrants collide with turbines and how aviation obstruction lighting relates to collision fatalities. (Kerlinger, et al., 2012) Fatality rates of night migrants at turbines 54 to 125 m in height ranged from <1 bird/turbine/year to ~7 birds/turbine/year. Multi-bird fatality events (defined as >3 birds killed in one night at one turbine) were rare. (Kerlinger, et al., 2012) Lighting and weather conditions may have been causative factors in the four documented multi-bird fatality events, but in no case were flashing red lights (L-864,) involved, which is the most common obstruction lighting used at wind farms. Non-parametric analysis of unadjusted fatality rates revealed no significant differences between fatality rates at turbines with FAA lights as opposed to turbines without lighting at the same wind farm. (Kerlinger, et al., 2012)

The most important potential effect on birds is expected to be collision risk with the rotating blades. Most construction activities associated with the proposed Project are not expected to affect birds in migration since most will be passing through air space over the study area. Proposed overhead collector cables may also present a collision risk to migrating birds. Auditory disturbance due to turbine operation may result in changes to migration patterns and activity (e.g. avoiding proposed Project area as a stopover location).

Overall, based on the findings of the various wildlife surveys, in addition to a myriad of research on the interaction of birds with turbines, it appears that there are no major constraints to affect development within the Project lands but bird mortality will be expected. The rates of mortality are clearly site specific and will range between the mortality estimates from the Glen Dhu Wind Project and those indicated by CWS.

5.9.9 Mitigation

To avoid destroying nesting or breeding species during breeding timeframes, clearing of vegetation will occur prior to April 15.

A follow-up monitoring program will be implemented after construction and will be designed in accordance with Canadian Wildlife Service and/or NSDNR requirements. The purposes of the follow-up monitoring is to determine rates of mortalities occurring and, if so, to identify any possible mitigation measures.

To avoid lighting-related bird mortality, all lighting used during the operation of the project (other than aircraft navigation lights) will be shielded and where possible, motion activated.

If it appears that a high number of direct fatalities are occurring, attempts will be made to determine the nature of the fatalities, specific timing or seasonality, weather related effects at the time, so that mitigation such as modifications to turbine operations may be designed (i.e. change to cut-in wind speeds for turbine operation; change to lighting; other).

Mortality studies will be focused on the following animals and time frames:

1. Spring bird migration (April to 1st week of June);

2. Breeding Bird Season (June to mid-August);
3. Autumn bat migration (mid-August to early October);
4. Autumn bird migration (mid-August to late October);

Carcass searches for both birds and bats will occur for two years post construction, at all turbines. After obtaining the required permits from federal and provincial agencies, searches will take place during the time frames given above. Searches will be more or less frequent depending on the results of the scavenger trials. Carcass searches will follow the protocols recommended by the Canada Wildlife Service (CWS, 2007).

Similarly, scavenger trials will also follow the recommendations of the Canadian Wildlife Service. These trials estimate the time it takes for large scavengers such as foxes, raccoons, and ravens to remove dead birds or bats from the area surrounding the turbine base.

5.9.10 Significance

5.9.10.1 <u>Magnitude</u>

The potential effect of WTG collision on migrating birds is unknown, as there is limited data in Cape Breton. The preliminary carcass search data collected at the Glen Dhu wind project in Pictou County showed that the magnitude of the effect of collisions on nocturnal migrating birds is lower than predicted during the environmental assessment for these projects. The potential cumulative effects of collision mortality on nocturnal migrating birds around the proposed Project are unknown. The proposed Project is not expected to contribute to mortality due to the implementation of mitigation measures avoiding steady burning lights. The collective evidence to date suggests the risk to birds from wind energy projects is low relative to other anthropogenic factors and is unlikely to be causing significant population declines (Friesen, December 2011).

The potential effect of the loss of breeding bird habitat from clearing for the proposed Project would be of low to moderate magnitude. This is due to the extensive loss of habitat already occurring from forestry operations within the Project boundaries. Breeding bird species that rely on mature forest could be more impacted because it would take a long time for reforested areas to reach maturity. The potential effect of sensory disturbance from construction activities may result in nest abandonment however the effect would be of low magnitude. Sensory disturbance during operations from the constant sound of operating wind turbines would be low. Ambient wind noise is expected to be high in the vicinity of the turbines which may mask some of the WTG operating sound. While collisions with WTGs are expected, the magnitude of the potential effect on breeding birds is unknown. Monitoring conducted as part of the approval is expected to inform government of the cumulative effects of collision mortality over time.

The potential effect of collisions with WTGs on migrating raptors is unknown, as there is limited data related to wind energy projects and existing migrating raptor populations. It is anticipated that the magnitude of the effect from habitat loss and fragmentation would be low because the area that would be harvested for the proposed Project is small and this habitat is not used for extended durations as migratory raptors migrate through the area. Ongoing monitoring should inform the government of the cumulative effects of collision mortality over time.

5.9.10.2 <u>Probability</u>

While some collisions are expected, the scale of the potential effect on migrating birds or raptors from collisions with WTGs at the proposed Project is uncertain, for the reasons outlined in the section on magnitude above. The potential cumulative effect is uncertain because while collisions are expected, the population level impacts are unknown.

The potential effect of loss of breeding bird habitat is certain because vegetation, including mature trees and other suitable habitat, would be cleared for the construction of the proposed Project infrastructure. The potential effect of sensory disturbance during construction and operations on breeding birds would also be certain. Breeding birds would be affected by construction noise and worker presence resulting in nest abandonment, particularly during breeding bird season. The potential effect of attractants and collision risk from the proposed Project is uncertain for the reasons outlined above in the magnitude section.

5.9.10.3 <u>Geographic Extent</u>

The extent of the potential effect of collisions with WTGs on migrating birds from the proposed Project would be regional, depending on the species of migrating bird and where the populations are based.

The extent of the potential effect on breeding birds from the proposed Project would be local.

5.9.10.4 <u>Duration and Frequency</u>

The potential effect of collisions with WTGs on birds would be long term and continuous during the operation of the proposed Project.

The potential effect of the loss of breeding bird habitat would be long term and continuous for the life of the proposed Project. The potential sensory disturbance effect on breeding birds would be short term and intermittent during construction and long-term and continuous during operations. The potential effect of attractants and collisions with WTGs on breeding birds from the proposed Project would be long term and continuous during the operation.

5.9.10.5 <u>Reversibility</u>

The potential effect of the proposed Project and cumulative effects on birds are expected to be reversible after the project is decommissioned.

The potential effect of the loss of breeding bird habitat would be reversible after the restoration of the habitat, including the re-growth of mature trees. Sensory disturbance would be partially reversible after construction, and fully reversible, after decommissioning, when noise and human presence would cease. After the proposed Project is decommissioned, there would be no impacts due to attractants and collisions with WTGs.

While uncertainty exists regarding potential population level effects from collisions with operating WTGs, based on the above analysis and having regard to the conditions identified the proposed Project is not expected to have significant adverse effects on bird populations during the proposed Project construction, operations and decommissioning activities, as the effect would be reversible and CBHI would implement/apply adaptive management measures should an adverse effect not predicted during the EA be determined.

5.10 Mammals

The East Bay Hills provide habitat for a range of fauna including white-tail deer, red fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), coyotes (*Canis latrans*), varying hares (*Lepus americanus*) and to a lesser extent moose

(*Alces alces*) and black bear (*Ursus americanus*). Raccoon *(Procyon lotor*), mink (*Mustela vison*), ermine (*Mustela erminea*) and river otter (*Lutra canadenis*) are present, but less common and confined to the lower river valleys and around the large lakes, outside the Project Area. As indicated above, there are known deer wintering areas especially on the side slopes of the plateau where suitable wintering habitat is present (Figure 11, Appendix I).

Given the types of habitat present in the Project Area, it can be expected to support a variety of mammal species characteristic of forested and open habitats (Table 28. Mammal Species Recorded in and/or Likely to Occur in the Project Area) However, given the fairly heavily disturbed nature of the habitats, it is unlikely that mammal species characteristic of remote areas or large tracts of mature forest such as American Marten (*Martes americana*) and Fisher (*Martes pennanti*) are present.

Table 28. Mammal Species Recorded in and/or Likely to Occur in the Project Area

Common Name	Scientific Name	NSDNR Ranking	ACCDC Ranking
American Black Bear	*Ursus americanus*	Green	
American Red Squirrel	*Tamiasciurus hudsonicus*	Green	
Coyote	*Canis latrans*	Green	
Eastern Chipmunk	*Tamias striatus*	Green	
Porcupine	*Erithizon dorsatum*	Green	
Racoon	*Procyon lotor*	Green	
Red Fox	*Vulpes vulpes*	Green	
Red-backed Vole	*Clethrionomys gapperi*	Green	
Varying Hare	*Lepus americanus*	Green	
White-tailed Deer	*Odocoileus virginanus*	Green	
Woodland Jumping Mouse	*Napaeozapus insignis*	Green	

5.10.1 Ungulates

Ungulates such as moose and deer are an integral part of forest ecosystem functions; they play an integral role in large-mammal predator-prey systems and have the potential to impact sympatric animal species as well as the plant communities and ecosystems that sustain them.

Preferred habitats for deer are typically associated with valley bottoms, especially within well-developed riparian habitats. Winter habitat represents the most important habitat for the survival of white-tailed deer; they are not adapted for travel through deep, soft snow packs. In areas of deep snow, white-tailed deer depend on coniferous forests, which tend to best catch the snow and provide areas within which to hide from predators and to seek shelter from winds. In general, white-tailed deer remain at lower elevations and are rarely found in higher elevations, including subalpine or alpine areas.

White-tailed deer are an "edge" species. Suitable habitats have an intersection of untreed grassy or shrubby areas for feeding and treed areas for cover (Buckmaster et al., 1999). Areas of > 75% canopy closure that is > 1.5 m in height provide thermal and hiding cover, and reduce snow accumulation, which can limit movements of white-tailed deer (Buckmaster et al., 1999). Most white-tailed deer habitat use is within 180 metres of cover/open area edges (Buckmaster et al., 1999). Thermal cover is important in winter during periods of extreme wind chill. Mature coniferous stands may be used for protection since the branches provide wind protection and the ground tends to accumulate less snow. Cover is also required for protection from predators (Buckmaster et al., 1999). Areas with conifers and aspens may be among the best habitat for providing a mixture of food and cover.

While moose habitat preferences can change as the abundance of available habitat changes (Osko et al. 2004) and habitat selection shows a high degree of variability among individuals (McLaren et al 2009), moose generally require large areas with diverse habitat types (Snaith and Beazley 2002). Moose habitat preferences are correlated with forage and cover requirements, as well as breeding behaviours (Peek et al. 1976). Early successional deciduous vegetation is the main source of moose forage, food types often associated with open or disturbed areas (Snaith et al. 2002; Snaith and Beazley 2002; Parker 2003). The presence of such early successional trees and shrubs is particularly important during the winter months (Parker 2003).

In Nova Scotia, the most important food species are red, sugar, and mountain maple, as well as yellow and white birch (Snaith and Beazley 2002). In the summer months, particularly in June, aquatic vegetation can be an important component of the diet of moose (Peek et al. 1976; Fraser et al. 1980), but the fact that moose have persisted in areas containing infrequent or unsuitable wetlands suggests that these areas are not essential foraging grounds for moose in Nova Scotia (Snaith and Beazley 2002).

Although not considered critical habitat (Balsom et al. 1996), mature, conifer forests are extremely important for moose in Nova Scotia during the late winter months (Telfer 1967a; Peek et al. 1976; Parker 2003), because they provide protection from extreme weather and the canopy prevents snow from accumulating to depths hindering moose movement (Snaith and Beazley 2002). Ideal winter habitat also includes regenerating, mixed woods that provides both hardwood and softwood browse (Parker 2003)

Table 29. Habitat preferences for moose in Nova Scotia (from Snaith and Beazley 2002)

SPRING/EARLY SUMMER	SUMMER	FALL/EARLY WINTER	LATE WINTER
- Open or disturbed areas with plenty of forage, calving areas, and forest cover - Aquatic vegetation may provide needed nutrients if it is available	- Dense forest cover for protection from heat stress - Forage rich areas to provide energy for growth, lactation, and fat storage - Water bodies - Interspersion of dense forest stands and mixed or disturbed forests with open canopies or mature forests with well a developed understory (for forage)	- Forage rich areas still important - Cover less important because heat stress and snow depth are at low levels - Open or disturbed habitat with early successional vegetation	- Densely forested areas for relief from snow accumulation - Interspersion of forage-rich areas (disturbed areas, forest edges) in close proximity to cover

5.10.1.1 Response to Disturbance

5.10.1.1.1 Linear Disturbances

Ungulates are affected by a variety of disturbance types, and in a variety of ways. The removal of habitat to create linear disturbances can decrease foraging and cover habitat and decrease connectivity of the landscape (MEG Energy Corp. 2010). Research suggest that the response of moose to roads is highly variable and it most likely situation specific.

5.10.1.1.2 Larger Disturbances

Large-scale disturbances, such as forestry operations, are particularly important from the perspective of ungulate management. The net effect of many forestry operations is the creation of open areas with early successional vegetation, areas which are necessary elements of ungulate habitat (Ontario Ministry of Natural Resources 1988). Researchers found that the removal of the overstory and scarification of the soil, either through the logging activities themselves or by post-logging site preparation, achieved the best establishment of early successional hardwoods favoured by ungulates. In contrast, birch, balsam poplar, birch-spruce, and balsam poplar-spruce stands that were not scarified following logging usually developed into grassy areas that are not suitable for moose habitat. In addition, cutover areas that are too far away from suitable cover may not be utilized by moose (Eason 1985), and employing a cut and leave strategy (alternating cutover and undisturbed areas of 1km^2) as opposed to continuous clearcutting may support higher moose populations through the provision of better cover (Eason 19889).

In terms of possible effects of forestry on coarse scale habitat usage, Courtois et al. (2002) found that females increased the size of their home ranges in the presence of cutover areas, but that they did not increase their movements in accordance. Crête (1988) noted that in addition to increasing hunter access to moose habitat through the creating of roads, the removal of cover increases the exposure of moose to hunters until regrowth occurs. This trend was observed in Ontario by Eason (1985), who reported a decline of 75% in the density of moose in a recently logged area due to overharvesting made possible by extensive road networks and greatly reduced cover.

The literature available on other response of ungulate populations, and specifically Moose to wind projects is sparse. Westworth et al. (1989) studied the usage of habitat by moose in the vicinity of a copper mine in British Columbia. These researchers determined that habitat type had a more important influence on moose distribution than did distance from the mine site. Specifically, moose pellet densities were as high or higher within 300m of the mine site as they were 1000-2000m from the site. They concluded that moose in the area had habituated to the various disturbances associated with the mining operation, including noise.

5.10.1.1.3 Human Development and Activity

While moose are considered more tolerant of human presence than are other ungulates (AXYS 2001), they are nonetheless sensitive to human proximity (Neumann 2009). A number of human activities intrude on moose habitat. Anderson et al. (1996) determined that human sources of disturbance, as opposed to mechanical sources, elicit flight responses from further away and result in longer periods of elevated heart rates in moose

Based upon the results indicated by numerous researchers, disturbance of the area by construction may increase the amount of grass and forb forage, as understory species will flourish when the overstory canopy is removed and grasses resulting from interim reclamation establish. It is also expected that maintenance of surrounding forest systems will maintain adequate thermal and security requirements of the species.

Aerial photo interpretation and field assessments indicate that the location is surrounded by habitat of similar quality. Fragmentation of habitat will be minimal as the site is located adjacent to existing disturbances and wildlife corridors through forested stands will be maintained.

5.10.2 Bats

Consistent with the requirements as set out by the Nova Scotia Department of Environment (Nova Scotia Environment, 2007, updated 2012) the following four objectives were established:

(1) To review of the potential impacts of wind turbine developments on bats;
(2) To provide a summary of the ecology of the bat species that are likely to be present in the area that is relevant to the proposed development;
(3) To assess whether there are any known bat hibernacula within 25 km of the proposed development site; and,
(4) To conduct a survey to count local species richness and assess the level of bat activity levels at the site (as bat passes/night).

All bat species native to Nova Scotia are considered to be sensitive to anthropogenic disturbance. There are occurrence records for seven species of bats in Nova Scotia, including hoary (*Lasiurus cinereus*), silver-haired (*Lasionycteris noctivagans*), eastern red (*Lasiurus borealis*), big brown (*Eptesicus fuscus*), eastern pipistrell (*Perimyotis subflavus*), northern long-eared (*Myotis septentrionalis*), and the little brown (*Myotis lucifugus*) (Broders *et al*., 2003; van Zyll de Jong, 1985). With the exception of the northern long-eared and the little brown bat, Nova Scotia is at the northern extent of the current known range for each of these species (van Zyll de Jong, 1985). These two species, as well as the eastern pipistrelle, appear to be the only bat species with significant populations in the province (Broders *et al*., 2003). The little brown and northern long-eared bats are likely ubiquitous in Nova Scotia as their distributions extend into Newfoundland (Broders *et al*., 2003) while the eastern pipistrelles appears to be locally abundant only in southwest Nova Scotia (Broders *et al*., 2003; Farrow, 2007; Rockwell, 2005). Based on available evidence, the incidence of migratory bats in northern Nova Scotia is thought to be very low. The bats most likely to frequent the Project Area are the northern long-eared and the little brown bat. In addition to the potential for the direct mortality of bats from striking the revolving blades, the removal of forest habitat may degrade the roosting tree habitat for bat populations that reside in the area during the summer.

However, the risk of bat collision with wind turbines is generally greater for migrating bats than for resident breeding, commuting or foraging bats, which generally forage between 1-10 m above ground level and seldom above 25 m, thus avoiding turbine blades (Erickson *et al*., 2002).

In July 2013, the three resident species of bat in Nova Scotia (Little brown bat, Northern long-eared bat, and Tri-colored bat), were listed as endangered species under the Nova Scotia Endangered Species Act (NSESA) as a result of a major outbreak of the disease known as White Nose Syndrome (WNS), which is caused by the fungus, *Geomyces destructans*.

Little brown bat, which was once the most common bat in Nova Scotia is now endangered as a result of WNS. The disease has killed nearly 7 million bats in eastern North America in the past 8 years and estimates of a 90% percent decline in Nova Scotia have taken place in just 3 years since the disease was first recorded (NSDNR 2013). There is no known cure for the disease which is lethal and affects all bat species that congregate in caves and abandoned mines used for hibernation through the winter (NSDNR 2013). The Northern long-eared bat is Nova Scotia's second most common bat. It usually hibernates in association with the Little Brown Bat in caves and abandoned mines and at other times of the year is a true forest bat. Northern Myotis are also endangered by White-nose-Syndrome (NSDNR 2013).

The Tri-colored Bat is the rarest of three bats that occur in the province. The Nova Scotia population is thought to be geographically isolated from others in eastern North America. Little is known about the ecology of tri-colored bats in the province, but research shows that it uses rivers and streams for feeding. Although white-nose syndrome has not been confirmed in this species in Nova Scotia (likely because the bat was always rare), evidence in the north east US indicates the species has been seriously impacted (NSDNR 2013).

Table 30. Bat species previously recorded in Nova Scotia

Species	Overwintering Strategy	Documented fatalities at wind farms?	Global ranking[2]	Federal, Provincial or ACCDC Ranking
Little brown bat	Resident hibernator (NS and NB)	Yes	G5	NSESA (endangered)
Northern long-eared bat	Resident hibernator (NS and NB)	Yes	G4	NSESA (endangered)
Tri-colored bat	Resident hibernator (NS and NB)	Yes	G5	NSESA (endangered)
Big brown bat	Resident hibernator (NB)	Yes	G5	N/A
Hoary bat	Migratory	Yes	G5	S2
Silver-haired bat	Migratory	Yes	G5	S1
Eastern red bat	Migratory	Yes	G5	S2

1 Bat species documented in fatality events from carcass surveys conducted at wind energy development sites in N.A.
2Global ranking based on the NatureServe Explorer, G5= **Secure**—Common; widespread and abundant: G4= **Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
3Atlantic Canada Conservation Data Centre ranking, based on occurrence records from NB and NS; S1= **Extremely rare**--May be especially vulnerable to extirpation (typically 5 or fewer occurrences or very few individuals; S2= **Rare**--May be vulnerable to extirpation due to rarity or other factors (6 to 20 occurrences or few remaining individuals); S4= **Usually widespread--** fairly common and apparently secure with many occurrences; (?) qualified as inexact or uncertain.
NSESA ranking: http://novascotia.ca/natr/wildlife/biodiversity/species-list.asp

5.10.2.1 Potential for hibernacula in Project area

The guide to wind development prepared by the Nova Scotia Department of Environment and Labour (NSDEL, 2007, updated January 2012) states that wind farm sites within 25 km of a known bat hibernaculum have a ‘very high’ site sensitivity.

The closest hibernacula site mentioned by Moseley (2007) as a potential hibernaculum is Hirschfield Galena Prospect (an abandoned mine with a surveyed length of 215 m). This site is located on the mainland of Nova Scotia approximately 65 km southwest of the Canso causeway. Moseley described this location as a significant hibernaculum with 200-300+bats. The species composition was not confirmed, but probably was mostly *M. lucifugus*.

The Nova Scotia Abandoned Mine Openings Database was also used to identify mine shaft sites near the Project Area that could have the potential to serve as hibernacula.

Table 31. Abandoned mine shafts in proximity to Project.

Mine Shaft ID	Closest Turbine Number	Distance (m) and Heading from Closest Turbine	Opening Type	Depth (m)	Notes

LAE-2-002	8	4862m at 114 degrees	Shaft	7.5	flooded
LAE-1-001	16	4782m at 114 degrees	Pit	N/A	flooded
GLE-2-007	16	7150m at 274 degrees	Shaft	Unknown	Surface shaft only
GLE-1-001	31	4031m at 272 degrees	Shaft	6	flooded
GLE-1-002	31	4031m at 272 degrees	Shaft	7.5	flooded
GLE-1-003	31	4016m at 274 degrees	Shaft	36	Not found
GLE-1-004	31	3734m at 267 degrees	Adit	6	
GLE-1-005	31	2744m at 254 degrees	Shaft	13	flooded
GLE-1-006	31	4030m at 91 degrees	Slope	175	

Given the distance from the above noted sites to the Project Area, it is unlikely that any onsite activities would cause disturbance to bats that might be hibernating in the mine. If the mines serve as a hibernaculum, there is some potential for elevated numbers of bats to be present in the Project Area during the spring and autumn as regional populations leave and return to the hibernaculum. However, these bats would likely be residents and not flying at turbine altitudes.

The intensity of bat activity levels will vary throughout the Project lifecylcle. Night-to-night variation in bat activity levels may be caused by variations in weather conditions, migration timing or foraging intensity. Both migratory and foraging behaviour may also be a function of environmental conditions (e.g., wind speed) (Baerwald et al. 2009).

In previous studies of Bat activity at three other wind power projects in Nova Scotia, the average number of sequences per night at the various projects were as follows:

1. Glen Dhu wind development area in 2007 was 6 per night during the sampling period;
2. Hampton Mountain wind development area in 2009 was recorded on the ground-based detector from 19 July until 25 August 2010 was 75 per night;
3. Glen Dhu South wind development area in 2011 was 28.4 for ground based detectors;
4. Pugwash Wind Farm, the average number of sequences per night was 30 during the sample period (CBCL, 2012);

For context, in 129 nights of monitoring along 5 forested edges from June-August 1999 in the Greater Fundy National Park Ecosystem the average number of sequences per night was 27 (SD = 44) (Broders, unpublished data).

Bats exhibit dynamic movements across the landscape where they typically forage in several different locations each night (Kunz et al. 2007). Nightly activity as measured by bat passes can vary significantly at any one location so that a single night of data will not statistically represent the overall trend of bat activity at that location (Kunz et al. 2007).

Echolocation surveys were conducted in the spring and of fall of 2012 within the East Bay Hills study area. Spring surveys were conducted at two sites between from May 12th and June 21st, 2012; however, the number of survey nights was not consistent amongst the survey sites (Table 32). Fall surveys were also conducted at two sites for 11 consecutive days from September 4th to September 14th, 2012. When extraneous noise was discounted a combined total of 29 bats generated ultrasound files were recorded for all surveys sites and time periods.

With the exception of one recorded unknown bat species all recorded echolocation calls were associated with Myotis species bats (i.e., little brown bat (*Myotis lucifugus)* and northern long-eared bat *M. septentrionalis*) both common species in Nova Scotia. No attempt to identify each of the Myotis species calls to species because of the difficulty in achieving defensible identifications (Broders 2011). Despite this, there were echolocation calls with characteristics consistent with both northern long-eared and little brown bat. The unknown call was clearly bat generated ultrasound; however, the quality of the file was not sufficient to render a definitive identification.

Bat activity during the survey was similar at both sites with 11 and 9 calls detected at sites 1 and 2 respectively (Table 32). Bat activity during the fall survey was higher at site 1 than at site 2. A total of 8 calls were detected at sites 1 versus 2 calls detected at site 2. Over all bat activity was very low for both, spring and fall surveys. This could be due to habitat quality but more likely can be attributed to the rapid decline in non-migratory bat populations seen throughout northeastern North America caused by white-nose syndrome.

Table 32. Number of echolocation calls by species recorded at two sites between May 2012 and June 2012.

Date	Site 1	Site 2		Date	Site 1	Site 2
	Myotis	Myotis			Myotis	Myotis
12/05/12	0	0		02/06/12	0	0
13/05/12	0	0		03/06/12	0	0
14/05/12	0	0		04/06/12	0	0
15/05/12	0	0		05/06/12	0	0
16/05/12	0	0		06/06/12	0	0
17/05/12	0	0		07/06/12	0	0
18/05/12	0	0		08/06/12	0	0
19/05/12	3	0		09/06/12	0	0
20/05/12	0	2		10/06/12	0	0
21/05/12	0	7		11/06/12	0	0
22/05/12	0	0		12/06/12	0	0
23/05/12	0	0		13/06/12	0	0
24/05/12	0	0		14/06/12	0	0
25/05/12	0	0		15/06/12	0	0
26/05/12	0	0		16/06/12	0	0
27/05/12	0	0		17/06/12	0	0
28/05/12	0	0		18/06/12	0	0
29/05/12	0	0		19/06/12	0	0
30/05/12	0	0		20/06/12	2	0
31/05/12	0	0		21/06/12	6	0
01/06/12	0	0		TOTAL	11	9
				Calls/Day	0.26	0.22

Table 33. Number of echolocation calls by species recorded at two sites between September 4th and September 14th, 2012.

Date	Site 1	Site 2	
	Myotis	Myotis	Unknown
04/09/12	0	1	1
05/09/12	0	0	0
06/09/12	0	0	0
07/09/12	2	0	0
08/09/12	0	0	0
09/09/12	0	0	0
10/09/12	0	0	0
11/09/12	2	0	0
12/09/12	3	0	0
13/09/12	0	0	0
14/09/12	1	0	0
TOTAL	8	1	1
Calls / Day	0.72	0.09	0.09

5.10.3 Canada Lynx

Canada lynx *(Lynx canadensis)*, hereafter referred to as lynx, were designated "endangered" in 2002 under the *Nova Scotia Endangered Species Act* and are listed as 'Red' under Nova Scotia Department of Natural Resources' (NSDNR) General Status Ranks of Wild Species. Although a recent COSEWIC estimate (2001) listed lynx as 'Not at Risk' across Canada, this mammal been extirpated from mainland Nova Scotia, with the exception of rare sightings, associated with population lows of their primary prey, snowshoe hare *(Lepus americanus)* (Parker, 2001).

Lynx are known to be found in only three areas on Cape Breton Island: Cape Breton Highlands, Boisdale Hills, East Bay Hills, and South Mountain (Nova Scotia Lynx Recovery Team, 2007). The proposed East Bay Hills Wind Power Project (the 'Project'), bordering on Cape Breton and Richmond counties, is associated with an historic subpopulation of lynx, and there may still be lynx using this habitat. Recent surveys have estimated there to be a small sub-population of Canada lynx within the East Bay Hills region (Nova Scotia Lynx Recovery Team, 2007).

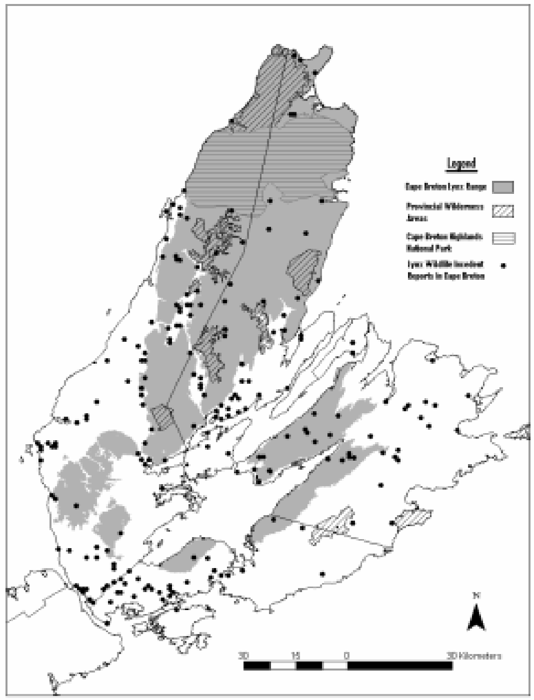


Figure 7. Lynx sitings from DNR Wildlife Investigative Reports (WIR) up to 2006/2007

Total numbers of lynx on Cape Breton Island may vary from approximately 475-525 (10-11 lynx/100 km^2) during cyclical highs, and 95-140 (2-3 lynx/100 km^2) during population lows (Parker, 2001).

Lynx are closely tied to its preferred prey, snowshoe hare. The hare follows a fairly regular 10-year boom and bust cycle, lasting 1 to 2 years (Poole, 2003). Although more geographically north than populations in the United States, the Cape Breton lynx populations are characteristic of the southern range of the species. Southern populations, such as those studied in northern Maine, generally experience a low 2 to 3 years after the hare's cyclical collapse (O'Donoghue, Boutin, Krebs & Hofer, 1997; Parker, 2001; Poole, 2003). The last documented peak in the Cape Breton lynx population was the 1999/2000 season, with lows between 1992 and 1994 (Parker, 2001). Following accepted 10-year trends, lynx should have experienced a high in 2009/2010 and should now be in a low trough, from 2012 until 2014. These trends are important to keep in mind during monitoring of the Project area for the 2012/2013 season.

In times of low hare abundance, common prey items for lynx in Nova Scotia include Red Squirrels *(Tamiasciurus hudsonicus)*, Ruffed Grouse *(Bonasa umbellus)*, and occasionally other birds and mammals. During these lows, Eastern coyote *(Canis latrans)* and Bobcat *(Lynx rufus)* may compete with lynx for prey. Recent estimates have indicated a population growth of these carnivores on Cape Breton Island, and some research, in addition to conversations with DNR, suggests that roads may facilitate their distribution (Parker, 2001) into lynx habitat.

Lynx were listed as a threatened species in 2000 under the United States *Endangered Species Act*, and this listing has resulted many recovery plans and studies that are well suited for a greater understanding of this species in its Cape Breton range (see Jakubas & Ritchie, 2008; Nordstrom, 2000; Organ et al., 2008). Lynx have been monitored using bait stations, hare snares, triggered cameras, tracking surveys, GPS and radio-collar tracking, carcass collection, monitoring snowshoe hare populations, and soliciting reports from local trappers (Nova Scotia Lynx Recovery Team, 2007). However, their elusive nature and low population densities make monitoring difficult and expensive, particularly with radio telemetry techniques (Jakubas & Ritchie, 2008).

In 2012, McCallum Environmental proposed a monitoring protocol to DNR to determine the presence/absence of lynx in the study area. (Appendix V. LYNX MONITORING PROTOCOL) The first objective of this monitoring protocol was to determine the presence of lynx within the Project area. This objective was achieved through an assessment of the numbers and distribution of lynx throughout the Project area, as well as any observations of its preferred prey, snowshoe hare. Therefore, this first phase of monitoring, conducted in the summer months of 2012, and then again in the winter of 2013 and 2014, was to:

1. Create transects based on preferred habitat;
2. Complete transect assessments for snowshoe hare pellet counts, and/or visual evidence of lynx in the area.

Future objectives of the monitoring protocol will be to document locations, movements, and observations of lynx and snowshoe hare in the Project area. Continued through winter season of 2014/2015, monitoring will further assess the presence of lynx in the Project area, while documenting snowshoe hare location and movement. Winter monitoring will focus on snow tracking for lynx, as well as pellet counts for snowshoe hare.

Therefore, the overall objective of this monitoring protocol will be to:
1. Determine the presence of Lynx and its main prey, snowshoe hare, within the project area.
2. Document species locations, movements, and composition;
3. Inform local authorities about the observable characteristics/distribution of the lynx.

5.10.3.1.1 Lynx Monitoring Project Results

In January 2014, the Unama'ki Institute of Natural Resources (UINR) was contracted by McCallum Environmental, to conduct a Canada Lynx (*Lynx canadensis*) monitoring project in the East Bay Hills area of Cape Breton Co. Nova Scotia.

There is a considerable road network, throughout the East Bay Hills, which was built by the Port Hawkesbury paper mill as part of their forestry operations in the early 1990's.

The paper mill holds the harvesting lease on the provincial crown land in which the Lynx survey took place. Thus, a considerable portion of the forest stands in the survey area have been harvested in the past 20 years. The forested areas that have not been harvested in the last 2 decades are mostly comprised of mixed wood stands.

During the survey UINR observed stands of almost pure softwood and pure hardwood but in general terms the survey area could be described as a mix of regenerating softwood stands (< 20 years old) and mixed wood stands.

Due to the nature of the project the weather was the dominating factor in determining when UINR was able to track. An ideal tracking day would be; following an initial snow fall, 48-72 hours passing with no precipitation and little to no wind. This would give the animals 2-3 days to move about before UINR began to track. One phenomenon UINR experienced on several occasions was that of snow being blown into a set of tracks and making their absolute identification difficult.

All observations made throughout the survey were made using track identification with the exception of four occasions when snowshoe hare pellets were found on the transects and recorded.

The initial trip was made on January 10th, 2014 with 2 more trips occurring in January. One trip was made in February, four in March and the ninth and final trip, being on April 4th 2014.Throughout the monitoring project snowshoe hare tracks were observed on all trips (see Table 34).

Eastern coyote was observed on all trips except one on January 30th (see Table 34). On this date the snowfall the day before was minimal (less than 2cms) and the snow crust was very hard leading UINR to assume any animals traveling were staying on top of the crust thus, not imprinting their tracks down into the snow.

Table 34. Number of tracks observed per transect for snowshoe hare and Eastern coyote.

Species	Trans. # 1	Trans. # 2	Trans. # 3	Trans. # 4	Trans. # 5	Trans. # 6	Trans. # 7	Trans. # 8	Trans. # 9
Snowshoe Hare	4	13	13	26	10	65	16	18	32
Eastern Coyote	0	1	0	3	2	4	1	2	3

UINR did observe Lynx tracks on two occasions both occurring on February 25th. The first was observed off of the primary East Bay Hills road between transect 6 and 7 and secondly adjacent to the logging road while traveling into transect 9 (See Table 35). UINR staff verified the tracks to be that of Lynx, through photographs, with a NSDNR wildlife biologist, Terry Power, who is based out of the Coxheath field office.

Table 35. UTM coordinates of the two observations made of Canada lynx tracks.

Canada Lynx Track location	Easting	Northing
Observation #1	**0688082**	**5082937**
Observation #2	**0688600**	**5082235**

UINR was able to verify that the Canada lynx does indeed inhabit the Project area on the East Bay Hills. This was known from DNR consultation, but the exact amount of use was unknown. However, using the information UINR collected it is very difficult to estimate the exact lynx population in the East Bay Hills, but it is likely that the population is small. Furthermore, the Project Area is not expected to provide the only habitat in this area. Lynx habitat extends to the southwest and northeast of the Project area, along the same prominent ridge features that border the Bras d'Or Lakes. These ridge features are greater than 45 km in length.

5.10.4 American Marten

American Marten are listed as endangered in Nova Scotia. Marten are typically found in in dense deciduous, mixed, or (especially) coniferous upland and lowland forest. When inactive, occupies hole in dead or live tree or stump, abandoned squirrel nest, conifer crown, rock pile, burrow, snow cavity, etc.; uses mainly subnivean sites, often associated with coarse woody debris, in winter. Young are born in a den, usually in a hollow tree, sometimes in rock den.

In Nova Scotia, two distinct populations have been identified, one in the Cape Breton highlands and one in south western Nova Scotia. The majority of the records in the ACCDC database come directly from the CBHNP. It is believed that the Cape Breton population of American marten may extend into the East Bay Hills area (T. Power, pers. comm.).

No evidence of American Marten was found during environmental assessment work. Vegetation assessments conducted during the field work also did not find evidence of mature coniferous forests that would potentially support Marten.

5.10.5 Fisher

Fisher were extirpated from Nova Scotia by the early 1920s but were reintroduced in southwestern Nova Scotia and central Nova Scotia. Fisher prefer habitat containing large expanses of mature mixedwood forest, particularly areas containing abundant prey and suitable denning sites such as hollow trees. As mentioned earlier, the Project Area has been extensively logged in recent years and does not provide good fisher habitat. In addition, the Project Area is located outside of the area of both re-introduction sites in Nova Scotia believed to be occupied by fisher. As such, it is unlikely that the Project would adversely affect fisher populations.

5.10.6 Long-Tailed Shrew

Long-tailed shrew are listed as Yellow in Nova Scotia due to their potential to be affected by anthropogenic influences. They generally inhabit talus slopes and rock slides in both deciduous and coniferous forests. They have also been observed using man-made artificial talus created by road-building. According to Shafer and Stewart (2006), *Sorex dispar* have been identified in Nova Scotia at three sites in the Cobequid Mountains and a population at Stewart Mountain. The records in the ACCDC database are from greater than 40 km away from the Project Area. The Project Area does not include talus slope and no Project components are to be constructed on or near any talus slopes.

5.10.7 Effects of the Project

5.10.7.1 General

The following potential effects on mammals would occur from construction, operations, and decommissioning activities and will be a result of effects such as tree clearing, road building and infrastructure installation and maintenance, including:

- loss of habitat and habitat fragmentation;
- sensory disturbance;
- predation or hunting risk; and,
- road mortality.

Vegetation clearing of the proposed Project footprint is anticipated to result in loss of available habitat for mammals. The majority of the moderate quality habitat affected is located along the connector access roads for the proposed Project.

There is some established literature pertaining to the response of wildlife to wind farm development. A wildlife monitoring report from the Searsburg wind project in Vermont reported that moose were using the area under a generating turbine (Multiple Resource Management Inc. 2006). A total of 23 images of moose were captured using a remote camera installed under the turbine, and of these, 61% occurred when the turbine was on and generating power. Observations of moose scat and of a single moose foraging were reported on the site of the Dokie Wind Energy Project in British Columbia (Jacques Whitford AXYS Ltd, UNBC 2008), meaning that moose continued to use the area after the wind farm was in operation.

A study of the response of elk, another ungulate, to wind-power development in Oklahoma was conducted by Walter et al. (2006). They determined that elk in the area were not adversely affected by the wind-power development, either through negative effects on diet or through changes in home range. The elk remained in the area throughout the construction and operation phases of the wind farm, and the access roads were no barrier to elk movement.

Although moose and deer are not listed as species of concern the rationale for selection of these species as VECs pertains to their socioeconomic value as hunted game species and to their importance to local First Nations. Unfortunately, the number of ungulates currently harvested by local First Nations within the Project Area is not accurately known.

While habitat preferences can change as the abundance of available habitat changes (Osko, Hiltz, Hudson, and Wasel, 2004) and habitat selection shows a high degree of variability among individuals (McLaren, Taylor and Luke, 2009), mammals may require large areas with diverse habitat types (Snaith and Beazley 2002). Habitat preferences are correlated with forage and cover requirements, as well as breeding behaviours (Peek, Urich, and Mackie, 1976).

Wildlife sensory disturbance may occur as a result of on-going human activity on-site as well as visual and auditory disturbance related to the operation of the turbines. Sensitivity of wildlife to disturbance varies by species and life-stage.

Human presence (noise, sight and smell) and vehicles may disturb wildlife. During operation of the wind-farm, Project-related vehicles and personnel will be in the vicinity of wind turbines on a regular basis for ongoing maintenance. It is likely that some disturbance of diurnal wildlife will occur during operation and maintenance of the Project. Bats are unlikely to be affected by human presence as they are nocturnal and the majority of human presence will occur in the Project Area during the day. Although there is the potential for limited human presence induced disturbance to wildlife, significant adverse effects are not predicted for several reasons. First, the Project Area has a high degree of existing human disturbance (*i.e.,* forestry activities) and thus wildlife species have either become acclimatized to some degree of human disturbance or have already left the area. Second, disturbance will be intermittent and generated noise will be of low levels (*i.e.,* human speech and vehicle noise). In order to further reduce the severity effects of human disturbance on wildlife, worker presence on-site should be minimized and limited to designated work areas. In consideration of existing conditions and suggested mitigation no significant adverse effects are predicted on wildlife due to human presence during operation and maintenance.

The operation of the wind turbines may also result in visual and auditory disturbance of wildlife. However, studies in the western United States have shown that there has been no significant effect of the construction and operation of wind farms on big game (Strickland and Erickson 2003), indicating that species are either unaffected by these developments, given their small footprint and the preservation of existing land use, or that they can readily adapt to the presence of wind turbines. At this site, habitat avoidance will most likely occur during periods of construction, and may be more intermittent during periods of operation, when human presence on-site is less frequent and would occur on a short-term basis.

Vegetation clearing will occur during the construction phase of the project, specifically around turbine pads, new and upgraded access roads, along transmission line corridors, at the new substation, and at the potential concrete plant. If footprints overlap with suitable ungulate habitat, this vegetation removal could result in the loss or fragmentation of habitat for ungulates. This effect has potential for long-term impacts when mature forest (potentially suitable security or thermal habitat) is converted to early succession stages (less suitable security or thermal but potentially suitable food habitat).

Limited research on the effects of wind turbines on terrestrial mammals exists regarding the effect of infrastructure development (i.e. powerlines, ski trails, wind-power) on ungulate behaviour, habitat use and movement. In a study conducted in at a wind energy facility in Oklahoma using telemetry data, Rocky Mountain Elk movement patterns prior to construction, during construction and operation did not vary and overall trends in home range size were not affected (Walter et al. 2006). Climatic variables and their effects on forage availability potentially have a greater influence on ungulate movement than the construction of wind-power facilities (Walter et al. 2006).

Although wildlife may also avoid the Project Area due to auditory (noise) disturbances, which may further limit winter habitat availability, the construction-related activities will not result in the reduction of any high quality winter habitat. Various studies demonstrate that ungulates habituate when disturbances are within their home range (Walter et al. 2006, Pelletier 2006).

Any construction activities undertaken during fall could potentially affect the rutting behaviour of ungulates. It is assumed that construction activities undertaken in spring (May to June) will not affect ungulate calving areas. Most ungulates prefer riparian areas, typically with high shrub vegetation cover to give birth. As the turbine array is not proposed near any large riparian areas, the noise associated with the construction and assembly of turbines is not likely to affect the selection of calving areas. Walter et al. (2006) observed that elk continued to use riparian habitats located within the project area during and after construction since this habitat was not altered by installation of the wind-power project.

Increasing road access has the potential to increase human access and presence throughout the Project Area, with a resulting increased mortality risk to ungulates. Upgrades to existing roads and construction of new road and connector road networks increases opportunities for hunters to access the area, and may increase predator access. Bear and coyote mobility may benefit from an increase in road or transmission corridor networks in the area and this could lead to increased predation on ungulates.

Linear features such as roads, trails and transmission corridors have the potential to influence wildlife movement patterns. They create a barrier to movement for certain species, may act as a conduit to movement for other species and the types of human activity can influence wildlife movement. Bears are tolerant of some human activity but will avoid features when human frequency is high (Jalkotzky et al. 1997).

The impacts and effects on wildlife movement associated with linear features will vary depending on the feature type, frequency of human activity, season of use and width of the feature. The existing Forestry roads, have already enabled access within much of the Project Area and it is anticipated that there will not be an appreciable increase in hunting activity due to construction activities.

Although ungulate mortality may occur through an increase in vehicle collisions, it is assumed that local ungulates have largely adjusted to the presence of the existing recently developed road networks.

Studies completed by Buckmaster et al. (1999) indicate that wildlife populations may be expected to disperse from the area during periods of construction. Based upon the vegetation characteristics in adjacent areas, and the conclusions of Buckmaster et al. (1999), it is expected that displacement of wildlife will be temporary. Development of the turbine sites and access roads is expected to increase forage potential as grass and forb species re-establish during interim reclamation. Loss of thermal and security cover is unavoidable, however, surrounding vegetation is expected to maintain these requirements.

5.10.7.2 Bats

In 2010/2011 mortality studies were completed at the Glen Dhu Wind Power Project. The Glen Dhu project is similar in size and terrain to this Project. The mortality estimates from that project were estimated using the formula recommended by the Canadian Wildlife Service.

Mortality statistics for bats has not yet been published for public use for Nova Scotia. For Glen Dhu Wind Energy, the estimated mortality was 28.42 bats or 1.05 per turbine using the square grids. Extrapolating to the 50-meter radius circular grids the estimated mortality is 0.74 to 0.96 per turbine. (John Kearney, February 2012) Extrapolating to this Project then, there would be an expected mortality of 31 bats / year.

The Canadian Wildlife Service maintains a database as a joint initiative of Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources. "The goals of this project are to facilitate improved understanding of the impacts of wind turbines on birds and bats, allow for greater consistency in assessment of wind power impacts across the country, and lead to future improvements in the Environmental Assessment and approval processes. The current report presents uncorrected results from available studies, primarily conducted between 2006 and 2010. It represents the findings of approximately 239 months of post-construction monitoring activity around 779 turbines at 24 different sites in Alberta, British Columbia, Newfoundland, Nova Scotia, Ontario, Prince Edward Island and Saskatchewan. Across Canada, a total of 2270 bat casualties were found representing 9 different species." (Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources, August 2012)

The Environment Canada database indicates that Hoary Bat was the species most often found (33% of all bat fatalities). Silver-haired Bat was the second most commonly found species (23% of all bat fatalities). Other species commonly found included Big Brown Bat (8%), Little Brown Myotis (20%) and Eastern Red Bat (15%). Migratory bats (Eastern Red Bat, Hoary Bat and Silver-haired Bat) represented 71% of all bat mortalities.

Across Canada, bat casualties were reported more often than birds at almost all sites monitored, accounting for 71% of all carcasses found (2270 bats and 945 birds). (Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources, August 2012) "In Canada, most bat casualties at wind power projects were found in July, August and September (87% of bat carcasses) corresponding to the swarming and migratory period for bats. Peak numbers of carcasses were found in August (43% of all bat carcasses). Migratory (Hoary Bat, Silver-haired Bat, and Eastern Red Bat) species were found more than resident species (Little Brown Myotis Big Brown Bat, Eastern Pipistrelle, Northern Myotis and Eastern Small-footed Bat) in August and September.

The increase in fatalities of resident bat species between July and September coincides with the period of swarming behavior and movements between summer roosting sites and over winter hibernacula." (Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources, August 2012)

All of the bat species expected to occur in the study area use trees as summer day roosts for shelter and maternity sites. Most bats change their tree roosts every few days. The impact of the proposed Project on bats would be from tree removal during clearing for turbine pads and roads.

Except for disturbance to hibernating bats the potential impact of noise or vibration from activities such as blasting, on bats is not well understood. Blasting and rock removal for road and turbine pad construction may disturb or displace roosting bats. There is evidence that ambient noise may impact foraging bats; however, proposed construction activities would take place during the day while bats are roosting. Potential adverse effects on bats from the noise of operating WTGs are not understood.

The most concerning potential effect of operational wind turbines on bats is fatalities caused by direct collisions with rotating turbine blades or barotrauma, which results from pressure changes near the edge of spinning blades.

Reviews of literature indicate that some bat species appear to be attracted to rotating turbine blades, although the reason for the attraction is not yet scientifically understood. Bat fatalities often exceed bird fatalities from collisions with WTGs and are a common issue with wind projects around the world. Carcass surveys at wind farms in the United States and Alberta show that most fatalities correspond with autumn migration or dispersal, and tend to be biased towards migratory species such as the hoary bat and the silver-haired bat. While acoustic surveys are expected to show bat activity rates at the proposed Project study area, there are no published studies that show a positive correlation between bat activity rates measured at a site before turbine construction and collision fatalities after they are operational.

5.10.7.3 Lynx

One notable comment by Terry Power (DNR Biologist, UNIR communication) was that if this Project is successful in its application, the building of the roads that are proposed to erect and maintain the turbines would be advantageous to the coyote population. Coyotes are known “road hunters”, meaning they use the road networks to travel, giving them fast and easy access, to their hunting areas. The existing length of forestry roads on the Project lands is 21,063 metres. An additional 15,284 metres of road will be constructed for the Project. Of the 15,284 metres, 8190 has been placed in clear-cuts to reduce impacts to vegetation and wildlife. Therefore 7094 metres of new cut is required.

Whereas, the Lynx rarely use roads to travel thus, putting the Lynx at a direct disadvantage in their competition with the coyote in capturing their main prey, the snowshoe hare.

However, initial Lynx monitoring indicates a continued abundance of snowshoe hare in the Project area.

5.10.8 Mitigation

Turbines have been placed as densely as was technically feasible in order to limit Project sprawl. The overall footprint of the Project has minimized its footprint in order to reduce habitat fragmentation.

The use of existing logging roads as much as possible for access to turbine locations has reduced the amount of fragmentation of forests as a result of the Project. This Project area is already highly fragmented based on the presence of significant forestry activity and access road layout on the lands. During the planning stages of this Project and during final turbine siting exercises, special care was given to using existing roads and clear-cuts wherever possible to minimize impact on remaining habitat.

5.10.8.1.1 Bats

Efforts to minimize conflicts between wildlife and wind energy development have focused on 2 areas: risk avoidance and impact mitigation. (Weller, July 2011) Risk avoidance involves conducting surveys prior to construction in order to avoid sites, or areas within sites, with high levels of usage by wildlife. Compiled at the landscape level these data could allow developers and regulators to compare relative level of risk among multiple sites; within a site, information could be used to avoid areas of highest risk to wildlife (Weller, July 2011). The foundation of this approach is that low indices of activity prior to construction should translate to low fatality rates because fewer animals are available to be killed (Baerwald and Barclay 2009). Impact mitigation has focused on developing methods to reduce wildlife fatalities at operational wind facilities. Changes in turbine cut-in speeds, the wind speed at which turbine blades begin to rotate and generate electricity, has reduced bat fatalities in 3 separate studies (Baerwald et al. 2009; Arnett et al. 2011; O. Behr, University of Erlangen, unpublished report) and, is the optimal mitigation measure for bats that has been tested at operational wind facilities.

5.10.8.1.2 Lynx

In order to mitigate effects of access by coyote as a result of new roads, and subsequently allow for increased prey for Lynx, a coyote trapping program could be developed and implemented to manage the coyote population. This would have to be done in consultation with DNR and other crown land users to create an effective program that incorporates all uses of the area, including forestry operations.

5.10.1 Significance

5.10.1.1 Magnitude

The potential effect of habitat loss on mammals should be low as pre-construction surveys will note active dens and buffer the dens and associated foraging area. The potential effect of sensory disturbance on mammals would be of moderate magnitude as species are sensitive to human disturbance and may choose to avoid the proposed Project.

The potential effect of increased hunting/trapping, predation and road mortality on mammals would be of moderate magnitude.

As noted by Terry Power (DNR Wildlife Biologist) the affect resulting from increases in road access is increased predation by coyotes on snowshoe hare, which is a primary food source for the Lynx. The magnitude of this effect is unknown. But existing data on snowshoe hares collected during Lynx surveys suggests an abundance of prey. Coyote populations may flourish as more prey becomes accessible by roads. The magnitude of this effect is unknown.

5.10.1.2 Probability

The potential effect on mammals from habitat loss and sensory disturbance are likely as some clearing of habitat, including riparian vegetation would occur species are sensitive to human disturbance. The probability of a potential increased effect from hunting/trapping, predation and road mortality on mammals would be unlikely. The probability of increased access by coyote along new roads is certain.

5.10.1.3 Geographic Extent

The extent of the potential effects on mammals would be local.

5.10.1.4 Duration and Frequency

The effect on mammals from habitat loss and sensory disturbance would be long term and continuous throughout the life of the construction phase of the proposed Project. Duration would decrease during operations. The potential effects from hunting/trapping, predation and road mortality would be long term, though intermittent during the life of the Project. The potential effects on coyote access resulting from increased roads would be long term and continuous.

5.10.1.5 Reversibility

The potential effects on mammals would be reversible after restoration and decommissioning. Temporary access and openings used during construction would be deactivated and re-vegetated, reducing the impacts of habitat loss and fragmentation over time.

5.11 Reptiles & Amphibians

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

Information regarding the herpetofauna in the Project area was obtained from existing information sources (e.g., ACCDC 2012; Gilhen 1984; Gilhen and Scott 1981) and field surveys. Table 36 also lists herpetile species that can reasonably be expected to occur in the Project Area. None of these species is considered to be rare or sensitive to human activities in Nova Scotia.

Table 36. Herpetile Species Recorded in and Likely occur in the Project Area

Common Name	Scientific Name	NSDNR Ranking	ACCDC Ranking
Maritime Garter Snake	*Thamnophis sirtalis pallidula*	Green	
Yellow-spotted Salamander	*Ambystoma maculatum*	Green	
Red-spotted Newt	*Notopthalmus viridescens viridescens*	Green	
Northern Spring Peeper	*Hyla crucifer*	Green	
Green Frog	*Rana clamitans*	Green	
Wood Frog	*Rana sylvatica*	Green	
Northern Leopard Frog	*Rana pipiens*	Green	
Wood Turtle	*Glyptemys insculpta*	Yellow	S3

5.11.1 Rare and Sensitive and at Risk Herpetiles

The ACCDC database search identified two rare or endangered herpetile species that have been recorded within a 100 km radius of the Project; including wood turtle (*Glyptemys insculpta*) and four-toed salamander (*Hemidactylium scutatum*).

The wood turtle is listed as threatened under the *Nova Scotia Endangered Species Act*. It is also listed under *SARA* as a Threatened species. Wood turtles are almost invariably associated with streams, creeks, and rivers and the adjacent rich interval forest and shrub communities, as well as with the meadows and farmland terrestrial habitat associated with these watercourses. Streams with sand and/or gravel bottoms are preferred, but rocky streams are used occasionally. Wood turtles may wander some distance from watercourses during summer foraging, but characteristically remain within linear home ranges. These home ranges are 1 to 6 ha in size and are centred on a suitable river or stream where non-vegetated or sparsely vegetated sandy beaches and banks serve as nesting sites. Natural nesting sites consist of sandy river beaches, but may also include select disturbed sites, such as railway grades and roadsides. Some turtles may travel considerable distances up small tributaries that lack suitable nesting sites and hibernacula during the summer months that offer good foraging opportunities. These smaller streams may serve as dispersal corridors between populations on different river systems.

The Project Area does not provide good wood turtle habitat. The Project Area is surrounded on three sides by steep grades and only small streams are present. The lack of large rivers limits the availability of suitable nesting and hibernaculum sites. In addition, the Project Area is located outside of the known range of wood turtles in Nova Scotia. As such, it is unlikely that wood turtles would be present in the Project Area.

Four-toed salamanders are listed as a Green species in Nova Scotia (NSDNR, 2012). The records in the ACCDC database indicate that this salamander has been recorded within 32 km of the Project Area. This species favored habitats are sphagnum bogs, grassy areas surrounding beaver ponds and deciduous or mixed forests rich with mosses. The Four-toed Salamander will use the sphagnum bogs during reproduction, but uses the forest habitat during the summer. It overwinters in terrestrial habitat, using old burrows or cavities created by rotting roots, below the freezing depth. Where Project components are planning to be built in wetlands, and there is the potential for four-toed salamanders, further field assessments will be completed to confirm or deny the presence.

5.11.2 Effects of the Project

The following potential impacts from the proposed Project would be expected to result from Project construction and operation and include:

- vegetation/habitat loss and fragmentation;
- soil compaction;
- water quality degradation;
- attractants; and
- road mortality.

Habitat loss and fragmentation from proposed Project activities such as clearing for roads, turbine pads, the substation, could cause displacement of species from their upland habitats, change availability of prey, change foraging ability, degrade breeding habitats and increase predation risk. The proposed Project footprint may also overlap with breeding sites, such as shallow water bodies and wetlands. Soil compaction due to heavy machinery operating in the area during construction and decommissioning could affect reptiles/amphibians by reducing the availability of subterranean habitat or by reducing the abundance of prey species. Water quality in streams and wetlands may be degraded through siltation or contamination as a result of proposed Project activities near water bodies, potentially impacting breeding sites. Ruts, caused by equipment and vehicles, may fill with water in the spring and attract breeding species. Since these ruts would likely dry up in the summer, this presents a potential risk to species that hatch and reproductive failure could occur.

5.11.3 Mitigation

The following key mitigation measures to address the potential impacts of the proposed Project on reptiles/amphibians and include:

- Leave coarse woody debris in areas that would be re-vegetated after construction to provide refuge and foraging areas;
- Conduct regular road maintenance in the form of grading to prevent water pooling and to minimize deep ruts.

5.11.4 Significance

5.11.4.1 Magnitude

The potential effects of habitat loss would be of low magnitude because construction activities may result in creation of small depressions and ruts where water collects, providing temporary breeding sites. The magnitude of the effect from such attractants would be low. The potential effect of increased traffic during construction on road mortality would be of low to moderate magnitude and occur mainly during times of migration when species leave wetlands.

5.11.4.2 Probability

The probability of effects is certain as potential habitat, including treed areas, would be cleared during construction. Construction activities are likely to result in the creation of ruts which would fill with water providing temporary breeding areas for western toads. Road mortality risk is most likely to occur during construction when vehicle traffic volumes would be higher and when species may be migrating out of wetlands.

5.11.4.3 Geographical Extent

The extent of the effect on amphibians and reptiles would be within the proposed Project footprint, and therefore, local.

5.11.4.4 Duration and Frequency

The duration of the effect on amphibian and reptile habitat would be long term and continuous, during the life of the proposed Project. The effect of attractants (ruts) would be short term and intermittent during construction. Mortality effects would be short term and intermittent, during the construction phase, and limited during operations.

5.11.4.5 Reversibility

Effects on amphibian and reptile habitat from the proposed Project would be reversible after restoration of the habitat. Potential attractants and mortality effects would be largely reversible once construction ends.

6 ARCHAEOLOGICAL RESOURCES

Please refer to Appendix VI. ARCHAEOLOGICAL RESOURCE IMPACT ASSESSMENT for the complete report.

In November 2013, Davis MacIntyre & Associates (DM&A) Limited was contracted to conduct an archaeological resource impact assessment of the proposed East Bay Wind Farm in Cape Breton County. The purpose of the assessment was to determine the potential for archaeological resources within the development zone and to provide any recommendations for further mitigation, if deemed necessary. The assessment consisted of a reconnaissance of the study area. A background study and field reconnaissance of a previous turbine layout was conducted by DM A under Heritage Research Permits A2007NS72 and A2008NS36.

Fourteen new turbine candidate sites were assessed during the reconnaissance, along with the newly proposed access roads to both new and previously assessed turbine sites. The 2013 field reconnaissance has resulted in the identification of a variety of archaeological and cultural features, including two hunting camps, and unidentified cluster of stones, and a site complex at turbine site T3 including seven stone mounds resulting from field clearing along with two confirmed foundations and a third possible cellar feature.

Additional sites were noted along the existing Hay Cove Road / Loch Lomond Road, but it is not currently known if this road will require upgrades prior to wind farm construction.

In February of 2014, a revised turbine layout was completed and reviewed by DM&A. The layout included modified roadways around turbines T36, T11, T34, T37, T40, and T46. Based upon previous surveys it is not expected that these areas have experienced significant cultural activity.

Due to the timing of the December 2013 survey, inclement weather prevented the team from surveying the proposed roads between T10 and T32, as well as the roads to T25 and T45.

The 2014 layout includes a shift in the position of turbine T3 which, coupled with the creation of a flagged buffer zone and a "short side" of the turbine pad land lease, should be sufficient to protect the identified archaeological features (two foundations and seven stone piles) from impact during wind farm construction.

6.1.1 Effects of the Project

No significant historic resources were encountered directly within the impact areas of the turbines, therefore there would be no potential adverse residual effect on archaeological resources. However, in compliance with the terms of the Special Places Protection Act, a reconnaissance of these new turbines sites by a professional archaeologist is required before the Heritage Division of the Nova Scotia Department of Communities, Culture and Heritage will approve of the project's heritage assessment."

6.1.2 Mitigation

It is recommended that the pile of stones on the proposed road between T11 and T34 be avoided by all heavy equipment.

Should significant improvements to either the Hay Cove Road / Loch Lomond Road roads be required, specifically in the form of road widening or roadside laydown areas, it is recommended that any impact areas associated with such road improvements be subjected to a more detailed assessment by a qualified archaeologist prior to construction activity.

In February of 2014, a revised turbine layout was completed and reviewed by DM&A. The layout included modified roadways around turbines T36, T11, T34, T37, T40, and T46. Based upon previous surveys it is not expected that these areas have experienced significant cultural activity. However, in accordance with Special Places standards it is recommended that these areas be subjected to a reconnaissance survey to confirm the absence of archaeological material.

However, the road leading between T3 and T28 was not adjusted in the February 2014 layout, and it is recommended that it be moved and if necessary revisited by an archaeological team to confirm avoidance of archaeological features in this area.

In the event that any archaeological material is encountered during ground disturbance activities, all activity should cease and the Coordinator of Special Places, Sean Weseloh-McKeane (902-424-6475) should be contacted immediately to determine a suitable method of mitigation.

6.1.3 Significance

No significant impacts to archaeological resources are expected once the above noted mitigation is implemented.

7 MI'KMAQ ECOLOGICAL ASSESSMENT

A Mi'kmaq Ecological Project of the Project was completed by Membertou Geomatics Consultants in 2008. The MEKS was subsequently updated in 2012 and is found in Appendix VII. MI'KMAQ ENVIRONMENTAL KNOWLEDGE STUDY.

The recommendations of the MEKS are as follows:

"The East Bay Hills MEKS has identified Mi'kmaq Traditional Use Activities occurring in the Project Site as well in various locations throughout the Study Area. Based on the information gathered and presented in this report, there is some potential this project could affect Mi'kmaq traditional use in the proposed areas, specifically trout fishing in the area. Although the possible effects of the project could be minimal, considering the number of traditional use activities and the overall size of the proposed project, it is recommended that the proponent communicate with the Assembly of Nova Scotia Mi'kmaq Chiefs to discuss future steps, if required, with regards to Mi'kmaq use in the area."

8 SOCIO-ECONOMIC CONDITIONS

The Project is located in Cape Breton Regional Municipality, Nova Scotia, near the Richmond County border. Immediate impacts and benefits will be felt in both Cape Breton and Richmond counties and across the province of Nova Scotia. Background information on the area and populations of the counties is summarized below.

8.1 Population and Demographics – Cape Breton

Due to the location of the project, several counties are likely labour sources and beneficiaries of the project: Three counties on the Cape Breton side of the Canso Causeway are centres of population near the project site: Richmond, Inverness, and Cape Breton Regional Municipality.

Cape Breton County, the second most populous county in Nova Scotia, had a total population of 1001,619 in the year 2011, approximately 11.0% of the Provincial population. Over the past five years, the population of the county has declined 4.1% while the population for the Province increased by 0.9%.

Richmond County, ranked 16th in terms of county population within the province, had a total population of 9,293 in 2011, a 5.6% decline in population over the level five years prior. Richmond County accounts for just over one percent of total provincial population.

Inverness County, including the town of Port Hawkesbury, had a population of 17,947 in 2011. It was the 13th most populous county in the province. Five years earlier, the population was 19,036, for a total population decline of 5.7%.

8.2 Cities and Towns

The Cape Breton Regional Municipality (CBRM), is the largest centre of population in Cape Breton County, with a population of 101,619 in 2011. It includes nearly all of Cape Breton County, including the larger population centres around Sydney.

The town of Port Hawkesbury is the largest centre of population in Inverness County, and is located on the Cape Breton side of the Canso Causeway, on the west side of Cape Breton.

Richmond County is located on the Cape Breton side of the Canso Causeway, on the east side of Cape Breton. The Richmond County municipality has three statistical subdivisions (named A, B, and C), with smaller population centres in St Peter's, Arichat. The town of Port Hawkesbury in Inverness County is adjacent to the Richmond County border.

All of the above areas would be likely sources of labour for, and areas of impact from the project. Their various attributes are discussed below.

Table 37. Population and Demographics, CBRM and Cape Breton County

	CBRM	Cape Breton County
Population in 2011	97,398	101,619
Population in 2006	102,250	105,928
2006-2011 Population Change (%)	-4.7%	-4.1%
Total private dwellings (2011)	45,371	46,632
Total number of households (2006)	42,015	43,085
Population density per square km (2011)	40.0	41.1
Land area (square km) (2011)	2433.4	2470.6
Median Age of the Population (2011)	47.5	46.6

Note: with the recent release of the Census 2011 data, not all information are available. 2006 figures are presented where more recent information has not yet been released.

Table 38. Population and Demographics, Port Hawkesbury and Inverness County

	Port Hawkesbury	Inverness County
Population in 2011	3,366	17,947
Population in 2006	3,517	19,036
2006-2011 Population Change (%)	-4.3%	-5.7%
Total private dwellings (2011)	1,415	7,437
Total number of households (2006)	1,390	7,485
Population density per square km (2011)	414.8	4.7
Land area (square km) (2011)	8.1	3,830.4
Median Age of the Population (2011)	42.5	47.3

Note: with the recent release of the Census 2011 data, not all information are available. 2006 figures are presented where more recent information has not yet been released.

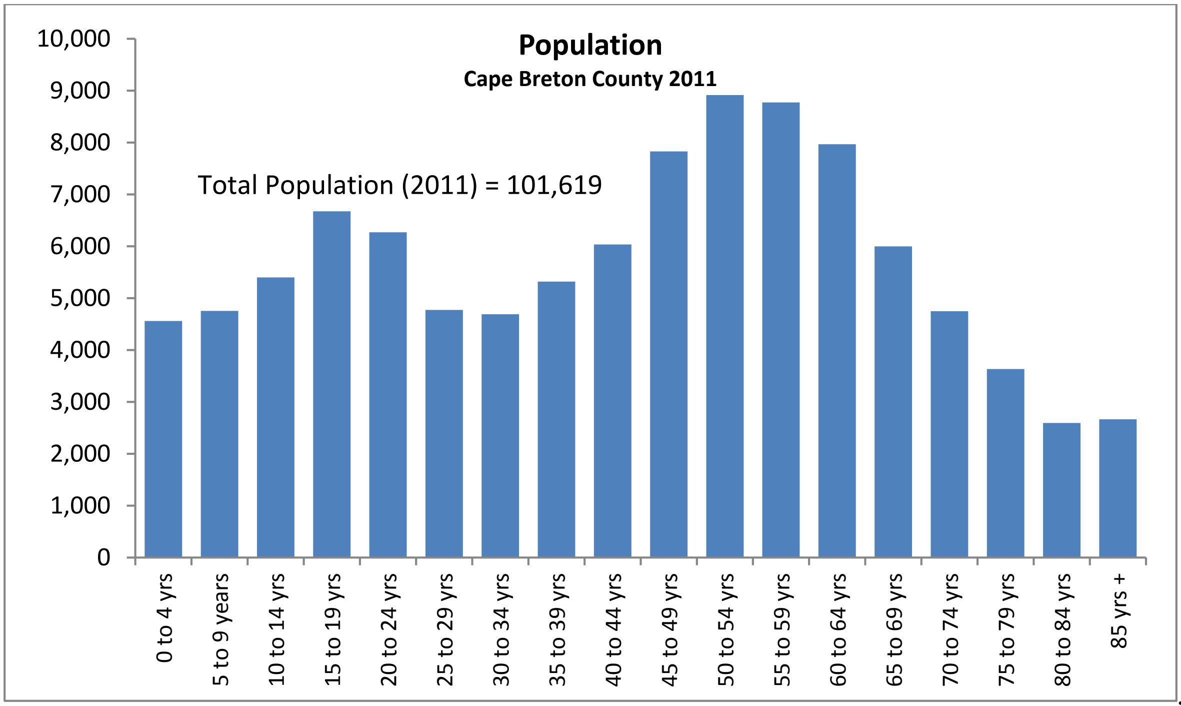
Table 39. Population and Demographics, Richmond County

	Richmond County
Population in 2011	9,293
Population in 2006	9,740
2006-2011 Population Change (%)	-4.6
Total private dwellings (2011)	4,947
Total number of households (2006)	3,790
Population density per square km (2011)	7.5
Land area (square km) (2011)	1,244.2
Median Age of the Population (2011)	49.6

Note: with the recent release of the Census 2011 data, not all information are available. 2006 figures are presented where more recent information has not yet been released.

The population of Cape Breton County has a median age of 46.6 years, slightly older than that of the province as a whole, which has a median age of 43.7. Inverness County has a median age of 47.3. Richmond County has a median age of 49.6.

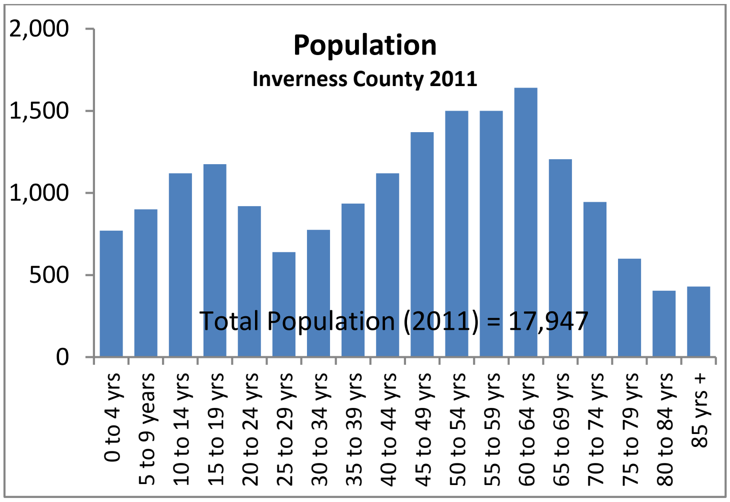
Figure 8: Population by Age Cohort, Cape Breton County



Source: Statistics Canada 2011 Census of Population Community Profiles

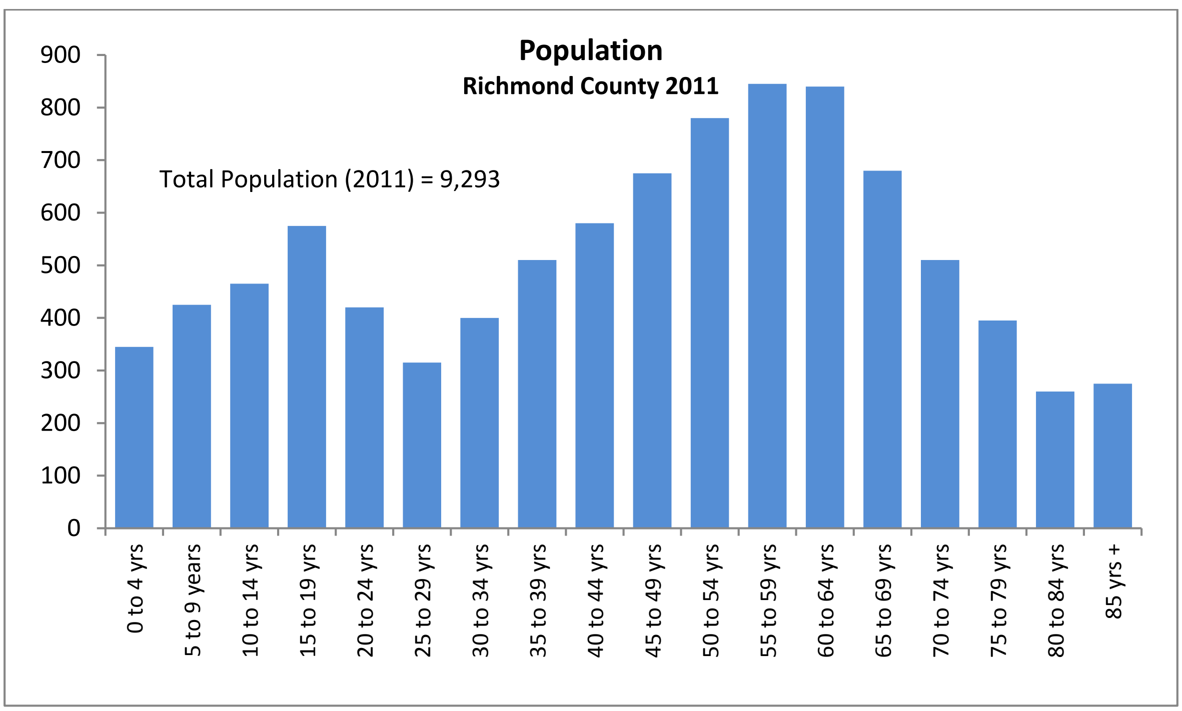
Median income in Cape Breton County for persons 15 years and older with income was $22,815. Seventy percent of income came from earnings, while 15.1% came from Government Transfers. In the CBRM (2006), median income was $20,384, with earnings accounting for 60.4% of income and 24.8% coming from Government transfers.

Figure 9. Population by Age Cohort, Inverness County



Median income in Inverness County (2006) for persons 15 years and older with income was $20,413 Seventy percent of income came from earnings, while 15.1% came from Government Transfers. In Port Hawkesbury, 71.7% of income came from earnings and 15.7% came from Government Transfers.

Figure 10. Population by Age Cohort, Richmond County



Median income in Richmond County (2006) for persons 15 years and older with income was $18,748. Sixty point five percent of income came from earnings, while 25.5% came from Government Transfers.

8.3 Health, Industry and Employment

8.3.1 Health

The three counties are served by two District Health Authorities. The Guysborough Antigonish Strait Health Authority, and the Cape Breton District Health Authority serves the county of Cape Breton.

The Guysborough Antigonish Strait Health Authority is served by St. Martha's Regional Hospital, the Strait Richmond Hospital, Guysborough Memorial Hospital, St. Mary's Memorial Hospital, and the Eastern Memorial Hospital. Not all of these facilities are on the Cape Breton side of the Canso Causeway. This health authority covers nine municipal units in its catchment area, including the Town of Port Hawkesbury, the Municipality of the County of Richmond, and the Municipality of the County of Inverness. The health authority employs over 1,000 individuals.

The Cape Breton District Health Authority includes 11 facilities, including the Cape Breton Regional Hospital in Sydney, the Northside General in North Sydney, the Glace Bay Health care facility in Glace Bay, New Waterford Consolidated, Harbourview Hospital in Sydney Mines, the Taig Na Mara continuing care facility in Glace Bay, Buchanan Memorial in Neil's Harbour, the Victoria County Hospital in Baddeck, Sacred Heart Community Health Centre in Cheticamp, the Inverness Consolidated Memorial Hospital in Inverness, and the Cape Breton Cancer Centre in Sydney. The Cape Breton District Health Authority employs 3,500 health care providers.

8.3.2 Industry and Employment

The Strait Region and Cape Breton regions have a long history of natural resource and manufacturing based industries. From hundreds of years of coal mining in industrial Cape Breton to a long tradition of pulp and paper industry in the Strait Region, the primary and manufacturing sectors have helped shape the regions.

Today, there is still primary industry in forestry and fishing, and less in mineral resources. Recent developments in the Strait region have caused the paper producing industry to change hands several times. Though idle at the moment, it is likely the paper industry will commence production in the area once again at the former Stora paper mill. The ice free port at the Strait of Canso remains a boon to shipping mined materials, and the Mulgrave area is home to new business in manufacturing food supplements.

The experienced labour force in Cape Breton County is about equally split between males and female, and the economy is dominated by the service industry. Primary industry, construction and manufacturing make up about 17% of the industry. The retail, wholesale, and other services industry help support tourism in Cape Breton, an industry which is becoming increasingly important as the economy shifts away from primary production.

Table 40. Labour Force by Industry, Cape Breton County

Industry	Total	Male	Female
Total experienced labour force 15 years and over	45,170	22,330	22,845
Agriculture and other resource-based industries	2,285	2,015	270
Construction	3,415	3,210	200
Manufacturing	1,980	1,495	485
Wholesale trade	875	625	250
Retail trade	6,345	2,625	3,725
Finance and real estate	1,275	530	740
Health care and social services	7,335	1,225	6,110
Educational services	3,600	1,230	2,370

Industry	Total	Male	Female
Business services	8,495	4,820	3,675
Other services	9,560	4,545	5,015

Source: Statistics Canada 2006 Census of Population

The participation rate (the percentage of working age population in the labour force) in 2006 for the county was 53%, lower than the provincial average of 62.9%. The unemployment rate for Cape Breton County in 2006 was 16.2%, well above the provincial average of 9.1%.

The labour force in Inverness county is slightly more populated by men compared to women. Over 30% of the industry is primary and manufacturing, while the rest is service based, including support to businesses, tourism, health care and education. The county has a strong fishing history and fish products remain part of the economy today.

Table 41. Labour Force by Industry, Inverness County

Industry	Total	Male	Female
Total experienced labour force 15 years and over	9,200	4,890	4,305
Agriculture and other resource-based industries	1,340	1,165	175
Construction	585	520	60
Manufacturing	895	750	145
Wholesale trade	185	130	50
Retail trade	1,105	450	655
Finance and real estate	250	55	200
Health care and social services	1,020	120	900
Educational services	605	170	430
Business services	1,205	700	505
Other services	2,005	830	1,175

Source: Statistics Canada 2006 Census of Population

The participation rate (the percentage of working age population in the labour force) in 2006 for the county was 59.8%, slightly lower than the provincial average of 62.9%. The unemployment rate for Inverness County in 2006 was 15.0%, higher than the provincial average of 9.1%.

The experienced labour force in Richmond County is split 55/45 between males and females. Manufacturing plays a larger role in the county's economy compared to Inverness County as a whole. Ease of labour mobility means that workers can travel to the centrally located Port Hawkesbury and the Strait area for work. The service based industries make up two thirds of the economy, much like the province of Nova Scotia as a whole.

Table 42. Labour Force by Industry, Richmond County

Industry	Total	Male	Female
Total experienced labour force 15 years and over	4,175	2,305	1,870
Agriculture and other resource-based industries	360	300	60
Construction	390	375	20
Manufacturing	660	515	150

Wholesale trade	95	80	15
Retail trade	340	130	210
Finance and real estate	125	25	100
Health care and social services	475	65	410
Educational services	290	85	205
Business services	625	320	300
Other services	810	415	395

Source: Statistics Canada 2006 Census of Population

The participation rate (the percentage of working age population in the labour force) in 2006 for the county was 52.8%, almost ten percentage points lower than the provincial average of 62.9%. The unemployment rate for Richmond County in 2006 was 16.6%, higher than the provincial average of 9.1%.

8.4 Tourism in Cape Breton

Nova Scotia markets itself as a tourism destination, with a tourism industry that contributes more than $640 million to provincial GDP, and with direct and spinoff employment of nearly 32,000.

The tourism industry is important to Cape Breton, with vast wild areas, the scenic Bras d'Or lakes, and Cabot Trail that skirts the top of Cape Breton Island, where the Cape Breton Highlands National Park lies. Provincial parks in the area include Dundee, Burnt Island, Port Michaud beach, Battery, and the Isle Madame parks (Lennox Passage and Pondville Beach)

The greater Cape Breton region boasts heritage sites, and provides many types of all-season tourism. The eastern part of the Island is home to Isle Madame, home to the largest number of lighthouses in Canada. Golf destinations and premiere accommodations are popular destinations for tourists. Historic and cultural destinations such as the Alexander Graham Bell museum in Baddeck, the Fortress of Louisbourg and the Gaelic College of Celtic arts and crafts are important to the rich cultural history of the area. The region is popular for paddling, fishing and hiking.

8.5 Property Values

There were 43,085 private dwellings in Cape Breton County in 2006, with an average value of $87,935 (44.4% lower than the Provincial average). Seventy-four percent of dwellings in Cape Breton County were owned, and 82% of dwellings were constructed prior to 1986. In the Cape Breton Regional Municipality in 2006, there were 42,010 private dwellings, with an average value of $87,935. Seventy five percent of dwellings were owned, and 83.1% of dwellings were constructed prior to 1986.

There were 7,485 private dwellings in Inverness County in 2006, with an average value of $120,662 (23.6% lower than the Provincial average). Nearly eighty percent dwellings in Inverness County were owned, and 73.7% of dwellings were constructed prior to 1986. There were 1,390 private dwellings in Port Hawkesbury in 2006, with an average value of $120,203. Sixty four percent were owned, and 64% were constructed before 1986.

There were 3,970 private dwellings in Richmond County in 2006, with an average value of $101,607 (35.6% lower than the Provincial average). Eighty-three percent of dwellings in Richmond County were owned, and 77.6% of dwellings were constructed prior to 1986.

8.6 Recreation

There are no provincial parks or known sensitive heritage or cultural attractions near the study area. Local residents and tourists do make use of the watershed for fishing, swimming, recreation and as a water source.

There is some opportunity within the Project area for public access for hiking and walking, however, there are no designated public recreational trails present inside the Project area.

All-Terrain Vehicles (ATV) and Snowmobiles use is widespread within the Project area and there is a myriad of interconnected trails, and tracks suggesting continuous and extensive use. All trails appear to be used by public riders. No trail signs are present.

No other public recreational lands exist within the Project boundaries.

8.6.1 Effects of the Project

8.6.1.1 Economic

This Project represents an investment of approximately $110 million. The Domestic Content Plan for this Project includes over 24% or $27 million of capital expenditures to be invested locally in Nova Scotia: This includes:

- Onsite construction labour
- Crane and Equipment Suppliers
- Civil, Geotechnical Engineering and Environmental Consulting
- Electrical design and installation contractors
- Concrete and aggregate supply
- Wind turbine tower supply
- Civil and roads construction contractors

The intent is to fulfill construction and operations contracts/positions with local personnel wherever possible. However, due to the specialized nature of wind turbine delivery, erection, and energization, if local personnel cannot be found, personnel may be required from other municipal, provincial, national, or international firms.

8.6.1.2 Staffing Requirements

As indicated above, approximately 175,000 person – hours of work during the permitting, construction and operation will be required. Over 2 years that would be equivalent to 20 persons being employed 12 hours / day for 700 days. However, in a project like this there is typically a large variation in the number of on-site workers day to day, week to week, month to month and is completely dependent upon what stage of construction is occurring. Typical skills required for a project such as this include:

Design Manufacturing
• Engineers (Aerospace, civil, electrical, electronics, environmental, industrial, materials, mechanical, technicians); • Machinists • Assemblers • Welders

• Inspectors • Production Managers
Project Development
• Land managers • Project managers • Engineers • Geotechnical • Archaeologists • Biologists • Technologists • Regulators
Construction
• Swampers • Labourers • Drivers • Machine operators • Environmental monitors • Engineers • Project managers • Electricians • Welders • Material suppliers
Operation
• Site managers / engineers • Equipment supply technicians • Labourers • Environmental monitors • Land managers • Project managers • Equipment operators

8.6.1.3 Sources of Financing

Cape Breton Hydro Inc. may use a number of financial sourcing methods for the Project once project approval is received. These have not been determined specifically for the Project at this date However at this time it is anticipated that the equity for the Project will be 100% financed through its parent company, BluEarth Renewables Inc. BluEarth is a private Canadian company focused on commercial-scale renewable energy development, headquartered in Calgary, Alberta.

BluEarth has approximately $170 million in committed equity capital, which is available for investment in renewable energy projects subject to certain conditions, which are set out in detail below. BluEarth's capital was invested by its founders, Teachers' Private Capital, the private investment department of OTPPB and ARC. The debt for the Project will be financed through major Canadian lenders or financial institutions.

8.6.1.4 Property Values

The concern that property values will be adversely affected by the Project is a concern raised at other WPP throughout North America. In 2009 a study was commissioned by the U.S. Department of Energy to determine if this impact does in fact exist. (Hoen, Wiser, Cappers , Thayer, Sethi, 2009) The study collected data on almost 7,500 sales of single family homes situated within 10 miles of 24 existing wind facilities in nine different U.S. states. (Hoen, Wiser, Cappers , Thayer, Sethi, 2009) In addition, the study reviewed a number of data sources and published material. Although that reviewed information addressed concerns about the possible impact of wind energy facilities on the property values of nearby homes, Hoen et al. found that "the available literature that has sought to quantify the impacts of wind projects on residential property values has a number of shortcomings". The list of shortcomings identified in that study (Hoen, Wiser, Cappers , Thayer, Sethi, 2009) are as follows:

1. Studies relied on surveys of homeowners or real estate professionals, rather than trying to quantify real price impacts based on market data;
2. Studies relied on simple statistical techniques that have limitations and that can be dramatically influenced by small numbers of sales transactions or survey respondents;
3. Studies used small datasets that are concentrated in only one wind project study area, making it difficult to reliably identify impacts that might apply in a variety of areas;
4. Many studies had no reported measurements of the statistical significance of their results;
5. Many studies have concentrated on an investigation of the existence of Area Stigma, and have ignored Scenic Vista and/or Nuisance Stigma;
6. Only a few studies included field visits to homes to determine wind turbine visibility and collect other important information about the home (e.g., the quality of the scenic vista); and,
7. Only two studies have been published in peer-reviewed academic journals.

Ultimately, the Hoen et al. study indicated that "none of the models uncovers conclusive evidence of the existence of any widespread property value impacts that might be present in communities surrounding wind energy facilities. Specifically, neither the view of the wind facilities nor the distance of the home to those facilities is found to have any consistent, measurable, and statistically significant effect on home sales prices. Although the analysis cannot dismiss the possibility that individual homes or small numbers of homes have been or could be negatively impacted, it finds that if these impacts do exist, they are either too small and/or too infrequent to result in any widespread, statistically observable impact." (Hoen, Wiser, Cappers , Thayer, Sethi, 2009)

Critiques have been developed in response to the Hoen report, notably by Wayne Gulden at Wind Farm Realities (2010) and Albert Wilson in 2010. These reports both outline concerns with methodology in the Hoen report including the conclusion that the analytical methods can not be shown to be reliable or accurate (Gulden 2010 and Wilson 2010). Another study completed by Gardner Appraisal Group Inc. in Texas, USA (Gardner 2009) states that " market data and common sense tell us property values are negatively impacted by the presense of wind turbines." (Gardner 2009). This study was completed for a conference in February 2009.

In August of 2013, Hoen et al published an updated study (Hoen, et al., 2013). They collected data from 50,000 home sales among 27 counties in nine states. These homes were within 10 miles of 67 different wind facilities, and 1,198 sales were within 1 mile of a turbine. The results of that updated study indicated "no statistical evidence that home values near turbines were affected in the post-construction or post-announcement/pre-construction periods. Previous research on potentially analogous disamenities (e.g., high-voltage transmission lines, roads) suggests that the property-value effect of wind turbines is likely to be small, on average, if it is present at all, potentially helping to explain why no evidence of an effect was found in the present research."

8.6.1.5 Tourism

In 2002, MORI (Market Opinion Research International) completed an independent research study on the "Economic Impacts of wind farms on Scottish tourism" for the British Wind Energy Association (BWEA) and the Scottish Renewables Forum. (Market Opinion Research International, March 2008) MORI interviewed 400 tourists visiting Argyll and Bute, Scotland, an area chosen because, at the time, had the greatest concentration of wind farms in Scotland. In addition the tourism industry in the region has a strong reliance on the area's high landscape value (the study indicates that 48% of the respondents who came to the area reporting doing so for the scenery). (Market Opinion Research International, March 2008)

The MORI study indicates that forty (40%) percent of tourists interviewed were aware of the existence of wind farms in the area and when asked whether this presence had a positive or negative effect, 43% indicated that it had a positive effect, while a similar proportion (43%) felt it made no difference. 8% felt that it had a negative effect.

In comparison, a 2003 study was completed for the Wales Tourist Board (NFO World Group, 2003) in response to an inquiry from the Welsh Assembly to "assess the effects of renewable energy, and particularly wind farms, on tourism." (NFO World Group, 2003) This study used a 266 person sample size and found that overall 78% of respondents were positive or neutral towards wind farms, with 21% negative, and 1% with no opinion.

Although the effects of the Project on local tourism and tourist perceptions cannot definitively be known until the Project is implemented, past research in the Scottish and Wales examples indicates that the dominant perceptions of the Project will likely either positive or neutral.

8.6.2 Mitigation

At present, no mitigation is available for impacts resulting from Project Effects and none will be implemented.

9 SOUND

A Noise Assessment Report has been completed for the Project and can be found in its entirety in Appendix VIII. NOISE IMPACT ASSESSMENT.

The sound pressure levels at the points of reception (POR) have been estimated using ISO 9613-2, implemented in the CADNA-A computer code. The province of Nova Scotia does not provide any guidelines for assessing the acoustical impact of wind turbine on residential properties. Thus, the performance limit used for verification of compliance corresponds to a standard value for rural areas of 40 dBA as required by the Nova Scotia Department of Environment.

The results presented in the report are based on the best available information at the time. It is the intention that, in the detailed engineering phase of the project, certified noise data based on final plans and designs will confirm the conclusions of the noise impact assessment study.

Information on existing receptors was gathered by the client and forwarded to Hatch. Wind turbine layout was provided by the Client and Hatch assumed to be compliant with the environmental restriction setbacks.

The results obtained in this study show that the sound pressure levels at POR will not exceed the limit of 40 dBA.

9.1 Effects of the Project

9.1.1 Construction and Decommissioning

Construction and decommissioning activities will generate noise from the use of heavy machinery and vehicles. The contribution to noise levels is only expected on site – a low population density area – and during a short period, i.e. the few months of planned work during the construction/decommissioning periods. Increased truck transport is not expected to significantly increase ambient noise levels on existing roadways, due to the already existing truck traffic on these roads. Increased noise levels will be of medium magnitude on the municipal access roads, but of short duration, intermittent and local.

Overall, the effect of construction on ambient noise levels is of low concern and considered not significant.

9.1.2 Operation

When modeled according to the ISO 9613-2 method "*Acoustics – attenuation of sound during propagation outdoors*," all receptors will experience noise levels below 40 dB(A).

Conservative assumptions have been selected for the turbine noise emission level, Point Of Reception (POR) height, and atmospheric conditions. In addition, the presence of crops, foliage, and other sound impeding obstacles were not modeled. Therefore the results of the calculations performed for the report are considered to be conservative.

Should the final turbine selection be different than the model used in the NIA, the NIA will be re-run with the selected turbine to ensure compliance with Health Canada guidelines.

9.2 Mitigation

9.2.1 Construction and Decommissioning

In order to minimize any effects during construction, CBHI will limit major construction activities to daytime and early evening hours, and implement a construction and traffic management plan. Nearby residents will also be advised of significant truck transportation passing through.

The Project will typically operate from 7:30 a.m. (arrival of personal vehicles), with heavy equipment in operation from 7:00 a.m. to dusk, 5 days a week. During certain construction activities, such as the turbine foundation concrete placement and the erection of the turbine, the work hours and number of days worked per week may be extended.

Construction activities will be limited to daytime and early evening hours and vehicle speeds on access roads will be limited to 40 km/h. Nearby residents will be advised of significant noise-causing activities and these events will be scheduled to reduce disruption to them.

9.2.2 Operations

In the event noise complaints are received, appropriate mitigation will be implemented and may include:

- The Project provides, and will continue to provide, periodic newsletter updates to the community and residents. This will act as a conduit to what is deemed to be a successful, and ongoing, public consultation process and will make the public aware of when construction is occurring so they can anticipate traffic and noise. Thorough the implementation of a noise complaint response Protocol, the Project will work will all concerned residents. If complaints cannot be resolved through communication with the complainant, on-site noise monitoring can be carried out at the site in question in order to assess the extent of the problem.

10 VISUAL

Any loss of aesthetic value associated with the Project may be as a result from the physical presence of new turbines, access roads, increased traffic, and changes in vegetation and wildlife communities.

Currently, no data is available which indicates how wind power Project visual thresholds are defined or exceeded. Therefore it is assumed that much of the aesthetic value is perceived by residents and visitors to the area. In order for the public and regulatory personnel to effectively estimate the visual effect of the Project, the following was completed:

The photomontages and visual zone of influence were completed with the specifications of the GE1.6-100 turbine.

In addition to visual impacts and aesthetics experienced by residents, the Project will affect the visual characteristics and, therefore, opinions of visitors to the region. Nova Scotia markets itself as a natural, coastal destination. From a tourism perspective, the question of how the Project will impact the visitor experience from the local scenic perspective is unknown, as that experience highly subjective.

10.1 Effects of the Project

Currently, no data is available which indicates how wind power Project visual thresholds are defined or exceeded. Therefore it is assumed that much of the aesthetic value is perceived by residents and visitors to the area and is subjective to the individual.

No negative comments have been received from the public or the Mi'kmaq during consultation activities.

10.2 Mitigation

None.

11 SHADOW FLICKER

A shadow flicker report was completed and is available in Appendix IX. SHADOWFLICKER ANALYSIS. The results indicate that "No receptors exceed the recommended limit of 30 hours per year or 30 minutes per day in both the astronomical worst case and the real case scenario. As the predicted annual values of shadow flicker are very low in the real scenario (from 0 to 2.6 hours per year), it can be concluded that the probability of these receptors to observe shadow flicker is also very low.”

12 RADIOCOMMUNICATION AND RADAR INTERFERENCE

Due to their large size, wind turbines can interfere with radio communication and radar systems. In response to these potential conflicts, the Radio Advisory Board of Canada (RABC) and the Canadian Wind Energy Association (CanWEA) have issued a set of guidelines which describe the methodology for assessing potential interference.

Interference created by a wind turbine can be classified in two categories:

1. Obstruction - occurs when a wind turbine is placed between a receiver and a transmitter, creating an area where the signal is weakened and/or blocked; and,
2. Reflection - caused by the distortion between a signal and a reflection of the signal from an object. Included within reflection is a sub-category called Scatter. Scatter is a result of rotor blade movement.

The specific characteristics of a wind turbine will influence the type and magnitude of the interference. Furthermore, wind turbines affect different types of signals in various ways as some radio communication signals are more robust to interference than others.

A preliminary investigation of the potential conflict between the proposed Project and communication systems has been completed. The entire report can be found in **EMI REPORT,** however the results of the investigation are summarized as follows:

Table 43. EMI Study Results Summary

System	Result of Study
Point-to-Point System above 890 MHz	There are no radio link transmitters or receivers that are within 1 km of the proposed wind farm. Additionally, there are no links that pass within the recommended consultation zone.
AM Transmitters	No AM transmitters within the 5 or 15 km consultation zones.
FM Transmitters	No FM Transmitters located within the 2 km consultation zone.
TV Transmitters	No TV Transmitters within the 2 km consultation zone.
Over-the-Air Reception	A number of potential receivers are located within the 15 km consultation zone recommended by the RABC for analogue Television transmitters. Proponent to develop a reception mitigation policy and procedures.
Cellular Networks	No cellular networks located within the 1 km consultation zone.
Land Mobile Radio Networks and Point-to-Point Systems below 890 MHz	Non within the 1 km consultation zone.
Satellite Ground Stations	No ground satellite stations located within 500 m of the proposed wind farm. No dwellings or buildings located within the projected consultation cones.

System	Result of Study
Direct to Home Satellite receivers	There are no buildings located within the consultation zones identified in this analysis.
Air Defence Radar	DND Contacted – No issues.
Vessel Traffic Radar	Vessel Traffic Systems – Canadian Coast Guard contacted - No Issues.
Air Traffic Control Radars	Nav Canada Contacted – No radar sites within the recommended consultation zones - No Issues.
Weather Radars	Weather Radar – Environment Canada contacted – No strong objections.
CBC Preliminary Report	No CBC AM Transmitters within 15 km of proposed wind farm. No CBC FM Transmitters located within 5 km. No CBC-TV Transmitters sites located within 100 km of the proposed wind farm.
VHF Omnidirectional Range (VOR)	There are no VOR sites located within 15 km of the proposed wind farm.

12.1 Effects of the Project

None indicated following consultation with the above noted agencies.

12.2 Mitigation

To be compliant with the CBC guidelines, a mitigation program (complaint driven) for CBC TV reception is recommended. This would be applied to households within the consultation zone for which interference from the wind farm is demonstrated.

13 CONSULTATION SUMMARY

CBHI believes that open, honest and transparent relationships are essential to their success. CBHI also believes that communities have a right to know about its activities in those communities. To this end CBHI attempted to structure its community involvement program to:

- Ensure all stakeholders have the opportunity to learn about operations, and projects, and are able to provide input;
- Create a positive relationship with stakeholders through community involvement and community investment;
- Work within the Project timeline;
- Resolve issues in a timely, friendly manner; and
- Do the right thing and be seen doing the right thing.

13.1 Community Engagement to Date

Community involvement activities associated with the Project to date included:

1) On October 6, 2007, the Chronicle Herald Newspaper (Halifax) ran an article on the proposed Project.

2) On December 3, 2007 Cape Breton Explorations Limited, registered a Wind/Hydro Energy Project for environmental assessment, in accordance with Part IV of the Environment Act.

3) A public meeting was held at the Loch Lomond Community Hall on April 21, 2008. Approximately 100 local residents attended. The project was introduced and presented by Ann Wilkie of CBCL. A number of questions were raised and answers were given.

4) A public meeting was held at Grand River in June 2008. Approximately 75 people attended at the Fire hall. The project was presented by Ann Wilkie and a QA followed. A number of questions were raised and answered.

5) A public meeting was held at Big Pond Fire hall in June 2008. Approximately 100 people attended. The project was introduced by Ann Wilkie and a QA followed. A number of questions were asked and answered.

6) A Community Liaison Committee was set up with several local residents volunteers. A newsletter was circulated to them more than once to update them on project progress.

7) On September 4, 2008 a power point presentation was made to the UARB

8) On October 1, 2008 a power point presentation was made to the Sydney Chamber of Commerce.

9) In April 2008, the original Project proponent, Cape Breton Explorations Limited released a community newsletter outlining initial Project plans;

10) On May 12, 2008 a power point presentation was made to the Cape Breton Trades Council.

11) On June 26, 2008 the Cape Breton Post ran an article titled “Environmental Assessment of wind project will thorough: developer”.

12) On July 20, 2008 a power point presentation was made to the NDP Caucus.

13) May 10, 2012 a public Open House was held in Big Pond, Nova Scotia (NE of the Project lands) on. This provided landowners, residents and other interested parties an opportunity to view and discuss with CBHI representatives (5 in attendance) information on the Project and wind power in general. The Open House was advertised in the Cape Breton Post in four issues prior to the Open House (May1, May 3, May 7, May 10, 2012). An information package including an introductory letter from CBHI, a project newsletter and a site plan was sent via Canada Post`s unaddressed admail service to all residences within a 25 – 30 km radius of the project. In addition, a door to door campaign was completed in the vicinity of the project area to notify residents of the proposed Project and to invite them to the open house. Finally, public ad notices were placed at various locations throughout local communities, 2 weeks prior to the Open House;

    - 77 people attended the Open House including one reporter from the Cape Breton Post. Attendees were encouraged to fill out comment cards. Only 4 comment cards were received. Two encouraged the Project, and two requested that BluEarth keep in touch on project development.

14) In 2014, CBHI sent out a newsletter via mailout which was distributed to communities within the area of the East Bay Hills site, as well as across the bay to Eskasoni. It was distributed through

Canada Post as unaddressed admail and was sent to all households in selected postal codes within the target area. The mailout was provided to Canada Post on April 7, 2014 and distributed to all areas within 2-3 business days.

The following is a breakdown of the distribution by households in each community:

851 - Eskasoni
206 - North Side East Bay to Eskasoni
63 - Grand River
130 - Chapel island First Nation
411 - East Bay to Irish Cove, Irish Cove to Chapel Island, Loch Lomond

The total distribution was to 1661 homes.

13.2 Engagement with the Mi'kmaq of Nova Scotia

The following summarizes engagement which has been completed and the outcomes based upon issues identified during consultation(s):

1) First Nations were engaged directly both by CBEX and CBCL at different private meetings, primarily with Membertou and Eskasoni. In 2008 a public meeting was held at Eskasoni. The presentation was interrupted by a Native Woman opposed to the pumped hydro component of the project. Subsequently another public meeting was held in Dartmouth on November 14, 2008 with the full Assembly of Chiefs and the project was presented. The Chiefs explained they were opposed to the hydro project because they believed it affected their fishing rights and they were concerned of potential adverse environmental effects.

2) On March 30th, 2012, on behalf of BluEarth, McCallum Environmental Ltd. met with Eric Christmas and Twila Gaudet of the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMK). At that meeting, the Project was outlined and summarized.

3) On April 4, 2012, BluEarth sent a follow up introductory letter to the KMK (attention: Twila Gaudet) introducing BluEarth to the KMK with a copy of the current Project description with some maps for their review/reference.

4) In 2012, on behalf of BluEarth, McCallum Environmental Ltd. spoke to the Unama'ki Institute of Natural Resources (UINR – on the Eskasoni First Nation) group to complete vegetation assessments on the Project. On April 4, 2012 a cover letter, Project Description and map were sent to the UINR (attached).

5) On April 17, 2012, on behalf of BluEarth, McCallum Environmental Ltd. emailed Alvaro Loyola, Director of Consultation, *Nova Scotia* Office of Aboriginal Affairs to provide a copy of the Project description and map for his/his office review.

6) On April 19, 2012, *Beata Dera, Senior Consultation Advisor, Nova Scotia Office of Aboriginal Affairs responded to McCallum Environmental Ltd. by email stating "*Alvaro requested that I respond to your inquiry since I typically work on Aboriginal consultation files related to environmental assessments. I also had an opportunity to discuss your request with Helen MacPhail at NS Environment, therefore I am also responding on her behalf.

a. Thank-you for providing the project description and illustrating the engagement efforts to date with the Mi'kmaq community. This is helpful and ought to be documented as part of your EA registration submission, as well as all other engagement efforts.

b. It is not uncommon for Proponents to directly provide project information to First Nation communities in closest proximity to their proposed projects. In this case I would recommend that you send an information letter with anticipated project timelines and attach the project description (if you wish to share that piece) directly to each of the five Mi'kmaq bands located in Cape Breton: Membertou, Eskasoni, Wagmatcook, Waycobah and Chapel Island. Given the scale and location of the project on the Bras d'Or Lakes, it would be advisable to contact all five. The letters should be addressed to the Chief and Council and copied to Twila Gaudet at the KMK. You may also offer in the letter to meet with each community. You may check with Twila if the Assembly of NS Mi'kmaq Chiefs would be interested in a presentation."

7) On May 3, 2012, letters of introduction, Project descriptions, and Project maps were sent by mail to the five first nations (Membertou, Waycobah, Chapel Island, Wagmatcook) indicated by the Office of Aboriginal Affairs.

8) On April 27, 2012 BluEarth met with Eric Christmas and Melissa Nevin of the KMK in Halifax. During the meeting Eric Christmas mentioned he was attempting to arrange a meeting with the Chief and Council of the Eskasoni and the Potlotek and thought there may be opportunity to help introduce BluEarth and discuss the project. As discussed during the meeting, BluEarth had recently sent introductory letters and project descriptions directly to the Chief and Council Eskasoni and Potlotek to help communicate the project details and to request a meeting.

9) On May 8, 2012, Eric Christmas of the KMK responded by email to Bryan Tripp that the KMK was "still waiting on a response from both councils re: meeting to discuss the project".

10) On 16 May, 2012, Bryan Tripp received a phone call from Steve Parsons, Manager of the Corporate Division for the Eskasoni First Nation. Mr. Parsons was aware of the project from the notice of public open house, the local media coverage. Mr. Parsons described his role as the first point of contact with the Eskasoni and he would bring the information of the project to Chief and Council for consideration. Steve was interested in discussing wind power and potential economic opportunity with the Eskasoni and the East Bay Hills project and potential linkages with the Eskasoni's own wind project. A meeting was arranged in Halifax with Mr. Parsons for June 1.

11) On 30 May 2012, Bryan Tripp exchanged emails with Eric Christmas, KMK to get an update on KMK progress in arranging a meeting between KMK and the Chief and Council of Eskasoni and Chapel Island First Nations. Eric indicated that he had not yet been able to arrange a meeting.

12) On June 1, 2012, Bryan Tripp and Scott Hossie of BluEarth met with Steve Parsons, Manager of the Eskasoni Corporate Division, and Richard Young, Program Manager of the Eskasoni Band Council to introduce BluEarth, the East Bay Hills Wind Project and further discuss economic, employment and contracting opportunity for the Eskasoni. It was agreed that Steve Parsons would attempt to set up a meeting with Eskasoni Chief and Council. A meeting date for a formal presentation to Chief and Council has been set for June 12, 2012.

13) June 12, 2012, Bryan Tripp and Scott Hossie completed a formal presentation to Chief and Council of the Eskasoni.

14) On April 20, 2012, Bryan Tripp phoned Roger Hunka, Director of Intergovernmental Affairs, and Joshua McNeely, Ikanawtiket Environmental, at the Maritime Aboriginal Peoples Council (MAPC)

offices in Truro, Nova Scotia. Bryan Tripp introduced BluEarth and its role as the developer of the East Bay Hills Wind Project and requested a meeting with MAPC to further discuss the project and understand MAPC and dicsuss questions or concerns they may have. Bryan Tripp commited to send a project description and introductory letter to Mr. Hunka, and a meeting was set for April 27, 2012. On April 25, 2012, Bryan Tripp sent an email to Mr. Hunka to provide him with further additional background on BluEarth and the East Bay Project for their upcoming meeting. Mr. Tripp attached an introductory letter and a copy of the current Project description with some maps for his reference.

15) On April 27, 2012, Bryan Tripp and Mr. Geoff Carnegie, VP of Project Development for BluEarth Renewables met with Mr. Hunka at the MAPC office in Truro. Mr. Hunka was provided further details about BluEarth and the East Bay Hills wind project. Mr. Hunka provided a background and history of the Mi'kmaq in Nova Scotia and discussed services and economic opportunities for BluEarth to engage the services of MAPC and Mi'kmaq peoples during the Project. Mr. Hunka requested that BluEarth continue to update MAPC as the Project develops and to communicate with MAPC when construction begins to ensure the safety of Mi'kmaq hunters that may use the project lands. Mr. Hunka requested a larger site plan of the proposed project and for BluEarth to maintain open communications with MAPC to which BluEarth committed to follow-up with the requested items and communications.

16) On May 4, 2012, Mr. Hunka sent a letter to Bryan Tripp, BluEarth, which discussed further expectations of the Maritime Aboriginal People's Council with respect to the Project.

17) On December 3, 2014 CBHI met with Eric Christmas to discuss the ongoing nature of the Project and the expected dates and future planning. At that meeting Mr. Christmas recommended that we consult with the individual Bands directly. CBHI believes this is also important and are continuing to discuss our Project with the Chapel Island, Eskasoni, Membertou, Wagmatcook and Waycobah First Nations.

18) On February 24, 2014, Tom Bird sent an update to Mr. Christmas summarizing the discussions held at the December 3, 2014 meeting.

19) Escasoni was included in the public consultation mailout.

20) CBHI sent a cover letter and the same project update to Chapel Island, Membertou, Waycobah and Wagmatcook First Nations.

13.3 Planned Community Engagement

Public consultation to date for the current project provides a level of confidence that the public is aware of the project and has no significant concerns that have not been/or cannot be mitigated. On-going and continuing public consultation will be completed by CBHI relating to the ongoing development components of the project. Ongoing consultation will include:

13.3.1 Project updates to the community at large

Effective and broad reaching community updates will be completed as follows:

a. Provide regular updates on the Project Website as the development of the project progresses.

b. Issue quarterly newsletters to landowners, residents within 2000 metres, and town and municipal councils during the construction, and initial 6 month operation of the Project.
c. Document calls with landowners, residents, or councillors or regulatory agencies.
d. Release ad in local paper prior to the initiation of construction activities on the Project.
e. Release ad in local paper prior to final commissioning of the Project.

13.3.2 Additional Public Meetings

CBHI will host additional public meetings as needed to ensure the community is aware of key project developments. For example, a public meeting would be held prior to the Project commencing construction to inform interested community members about the construction schedule and process. CBHI will also consider a job and opportunities workshop where local trades and businesses will be made aware of upcoming project needs for labour, materials, housing, catering and other services.

13.4 Mitigation of Risk of Opposition to the Project

Although there hasn't been specific opposition to the Project in its current form, CBHI recognizes neighbours in proximity to the Project may have questions, concerns, or complaints from time to time. Therefore CBHI proposes to work with residents to help address, and where possible, mitigate concerns. A contact management procedure will be developed to ensure timely investigation and resolution to public questions or concerns.

13.5 Strategy to Ensure Concerns are Identified and Mitigated

CBHI will develop a procedure for receiving, recording, investigating, resolving and reporting public inquiry or non-compliance events which may occur from time to time on the Project. One of the key outcomes of the process is to ensure there are steps taken so that CBHI can learn from our experiences and maintain diligence in its ongoing operations.

14 DISCUSSION OF IMPACTS

14.1 Impact Matrix

An impact matrix is a qualitative environmental impact assessment method, used to identify the potential environmental impact of a Project on the environment. The Leopold matrix is the best known matrix methodology available for predicting the impact of a Project on the environment. (FAO, 1996) The system consists of a matrix with columns representing the various environmental factors to be considered, and rows representing various Project components that will interact with the environment. The use of this Matrix for the discussion of impacts has been discussed with Nova Scotia Environment for use in the environmental assessment process.

The intersections are filled in to indicate the magnitude (from -10 to +10) and the importance (from 1 to 10) of the impact of each activity on each environmental factor. Measurements of magnitude and importance tend to be related, but do not necessarily directly correlate. Magnitude can be measured fairly explicitly, in terms of how much area is affected by the development and how badly, but importance is a more subjective measurement. While a proposed development may have a large impact in terms of magnitude, the effects it causes may not actually significantly affect the environment as a whole.

14.2 Limitations

The aforementioned Leopold matrix is not *selective*, and includes no mechanism for focusing attention on the most critical human concerns (Burton et al., 1977). The principle of a mutually exclusive method is not preserved in the Leopold matrix, and there is substantial opportunity for double counting (Burton et al., 1977). This is a fault of the Leopold matrix in particular rather than of matrices in general (Burton et al., 1977).

The Leopold Matrix can accommodate both quantitative and qualitative data. It does not, however, provide a means for discriminating between them. In addition, the magnitudes of the predictions are not related explicitly to the 'with-action' and 'without-action' future states (Burton et al., 1977).

Objectivity is not a strong feature of the Leopold matrix. Each assessor is free to develop his own ranking system on the numerical scale ranging from l to 10 (Burton et al., 1977). This typically results in extensive

Synthesis of the predictions into aggregate indices is not possible, because the results are summarized in a 1215 (27 x 45) cell matrix, with two entries in each cell - one for magnitude and one for importance. Thus the decision maker could be presented with as many as 2430 items for each alternative proposal for action (Burton et al., 1977).

14.3 Modifications for this assessment

As a result of the limitations explained by Burton et al. (1977), the Leopold matrix was modified for purposes of this assessment. The following matrix (

Table 44) uses the same fundamental characteristics of the Leopold Matrix. However, instead of splitting each cell into magnitude and likelihood, each interaction between a *Project component* and E*nvironmental component* has been given one of three values:

- -1: Negative Effect: If this value is presented in a cell, it indicates that as a result of the Project component a negative effect will occur on the environmental component;
- 0: Neutral: If this value is presented in a cell, it indicates that the effect of the Project component on the environmental component will be neutral; and,
- +1: Positive Effect: If this value is presented in a cell, it indicates that as a result of the Project component a positive effect will occur on the environmental component.

These values do not take into account that the impact is temporary but only that it exists. The purpose of modifying the matrix this way is to reduce the required explanation for each cell. As each cell would require an explanation, the result would be 1215 items for discussion. However, as each cell now only contains one of three values, and each value can be easily interpreted by the reader, further explanation of each cell is not warranted as previous sections in the original environmental assessment should be used for reference.

The reader should note that for the purposes of this assessment, the Project has been broken into three timelines with specific durations:

1. Construction – duration of 2 years (7% of the total Project timeframe);
2. Operations – duration of 25 years (86% of the total Project timeframe); and
3. Reclamation – duration of 2 years (7% of the total Project timeframe);

As such the total estimated duration of the Project is 29 years.

14.4 Interpretation of the Table

The reader must note that in the interpretation of this matrix, they must keep in mind that the interaction between the *Project component* and the E*nvironmental component* is based upon the actual *Project component* listed in the column, and the outcome of that specific *Project component*.

For example, the first *Project component* listed is Construction of Storage Yards. The first *environmental component* is Agricultural Land. Within the matrix, the value given is 0. In this case the construction of a storage yard will not involve loss of land use for agricultural purposes, as the storage yard is constructed outside of agricultural lands, and as such there is no effect. Whereas, further down the column, the effect of Reclamation of Surface Soils is +1 (positive) as the outcome of this is that land may be brought back into production by the landowner. Furthermore, the reader must also note that in the consideration of whether a *Project component* effect is negative, neutral, or positive, consideration has been given to mitigation to be used. Mitigation for each VEC has been described in previous sections. The interpretation of impact is then based upon experienced outcome of outcomes.

Table 44. Environmental Impact Matrix (modified Leopold Matrix)

Environmental Component →		PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT												SOCIAL/CULTURAL ENVIRONMENT									
								FLORA				Fauna																	
Project Component ↓		Agricultural Land	Soils	Surface Water Quality	Ground Water Quality	Air Quality	Wetlands	Trees	Shrubs & Understory Vegetation	Aquatic Vegetation	Species at Risk - Vegetation	Birds (includes Species at Risk)	Bats	Ungulates	Carnivores	Small Mammals	Reptiles/Amphibians	Barriers to Movement	Corridor Creation	Residential	Noise	Historical Resources	Health & Safety (Public)	Recreation (i.e. hunting)	Scenic Qualities	Economics for DNR	Economics for community at large	Economics for Municipalities	
Construction																													**Mean**
General	Construction of storage yards	0	-1	-1	0	-1	0	-1	-1	0	0	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.48
	Construction of temporary work space	0	-1	-1	0	-1	0	-1	-1	0	0	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.48
	Erection equipment delivery	0	0	0	0	-1	0	-1	-1	0	0	0	0	-1	-1	-1	0	-1	-1	-1	-1	0	-1	-1	-1	1	1	0	-0.41
Turbines	Construction of access roads, approaches, water crossings	0	-1	-1	0	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.59
	Construction of temporary work space(s)	0	-1	-1	0	-1	0	-1	-1	0	0	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.48
	Construction of Pits	0	-1	-1	-1	-1	0	-1	-1	0	0	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.52
	Site grading	0	0	0	0	-1	0	0	0	0	0	0	0	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	-1	1	1	0	-0.30
	Excavation of foundations	0	-1	0	-1	-1	0	0	0	0	0	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.41
	Pouring of foundations	0	0	0	-1	-1	0	0	0	0	0	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.37
	Tower/turbine erection and insulating	0	0	0	0	-1	0	0	0	0	0	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.33
	Install Turbine Electrical & Padmount Transformers	0	0	0	0	-1	0	0	0	0	0	0	0	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.26
	Removal of excess soils	0	1	-1	0	-1	-1	0	0	0	0	0	0	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.30
	String Interconnection Conductors & Wires	0	0	0	0	-1	0	0	0	0	0	0	0	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.26
	Interim Reclamation of pad sites and access roads	0	1	1	0	-1	0	0	0	0	0	0	0	-1	-1	-1	0	0	-1	-1	-1	0	0	-1	0	1	1	0	-0.15
Gathering Lines	Install & Connect U/G & O/H Collector System	0	0	0	0	-1	0	-1	-1	0	0	0	0	-1	-1	-1	0	0	-1	-1	-1	0	0	-1	0	1	1	0	-0.30
Substation	Establishment of temporary work space	0	0	0	0	-1	0	0	0	0	0	0	0	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.26
	Removal of surface soil	0	-1	-1	0	-1	-1	-1	-1	-1	0	0	0	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.48
	Construction of access road and approaches	0	-1	-1	0	-1	-1	0	0	-1	0	0	0	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	-1	1	1	0	-0.44
	Grading of site	0	0	0	0	-1	0	0	0	0	0	0	0	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.26
	Installation of gravel pad	0	0	0	0	-1	0	0	0	0	0	0	0	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.26
	Transformers & control building installation, wiring, finishing	0	0	0	0	-1	0	0	0	0	0	0	0	-1	-1	-1	0	-1	-1	-1	-1	0	0	-1	0	1	1	0	-0.26
	Reclamation of surface soils	0	1	1	0	-1	1	0	0	1	0	1	1	1	1	-1	0	1	-1	-1	-1	0	0	-1	1	1	1	0	0.22
	AVERAGE	0.00	-0.23	-0.27	-0.14	-1.00	-0.14	-0.36	-0.36	-0.09	0.00	-0.32	-0.32	-0.91	-0.91	-1.00	-0.05	-0.82	-1.00	-1.00	-1.00	0.00	-0.05	-1.00	-0.09	1.00	1.00	0.00	-0.34

Table 44. Environmental Impact Matrix (modified Leopold Matrix)

Environmental Component →		PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT												SOCIAL/CULTURAL ENVIRONMENT										
								FLORA				FAUNA																		
Project Component ↓		Agricultural Land	Soils	Surface Water Quality	Ground Water Quality	Air Quality	Wetlands	Trees	Shrubs	Aquatic Vegetation	Species at Risk - Vegetation	Birds	Bats	Ungulates	Carnivores	Small Mammals	Reptiles/Amphibians	Barriers to Movement	Corridor Creation	Residential	Noise	Historical Resources	Health & Safety (Public)	Recreation (i.e. hunting)	Scenic Qualities	Economics for DNR	Economics for community at large	Economics for Municipalities		
Operations & Maintenance																													Weights	Mean
Turbines	Production of electricty by turbines	0	0	0	0	1	0	0	0	0	0	-1	-1	0	0	0	0	-1	-1	-1	-1	0	0	-1	-1	1	1	1	98.000%	-0.15
	Weed control	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.286%	0.11
	Reclamation of disturbed soils	0	1	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0.286%	0.26
	Grading and road maintenance	0	0	0	0	0	0	0	0	0	0	-1	0	-1	-1	-1	0	-1	-1	-1	-1	0	-1	-1	-1	1	1	0	0.286%	-0.33
	Turbine maintenance	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	0	0	-1	-1	0	0	0	0	-1	0	0	1	0	0.286%	-0.15
Power lines/Transformer Station	Facility maintenance	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	0	0	-1	-1	-1	0	0	0	-1	0	0	1	0	0.286%	-0.19
	Testing of equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	0	0	0	0	-1	0	0	1	0	0.286%	-0.07
	Line maintenance as required	0	0	0	0	0	0	0	0	0	0	-1	0	-1	0	0	0	-1	-1	-1	0	0	0	-1	0	0	1	0	0.286%	-0.19
	AVERAGE	0.00	0.01	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00	-0.99	-0.98	-0.01	-0.01	-0.01	-0.00	-0.99	-0.99	-0.99	-0.98	0.00	-0.00	-0.99	-0.98	0.99	1.00	0.98		-0.15
Decommissioning																														Mean
Turbines & Access	Removal of tower and turbine infrastructure	0	0	0	0	-1	0	0	0	0	0	0	1	-1	-1	0	0	0	1	-1	-1	0	0	-1	-1	1	-1	1		-0.15
	Removal of transformers	0	0	0	0	-1	0	0	0	0	0	0	1	-1	-1	0	0	0	1	-1	-1	0	0	-1	-1	1	-1	1		-0.15
	Partial excavation and removal of cement base to depth >1.5 meters	0	0	0	0	-1	0	0	0	0	0	0	0	-1	-1	0	0	0	0	0	0	0	0	0	0	0	-1	1		-0.11
	Removal of gravel pads and gravel from access	0	0	0	0	-1	0	0	0	0	0	0	0	-1	-1	1	1	0	1	0	0	0	0	0	0	0	-1	1		0.00
	Recontouring of pad and access roads	0	0	0	0	-1	0	0	0	1	0	0	0	-1	-1	1	1	0	1	0	0	0	0	0	0	0	-1	1		0.04
	Reclamation of surface soils	0	1	1	0	-1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	-1	1		0.52
	Re-seeding/Re-vegetation	0	1	1	1	-1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	1	0	-1	-1		0.52
Power Lines/ Transformer Station	Removal of above ground poles and lines	0	0	0	0	-1	0	0	0	0	0	0	1	1	1	1	1	0	1	1	-1	0	0	-1	1	1	-1	1		0.22
	Removal of transformer station and associated infrastructure	0	0	0	0	-1	0	0	0	0	0	0	1	1	1	1	1	0	1	1	-1	0	0	-1	1	1	-1	1		0.22
	Removal of gravel pads	0	0	0	0	-1	0	0	0	0	0	0	1	0	1	1	1	0	1	1	1	0	0	0	1	0	-1	1		0.26
	Removal of interconnection lines and infrastructure	0	0	0	0	-1	0	0	0	0	0	0	1	1	1	1	1	0	1	1	-1	0	0	-1	1	1	-1	1		0.22
	Removal of access roads	0	0	0	0	-1	1	0	0	1	0	0	1	1	1	1	1	0	1	1	1	0	0	0	1	1	-1	1		0.41
	Recontouring of pad and access roads	0	0	0	0	-1	0	0	0	1	0	0	1	1	1	1	1	0	1	1	1	0	0	0	1	0	-1	1		0.33
	Reclamation of surface soils	0	1	1	0	-1	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1	0	0	0	1	0	-1	1		0.52
	Re-vegetation	0	1	1	1	-1	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1	0	0	0	1	1	-1	1		0.59
	AVERAGE	0.00	0.27	0.27	0.13	-1.00	0.20	0.27	0.27	0.47	0.00	0.13	0.80	0.27	0.33	0.80	0.80	0.13	0.93	0.53	0.13	0.00	0.00	-0.33	0.47	0.47	-1.00	0.87		0.23

Table 44. Environmental Impact Matrix (modified Leopold Matrix)

LEGEND

Negative Effect	-1
Neutral (No perceived effect)	0
Positive Effect	1

Environmental Component →		PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT												SOCIAL/CULTURAL ENVIRONMENT										
								FLORA				FAUNA																		
Project Component ↓		Agricultural Land	Soils	Surface Water Quality	Ground Water Quality	Air Quality	Wetlands	Trees	Shrubs	Aquatic Vegetation	Species at Risk - Vegetation	Birds	Bats	Ungulates	Carnivores	Small Mammals	Reptiles/Amphibians	Barriers to Movement	Corridor Creation	Residential	Noise	Historical Resources	Health & Safety (Public)	Recreation (i.e. hunting)	Scenic Qualities	Economics for DNR	Economics for community at large	Economics for Municipalities		
Project Timeline	**2012 - 2041**	**% of Project Timeline**																												
Construction	2 years	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%		7%
Operation	25 years	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%		86%
Reclamation	2 years	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%		7%
TOTAL	**29 years**																													
	Averages																													
	Construction	0.00	-0.23	-0.27	-0.14	-1.00	-0.14	-0.36	-0.36	-0.09	0.00	-0.32	-0.32	-0.91	-0.91	-1.00	-0.05	-0.82	-1.00	-1.00	-1.00	0.00	-0.05	-1.00	-0.09	1.00	1.00	0.00		-0.34
	Operation	0.00	0.01	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00	-0.99	-0.98	-0.01	-0.01	-0.01	-0.00	-0.99	-0.99	-0.99	-0.98	0.00	-0.00	-0.99	-0.98	0.99	1.00	0.98		-0.15
	Reclamation	0.00	0.27	0.27	0.13	-1.00	0.20	0.27	0.27	0.47	0.00	0.13	0.80	0.27	0.33	0.80	0.80	0.13	0.93	0.53	0.13	0.00	0.00	-0.33	0.47	0.47	-1.00	0.87		0.23
	Weighted Average	**0.00**	**0.01**	**-0.00**	**-0.00**	**0.71**	**0.00**	**-0.00**	**-0.00**	**0.03**	**0.00**	**-0.86**	**-0.81**	**-0.05**	**-0.04**	**-0.02**	**0.05**	**-0.90**	**-0.86**	**-0.88**	**-0.91**	**0.00**	**-0.01**	**-0.95**	**-0.82**	**0.95**	**0.86**	**0.90**		**-0.13**

The impact of different *Project component*s on a single *environmental component* has been tracked. In this example, we look at the outcome of all *Project components* on the *environmental component* Soils.

1. In this column, the average effect of the all *Project component*s on Soils, for the construction duration only, is -0.23. This suggests that overall, the construction duration for the wind Project will have a negative effect on Soils. As this value (-0.23) is closer to 0 (neutral) than -1 (negative), the perceived effect is borderline neutral due to reclamation practices and mitigation which can be used, with some overall negative impacts (i.e. loss of soil integrity due to use during construction). Furthermore, soil impacts are site specific and will not act cumulatively.

2. Continuing in this column, the average effect of the all *Project component*s on Soils, for the Operations duration only, is 0.0. That suggests, that overall, the operation duration for the wind Project will have a neutral effect on Soils. This is because following construction, areas that are no longer required will be reclaimed. In addition, weed control and re-seeding of disturbed sites will have a positive impact on Soils.

3. In the Soils column, the average effect of the all *Project component* for the Decommissioning duration only, is 0.27. That suggests, that overall, the reclamation duration for the wind Project will have a positive effect on Soils. This is because following operations, areas that are no longer required will be reclaimed and put back into forestry production.

4. At the bottom of Table 44, the reader should note that the averages for each Project stage (i.e. Construction, Operations, Reclamation) are summarized for each *environmental component* (columns).

5. Finally a weighted average has been determined for the overall Project, for each *environmental component*. The Weighted Average is necessary as different life cycle stages account for different percentages of the total Project timeline. Continuing with the previous example, the average impact of Construction on Soils is -0.23; the average impact of Operation on Soils is 0.0; and the average impact of Decommissioning on Soils is 0.27. However, both the Construction and Decommissioning stages each account for 7% of the total Project timeline (14% of the total Project timeline). Whereas the Operation stage accounts for 86% of the total Project timeline. As such, impacts associated with the Operation stage, are weighted accordingly as these impacts will be experienced for 86% of the total Project timeframe.

6. The resulting average impact of the overall Project on Soils is therefore calculated as 0.01. As such, the effect of the Project is considered neutral.

7. For Operation stages, a Weighted Average within the category is also necessary. This is due to the fact that the production of the wind energy by spinning turbine blades will likely account for 98% of operational activities on the site. The remaining components listed under Operational will account for 2% of the total time frame. As such, impacts associated with the production of electricity by spinning turbines are weighted accordingly as these impacts will be experienced for 98% of the total Project timeframe.

14.5 Discussion of Effects

14.5.1 Construction Phase

The results of the effects input into Table 44 indicate that throughout the Construction phase, impacts from the *Project components* on *environmental components* are negative; as one might expect. This is due to the extent of equipment, materials, labor, and construction requirements affecting most of the environmental components listed. The average impact across all *environmental components* is estimated at -0.34, suggesting an overall negative impact, with a slight skewness towards neutral.

The greatest negative impact on the Physical Environment will be associated with Air Quality due to the amount of emissions associated with construction from machinery, particulates and dust from roads and soils displacement during construction.

The greatest impacts on the Biological Environment will be on wildlife (as a result of displacement due to activity), establishment of barriers to movement for all wildlife, and corridor creation for wildlife. Neutral impacts will be associated with loss of vegetation as much of the impacts associated with vegetation loss will be mitigated.

The greatest impacts on the Social/Cultural Environment will be associated with effects to Residents, Noise, and Recreation of the area. All of these components will be negatively affected as a result of increased activity. For example, it is not anticipated that Safety or Health concerns will result directly from construction, however the increase in activity may increase the probability of an accident over what currently exists in the Project area. Economic effects are considered positive due to revenues and wages to local contractors, and effects to Historical resources are considered neutral as mitigation and assessment effectively eliminates impacts.

14.5.2 Operations Phase

The results of the perceived effects input into Table 44 indicate that throughout the Operations phase, the overall impacts from the *Project components* on *environmental components* are considered neutral, with a slight skew negative (-0.15).

With that in mind, weighted averages suggest that the greatest impacts on the Physical Environmental will be associated with Air Quality but will be positive. This is due to the lack of emissions associated with Project during operation, and the offset of equivalent emissions that would have occurred in the absence of the Project. This positive effect is more regional in nature.

The greatest negative impacts on the Biological Environment will be associated with Birds and Bats due to expected mortalities. Furthermore, spinning turbines will create barriers to movement to only Birds and Bats, and likely create corridors to movement for Birds and Bats. Limited negative effects to Small Mammals may occur as a result of road creation creating barriers to movement Negative impacts MAY occur to Lynx as more Coyotes use roads for access. Neutral impacts will be associated with loss of vegetation as much of the impacts associated with vegetation loss will already be experienced during construction, and interim reclamation will re-establish disturbed areas. Neutral effects to other wildlife species are expected.

The greatest impacts on the Social/Cultural Environment will be associated with effects to Residents, Noise, Recreation, and Scenic Qualities of the area. All of these components will be negatively affected as a result of turbine operations. Economic effects are considered positive due to operational revenues associated with power sales, taxes, procurement of local services, or other financial agreements to local Landowners, the Community at Large, and Municipalities.

14.5.3 Decommissioning Phase

The results of the perceived effects input into Table 44 indicate that throughout the Decommissioning phase, impacts from the *Project components* on *environmental components* are positive; as one might expect. This is due to the fact that the re-establishment of ecosystem components will result from the reclamation process, affecting most of the environmental components listed. The average impact across all *environmental components* is estimated at 0.23, suggesting an overall positive impact, with a slight skewness towards neutral.

The greatest negative impacts on the Physical Environment will be associated with Air Quality due to the amount of emissions associated with construction from machinery, particulates and dust from roads and soils displacement during reclamation. In contrast, the greatest positive impacts will be associated with the restoration of the lands within the Project boundaries.

All impacts on the Biological Environment are expected to be positive as the removal of equipment and reclamation of the ecological components will result.

The greatest impacts on the Social/Cultural Environment will be associated with negative effects to Recreation, Scenic Qualities, Economics for Landowners, Economics for Community at Large, and Economics for Municipalities. All of these components will be negatively affected as a result of increased activity. For example, economic effects are considered negative due to loss of operational revenues associated with power sales, taxes, or other financial agreements.

14.5.4 Overall Effects

The bottom of Table 44 summarizes the Weighted Averages of all *Project components* on individual *Environmental components.*

Within the Physical Environment, the greatest overall effect is associated with changes in Air Quality (+0.71). This is due to weighting of the regional effects of the reduction in Greenhouse Gas Emissions (GHG) from the Project when one considers if the production of the same amount of power over 25 years resulted from standard practices of Coal burning in the region. Over the timeframe of the Project, other effects are considered neutral.

Within the Biological Environment, the greatest overall effects are associated with negative impacts to Birds (-0.86) and Bats (-0.81). The Project is also expected to result in Barriers to Movement (-0.90) and Corridor Creation (-086). This is also due to weighting of the Operations Phase in the calculation of these averages. All other impacts effects are considered neutral.

Within the Social/Cultural Environment, the greatest overall effects are associated with negative impacts to Residential (-0.88), Noise (-0.90), Recreation (-0.95) and Scenic Qualities (-0.82). In contrast, significant positive impacts are associated with economic effects to DNR (+0.95) (DNR will collect lease revenue from the Project), the Community at Large (+0.86), and Municipalities (+0.84).

The overall Project effects are a weighted average of the effects of the Project on all components during Construction, Operation, and Reclamation. Overall impacts during Construction are -0.33, during Operation are -0.15, and during Decommissioning are +0.23. Due to weighting of the means, the overall Project effect is -0.13, negative, but almost neutral.

15 CONCLUSION

CBHI recognizes that the Project will affect the local environment in a number of ways. Negative impacts will include increased fragmentation and access to the Project lands. CBHI has used existing logging roads and clearcuts to the greatest extent possible to help reduce the amount of new impact.

The Project area sits atop a ridge and as such there are numerous isolated wetlands throughout. CBHI has attempted to avoid all wetlands but some wetland encroachment will occur. CBHI will compensate losses in accordance with provincial requirements. Permitting of watercourse alterations for watercourse crossings and wetland alterations will be required prior to construction.

With respect to the overall impacts of the Project, there will be mortality of birds and bats as a result of turbine operations. The mitigation proposed is meant to reduce these impacts to the greatest extent possible.

CBHI also recognizes positive impacts from the Project. Of course these will include positive financial inputs to local businesses, local contractors and consultants, CBHI, the Cape Breton Regional Municipality, and the Province of Nova Scotia. In anticipation of the 2015 implementation of the Electricity Reform Act, there are potential significant cost savings to businesses throughout the Province.

In a single year, this Project will produce real and measureable Greenhouse Gas Emissions (‘GHG’) offsets as very small emissions are created. Based on quantification protocols for Wind-Powered Electrical Generation, this Project could produce 0.65 tonnes CO_2e GHG offsets for every mega-watt hour of electricity produced. Given the Project produces measureable electricity, the GHG offsets are measureable. Current estimates using 35% capacity factors for 50 MW estimates that 99,645 tonnes of CO_2 would be offset in a single year. According to the Nova Scotia Power database (Nova Scotia Power, 2014), in 2013, total CO_2e emissions from Nova Scotia power plants were 7,572,982 tonnes. The addition of this Project could reduce the Nova Scotia CO_2e emissions by 1.32%.

The reader will note that there is a time lag between spring and fall migration and breeding bird data. Therefore CBHI proposes to updating the spring and fall migration and breeding bird data following approval by NSDOE and prior to construction of the Project. Lynx monitoring and assessment will also continue as per identified protocols. Also, some additional historical resource assessment work on road alignments will also be required in accordance with Special Places standards and as per the recommendations of Davis MacIntyre & Associates.

All impacts associated with this Project, both positive and negative, are similar to those experienced on other projects previously approved in not only Nova Scotia, but across Canada. With continued thoughtful consultation, CBHI will be able to develop this Project in accordance with Nova Scotia regulatory, environmental, and social requirements, and in accordance with already approved practices.

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