

### 3. Approach to the Assessment

#### 3.1. Scoping and Bounding of the Assessment

The scoping process identifies those biophysical VECs or socio-economic aspects that are valued and that may be subject to impacts given the works proposed as described in Section 2. These works are primarily the construction and operation/maintenance phases, including accidents and malfunctions, but decommissioning is included as part of the EA process. The identification of VECs is based upon the potential interaction of the Project within the environmental and socio-economic setting as described in Section 4. In addition, any stakeholder concerns identified in consultation as described in Section 5 are heavily weighted when identifying aspects or VECs to be assessed.

The potential interaction of Project activities with the VECs forms the scope of the assessment. Indeed this scoping was completed at a preliminary level to define the primary and secondary studies completed for the Project. Assessment of the environment is an iterative process. The scoping is continually refined as the project is further developed, the environmental setting is studied and consultation is held. As it is impractical, if not impossible, to assess all potential effects of a project, the scoping of the assessment is key.

The study team has determined the biophysical VECs and socio-economic aspects that will be subject to assessment based upon its collective knowledge and experience, review of the regulatory requirements, and feedback from the community, First Nations, regulatory authorities and others as part of the consultation program and selected field programs. Based on this process, the biophysical VECs and socio-economic aspects that are evaluated for the Project are identified in Table 3.1.

Table 3.1 Identified VECs and Aspects

<b>Physical Components</b>	<b>Ecological Components</b>	<b>Socio-economic Aspects</b>
Ground and surface water	Wetlands and watercourses	Land use
Radar and radio signals	Fish habitat	Aboriginal resources/uses
Ambient noise	Migratory and breeding birds	Archaeological resources
Ambient light	Flora and fauna	Recreation
	Species of concern	Vehicular traffic
		Landscape aesthetics
		Health and safety
		Local economy

An important factor in the assessment process is the determination of spatial and temporal boundaries, i.e., those periods and areas within which the VECs are likely to interact with, or be influenced by, the Project. Temporal boundaries encompass the times that Project activities, and their effects, overlap with the presence of a VEC. Spatial boundaries are the areas within which the Project activities are undertaken and the facilities are located, and the zone of influence of effects of the Project, i.e., emissions, effluents and discharges.

The study area itself (Figure 3.1) includes a spatial bound which includes the footprint of all works associated with the construction and operation of the proposed Project, and those areas within which most project-environment interactions could reasonably be expected to occur. It is not possible to establish a single study area boundary that accurately reflects the spatial characteristics of the potential project-environmental interactions. Temporal project boundaries include the timeline for the short term construction activities, as well as the long term operation of the facility of approximately thirty years and its eventual decommissioning. Such boundaries are identified for each VEC as an integral part of the analysis in Section 6.

### 3.2. Desktop and Fieldwork Completed

Ecological, social and geophysical desktop data was compiled and analyzed with the intent to design targeted field investigations at the Project site. Data was compiled from the following sources:

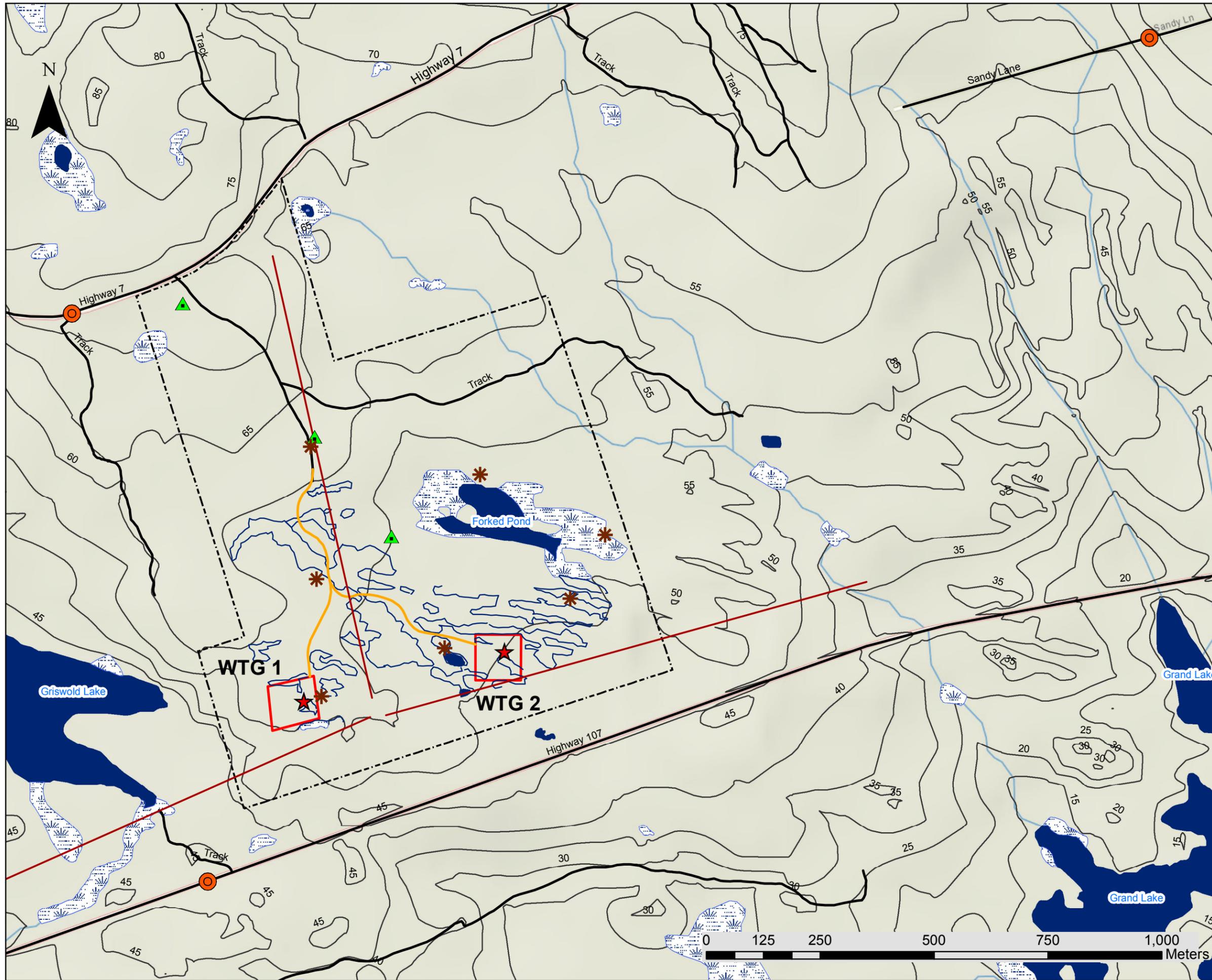
- Nova Scotia Department of Natural Resources (NSDNR);
- Service Nova Scotia and Municipal Relations (SNSMR);
- Atlantic Canada Conservation Data Center (ACCDC);
- Species at Risk Act (SARA);
- Committee of the Status of Endangered Wildlife in Canada (COSEWIC);
- Maritime Breeding Bird Atlas (MBBA); and
- Geobase, a database of Canadian GIS information.

Field programmes commenced in January 2014 and concluded in November 2014. All consultants were familiar with documented protocols related to the completion of a Nova Scotia wind energy registration document. The lead proponents of the field consultants can be found in

Table 3.2. Key locations executed during field work activities are displayed in Figure 3.1.

Table 3.2 Field Programme Consultants

Field Study	Field Programme	Major Consultant (Company)
Archaeological Investigation	Archaeology Screening and Reconnaissance	Melanie Smith (Strum), in association with Stephen Garcin (Boreas Heritage Consulting Inc.)



**Legend**

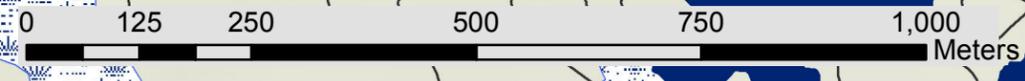
- ★ Revised WTG Location
- Revised Access Road
- ▭ Revised Laydown Area
- - - Field Study Area
- Visual Impact Study
- ▲ Bat Detector
- \* Avian Point Count
- Moose Transect
- ECA Wetland Delineation
- Contour Lines
- Existing Road
- Waterbody
- ▨ NSDNR Wetland

Figure 3.1  
Field Programmes

Drawn by: TAM	Date: 2014/11/13
Project #: 080	1 : 8 000



Coord. System: NAD83 CSRS UTM Z20N  
 Projection: Transverse Mercator  
 Units: Meters



Avian Surveys	Spring & Fall migration counts and Summer breeding survey	Andrew Horn (Dalhousie University)
Bat Monitoring	Acoustics and Anabat detection.	Dr. Hugh Broders (St. Mary's University)
Moose Survey	Moose Tracks and Pellet Group Inventory Surveys	Jody Hamper (Independent Consultant)
Rare Plant, Wetland & Watercourse Surveys	Early & Late season rare plant survey, wetland identification and delineation, electrofishing.	Andrew Sharpe (East Coast Aquatics Inc.)

### Bird Surveys

Bird migration surveys, passage counts and breeding bird surveys were carried out by Andrew Horn. Andrew has extensive knowledge of the bird populations in and around Halifax Regional Municipality. The study was designed using Canadian Wildlife Services *Recommended Protocols for Monitoring Impacts on Wind Turbines on Birds* (Environment Canada, 2007a).

The site was visited six times during the spring migration period from April 11 to May 30. Most visits included a line transect and area searches between dawn and four hours after sunrise. The line transect for avian surveys followed the existing access road and south to the western turbine location, continuing east to the second turbine location, and returning to the access road by paralleling the northern shore of Forked Pond. This transect was walked, with frequent scanning of the sky for migrants and any potential stopover habitat within sight; in addition, Forked Pond was scanned for waterfowl on each visit.

CWS protocols recommended several visits during the main breeding period for most bird species between late May and early July (Environment Canada, 2007a). Given that it had already been visited throughout May for the migration surveys, only three additional visits were made spread across at least two weeks as recommended (Environment Canada, 2007a). Methods were as described above, as well as 5-minute point counts that were conducted approximately 300m apart along the survey transect. During each visit in May and June, approximately 30 seconds of song and 30 seconds of mobbing calls for Rusty Blackbird were played at roughly natural amplitude levels (~85dBA). The last survey on July 13 was specific to the Common Nighthawk as the site appeared to have extensive suitable breeding habitat due to the past forest fire. Ten minute point counts were conducted from three separate locations during morning twilight when the species is most readily detected.

The site was visited nine times during the autumn migration period from September to early November 2013, each visit consisted of area searches, methods of transects and/or passage migration counts. Due to the observer's unfamiliarity of the difficult terrain (granite outcrops, wet

fissures and sinkholes), the length of transects were scaled back until sparse late-fall vegetation offered safer passage. Forked Pond was scanned for waterfowl on each day, when transects offered the clearest view. The observer noted the species, number of individuals in each flock and flight heights (Environment Canada, 2007a).

Location of transects and survey points are shown on Figure 3.1. Final reporting for the spring and fall migration surveys, as well as the summer breeding survey, can be found in Appendix 5.

### **Bat Monitoring**

Bat monitoring was completed by Dr. Hugh Broders of St. Mary's University and his studies involved the use of 2 Wildlife Acoustics SM2 bat detectors and an Anabat detector. The ultrasonic acoustics recorders passively recorded echolocation calls of bat species at two separate locations on the Project site. The seasonal timing of sampling corresponds to the end of summer residency period, movement of resident species to local hibernacula, and to fall migration by migratory species. Species were qualitatively identified from recorded echolocation call sequences by comparison with known sequences using frequency-time graphs in ANALOOK software. With the Proponents permission, Dr. Broders will have the opportunity to further study the PLWF results to aid the formulation of a broader, province-wide study on the wind farm impacts on bat populations. The results and analysis of the field program conducted by Dr. Broders can be found in Appendix 6.

### **Archaeological Investigation**

Strum Consulting (Strum) was retained to undertake archaeological screening and reconnaissance of the proposed PLWF. The objective of the archaeological assessment was to evaluate archaeological potential within the area that may be impacted by development of the wind farm. Strum Consulting, in association with Boreas Heritage Consulting Inc., developed a work plan that consisted of the following components: a background study including a review of previous archaeological research and data to identify areas of archaeological potential; archaeological reconnaissance of the areas that could be affected by development activities; and, a report summarizing the results of the background study and field reconnaissance, as well as providing cultural resource management recommendations. Final Strum Consulting reporting can be found in Appendix 7.

### **Rare Plant, Wetland and Watercourse Identification**

Andrew Sharpe and Mike Parker (East Coast Aquatics Inc.; ECA) were procured to perform a rare plant inventory and wetland identification at the PLWF site. The surveys were designed based on knowledge of the specialists and the ACCDC report, found in Appendix 9. Two botanical field surveys were conducted on the Project site, one for the early season survey (July 2) and the second for the late season (August 25). These dates were selected to maximize opportunities to identify botanical species in accordance with the NSE Guide to Addressing Wildlife Species and Habitat in an EA Registered Document (NSDNR, 2009a). The site visits included the identification of all vascular

plants and characterization of ecological habitats they were found, as well as initial mapping of wetland boundaries. No rare, endangered or species of conservation concern were identified. The final report on botanical finds can be found in ECAs report in Appendix 8.

Field surveys for wetland identification and delineation occurred on July 2, July 23 and August 25, with the surveys undertaken by ECAs qualified wetland delineators. An additional delineation was completed on October 17 while investigating the opportunity to minimize wetland impact by further micro-siting of WTG 2. The area of study was provided by the Proponent based on required setbacks in place by HRM, and environmental boundaries from knowledge of the site. The objectives of the field surveys were to:

- provide a general characterization of the vegetation communities within the wetlands;
- identify and delineate wetlands with intersect the proposed project infrastructure; and
- collect vegetation, soils and site details to facilitate subsequent wetland alteration applications for the Project.

The majority of the wetlands on site are classified as shrub and treed bogs, formed naturally through poorly drained depressions between the exposed bedrock ridges and past logging activities where large machinery traversed wetland areas. No floral species at risk or species of conservation concern were observed at the project site; in addition, no alien invasive species were identified.

Ongoing discussion through NSDNR, ECA and the Proponent will help to minimize the impact to wetlands and further refine the location of Project infrastructure and construction process. The complete delineation and final report of ECA on wetland identification can be found in Appendix 8.

### **Moose**

Jody Hamper performed a Pellet Group Inventory (PGI) and Tracks surveys (Appendix 10) in the winter and spring of 2014. Jody gained valuable experience completing the McLellans Brook and Barrington Wind Farm studies in 2012. The survey transects used by the independent consultant around the Project site can be seen in Appendix 10.

### **Ambient Sound**

The Proponent procured the expertise of Strum to perform a sound impact study for the Project. An acoustic assessment was completed for the PLWF using the “Decibel” module in the wind farm planning and design software WindPro v. 2.8.

Strum completed the calculations using ideal weather conditions for sound propagation and a conservative ground factor of 0.5 was applied to the model, even though the forested nature of the landscape could support a higher value. A second model was completed at the request of the Proponent to determine the sound propagation using a ground factor of 0. The Strum report, complete with tables and mapping, can be found in Appendix 13.

## Ambient Light

The Proponent procured Strum to complete an ambient light impact study for the PLWF. Using the “Shadow” module in the design software WindPro v. 2.8, Strum assessed the worst case scenario conditions that could potentially occur at the PLWF. Based on the predictive modelling, shadow flicker levels caused by the rotating WTG blades will comply with the industry standard of no more than 30 minutes of shadow on the worst day and no more than 30 hours of shadow a year. The complete report can be found in Appendix 13.

## Visual Impact Assessment

Strum was procured to complete the predicted visual impact of the Project by collecting representative photos from vantage points within the community. Photos were taken from three different locations with GPS waypoints to assist in the construction of a 3D view using Geographical Information System (GIS) software. The vantage points were selected based on locations where the PLWF could pose the greatest concern to aesthetics in the area. Strum’s simulated results, as well as a complete report, can be found in Appendix 14.

### 3.3. Methodology of Assessment

The assessment focuses on evaluation of predicted environmental effects resulting from potential interactions between the biophysical VECs and socio-economic aspects and the Project activities (construction, operation and maintenance, and decommissioning).

An “environmental effect” is defined in Nova Scotia’s *Environment Act* as:

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

To allow the Province to make a subsequent decision on the suitability of a project, the assessment needs to determine the significance of any residual adverse environmental effects. Residual environmental effects are those that remain after mitigation strategies are implemented. The prediction of residual environmental effects requires the determination that: the environmental effect is adverse; the adverse environmental effect is significant; and the significant adverse environmental effect is likely to occur.

Evaluation of environmental effects in this assessment uses the following definitions which consider the nature, magnitude, reversibility, duration and aerial extent of the effect:

- *Significant*: Potential effect could threaten sustainability of the resource in the study area and should be considered a management concern;

- *Minor*: Potential effect may result in a small decline of the quality of the resource in the study area during the life of the project, as such, research, monitoring and/or recovery initiatives should be considered;
- *Negligible*: Potential effect may result in a very slight decline of the quality of the resource in the study area during the life of the project, as such, research, monitoring and/or recovery initiatives would not normally be required; and
- *Beneficial*: Potential effect is expected to enhance the specific VEC or socio-economic aspect.

Where there is no predicted interaction of the Project and the biophysical VEC and socio-economic aspect prior to mitigative and control measures, there is no predicted effect and accordingly, it is not assessed. This is shown in Table 6.1.

To set the Project into its broader ecological and regional development context, the assessment considers how the proposed Project may interact with past, present or likely (i.e., approved) future projects within the spatial and temporal bounds identified. This evaluation of cumulative effects is completed for each VEC and socio-economic aspect in the assessment.

Further, a review of the effect of the environment on the Project is completed. This includes climatic fluctuations and extreme events, such as fire and spills.

## 4. Environmental Setting

### 4.1. Biophysical

#### 4.1.1. Geophysical

The PLWF site is centered between Porters Lake and Lake Echo, located on a narrow ridge of granite known as the Eastern Granite Uplands Ecodistrict spanning from Waverley to Sheet Harbour (Neily, 2003). Slight variation in elevation change occur along the ridge; the PLWF site ranges from 50m to 70m above sea level (ASL). The soil conditions associated with the underlying granite are coarse textured and normally very shallow (Neily, 2003). Large granite outcrops and boulders are found scattered throughout the Project site.

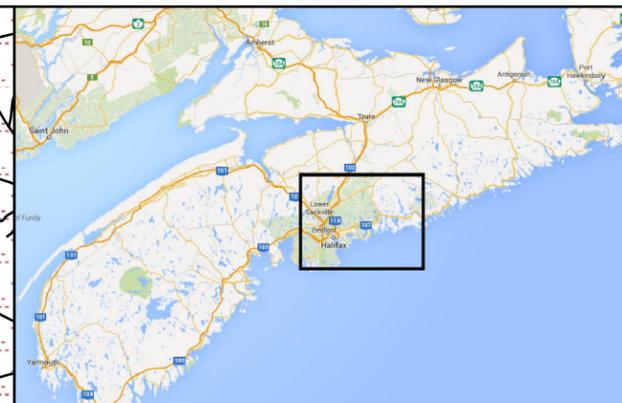
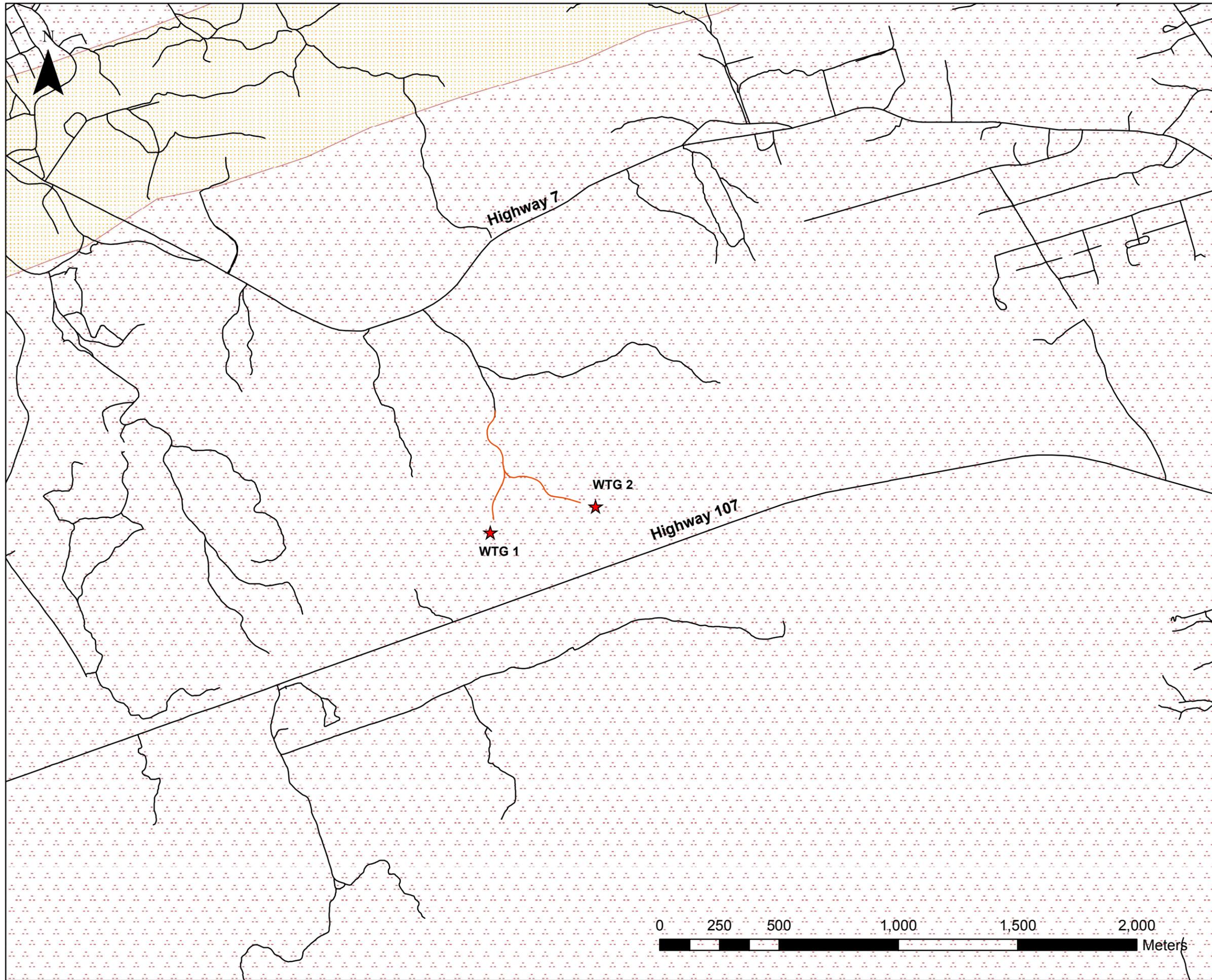
Figure 4.1 represents the digital version of NSDNR Published Map ME 2000-01, Geological Map of the Province of Nova Scotia, compiled by J.D. Keppie, 2000 (NSDNR, 2013). The digital product was created by the NSDNR, Mineral Resources Branch staff. The original data was compiled and digitized from over 60 maps and sources of information that are noted on the map. The GIS databases were developed from the information contained on this map. The digital product contains layers for geological features such as: bedrock geologic units, faults, geological contacts, isotope ages, other geological features (NSDNR, 2013).

The characteristics of the bedrock formation determined to be present at the PLWF site is outlined in Table 4.1. This formation is broadly known as the Goldenville Formation.

Table 4.1 Characteristics of Bedrock

Field	Description
Unit Description	Sandstone turbidites and slate: continental rise prism (in places metamorphosed to schist and gneiss), >5600m (U-Pb concordant zircon and detrital titanite ages near base and top of unit of 566±8 and 552±5 Ma <sup>39</sup> respectively
Field	Meguma Group
Formation	Goldenville Formation

Installation of the meteorological tower at the site indicated that bedrock exists either at the surface or within 0.25-1.0m from the surface. Section 2.5 details the procedures which will be taken should blasting be required for the construction the foundations.



### Legend

-  Turbine Location
-  Access Road
-  Existing Road
-  Goldenville Formation
-  Halifax Formation

Figure 4.1  
Geologic Formation

Drawn by: TAM	Date: 2014/10/31
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Coord. System: NAD83 CSRS UTM Z20N  
Projection: Transverse Mercator  
Units: Meters

The Project site is more than 1km south of the divide for the Halifax Formation bedrock which is known for its sulphide bearing materials. Hence no concern with acid generating bedrock is expected.

#### 4.1.2. Atmospheric

The PLWF is located in what is known as the Eastern Interior Uplands. Climate data was analyzed from an Environment Canada weather station located at Halifax Stanfield International Airport, approximately 22km northwest of the site (Environment Canada, 2012). The climate averages, extremes and months of occurrences can be found in Table 4.2.

Table 4.2 Site Atmospheric Conditions

Parameter	Time Period	Data Source	Value
Average Daily Temperatures (°C)	Yearly Average (1981-2010)	Environment Canada	6.6
Extreme Maximum Temperature (°C)	August 1, 1995	Environment Canada	35
Extreme Minimum Temperature (°C)	January 31, 1993	Environment Canada	-28.5
Average Total Rainfall (mm)	Yearly Average (1981-2010)	Environment Canada	1396.2
Average Total Snowfall (cm)	Yearly Average (1981-2010)	Environment Canada	221
Extreme Daily Rainfall (mm)	August 15, 1971	Environment Canada	218.2
Extreme Daily Snowfall (cm)	February 19, 2004	Environment Canada	66
Extreme Snow Depth (cm)	January 24, 1971	Environment Canada	94
Predominant Wind Direction	Yearly Average	Canadian Wind Atlas (confirmed with Watts MET tower analysis)	SW

The setting is considered rural, with no to low presence of artificial lighting coming from streetlights or shops. The main source of noise in the community emits from the roads surrounding the Project; Hwy 7 and Highway 107.

The wind direction “rose” from the collected MET tower data at the site can be seen in Figure 4.2. The wind rose is an important metric for the placement of turbines with respect to energy micro-siting, shadow flicker and noise modelling.

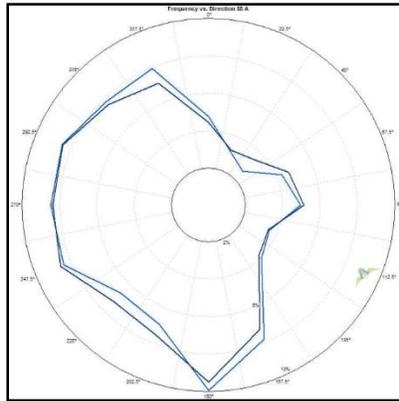


Figure 4.2 Wind Frequency Rose

#### 4.1.3. Groundwater, Surface Water and Wetlands

The PLWF site is within the Musquodoboit Watershed. Other than the relative proximity to small water bodies such as Forked Pond (i.e., approximately 250m east of the closest WTG) and Griswold Lake (i.e., approximately 300m west of the closest WTG), the nearest large water body is Grand Lake, located 1.5km southeast of the Project site. There is very little natural hydraulic connectivity between the Project site and Grand Lake; in addition, surface water flow to Grand Lake from the Project site is restricted to a culvert passing under Nova Scotia 107.

Information from nearby water wells located on Hwy 7 was analyzed to help assess distance to groundwater, and distance to bedrock at the Project site. Using the wells nearest to the Project site, the average depth-to-bedrock reading was 33 feet (ft). Wells depths range from 60ft to 360ft, inferring the depth where water bearing fractures were encountered.

There are minor watercourses and intermittent drainage on the Project site; no watercourse crossing are expected based on proposed access road routing. The site location is in a lowland area and wetlands have been identified along the proposed access route. The majority of wetlands can be identified as shrub or treed bogs containing sphagnum mosses over organic soils. The surface water drainage on site flows in a general northwest to southeast direction towards Grand Lake, reflecting the average change in slope of 1.7% over the Project property.

NSDNR wetland inventory maps indicate that wetlands do occur on site with the majority occurring on the perimeter of Forked Pond; there are no Wetlands of Special Significance in the vicinity of the Project site (NSDNR, 2004b). East Coast Aquatics has determined through delineation during field studies that smaller, low functionality wetlands are scattered over the Project area; specifically shrub and treed bogs. ECAs findings of additional wetlands, in comparison to NSDNR wetland inventory maps, is not unexpected as the inventory fails to recognize physically smaller wetlands.

The East Coast Aquatics report which describes and presents additional site figures on surface water hydrology and wetlands found on and near the study area can be found in Appendix 8. Figure 4.3 shows the interaction of the proposed Project with the local hydrology; this is assessed in Section 6.

#### **4.1.4. Migratory and Breeding Birds**

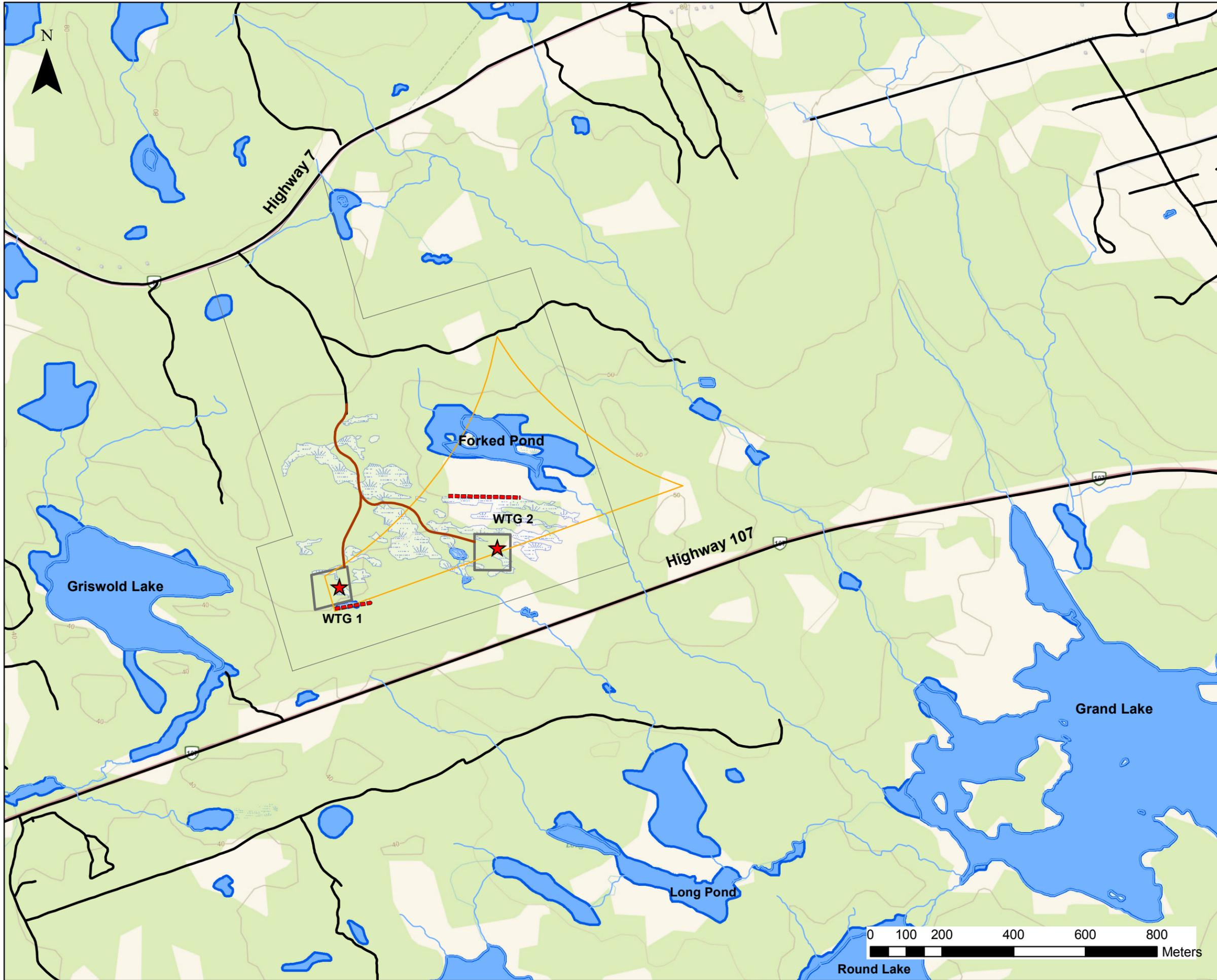
Data from ACCDC and the Migratory Birds Breeding Atlas (MBBA) were used to design and implement the migratory and breeding bird survey at the site, as well as reliance upon the pre-existing bird studies completed east of the Project site (for example, those publicly available studies for the Gaetz Brook Community Wind Farm). In addition, these surveys were completed by an experienced birder, Andrew Horn (Halifax).

Andrew Horn prepared draft protocols for several possible community wind energy sites originally proposed by the Proponent during the inception of the COMFIT program. The refined protocols specific to the PLWF were implemented by Andrew via spring and fall migration surveys and summer breeding bird surveys.

The key findings by Andrew Horn are presented below:

- During spring transects, area searches and passage and point counts, no migrants were encountered that could be unambiguously distinguished from local breeding birds.
- During breeding bird survey, species were typical of the habitats they were found in, although they do include several Partners in Flight Priority Species and species known to have flight displays.
- Two federally listed species (Common Nighthawk and Rusty Blackbird) were found, both encountered only once. Repeated efforts to locate both species using playback (see Methods in Appendix 5) resulted in no additional encounters of either species.
- Four species of provincial status Yellow (sensitive) were all encountered only once: Grey Jay, Tree Swallow, Golden-crowned Kinglet and Ruby-crowned Kinglet.
- During fall transects, no species at risk or high concentrations of birds were found. The only priority species found were one Common Loon, one Golden-crowned Kinglet and two Grey Jays.

An initial evaluation of the required pre-construction bird surveys (in consultation with (Environment Canada, 2007a) and (Environment Canada, 2007b)) classed site sensitivity as High using a precautionary approach; however, the survey results suggest that the site sensitivity is Low. The size category of the Project (two turbines) is Small, so the level of concern is judged to the Category 1 though the pre-construction surveys were designed to treat the site as a Category 2 (Environment Canada, 2007b).



**Legend**

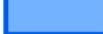
-  Turbine Location
-  Access Road
-  Existing Road
-  Undefined Wetland Boundary
-  Watercourse
-  Delineated Wetland
-  Waterbody
-  Laydown Area
-  WTG Setback Constraint
-  Field Study Area

Figure 4.3

Surface Water Hydrology

Drawn by: TAM

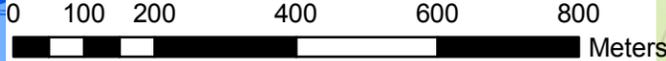
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Project: 080



Coord. System: NAD83 CSRS UTM Z20N  
 Projection: Transverse Mercator  
 Units: Meters



Reports by Andrew Horn which describe methodology and results of spring and fall migration and breeding bird studies can be found in Appendix 5; this predicted interaction with the proposed Project is assessed in Section 6.

#### 4.1.5. Flora and Fauna

The survey of plants in the area of the Project site found a fire-charred, upland coniferous forest. The dominant species of hardwoods include Red Spruce, Black Spruce, Red Maple and White Pine with an ericaceous shrub understory. This forest community has recently suffered from three significant disturbance events: Hurricane Juan (2003), wood harvesting (clear-cutting), and forest fire (2008). The ericaceous shrub understory includes Black Huckleberry, Late Lowbush Blueberry, Sheep-laurel and Rhodora. Herbaceous plants that also thrive in the area include Bracken, Bunchberry, Teaberry and Bristly Sarsaparilla.

The total list of vascular plants containing botanical finds of East Coast Aquatics (July 2, 2014 and August 25, 2014) are provided in Appendix 8. Field surveys completed within the Project bounds discovered no rare, endangered or species of conservation concern. 78 taxa encountered had a NSDNR ranking of Secure and 5 exotic taxa, or introduced species, were identified. The high native to non-native ratio reflects the integrity of the habitat in the area. Upland areas of the site are dominated by dead-standing coniferous tree trunks, or the remains of charred stumps indicating wood harvesting prior to the forest fire. Discussions of plant species at risk and of concern is within Section 4.1.7.

The Project is located in what is known as Nova Scotia's Eastern Ecoregion and situated within the Eastern Interior Ecodistrict (Neily, 2003). The total area of the Eastern Granite Uplands is 60,200 ha; granite outcrops account for 15% of the ecodistrict while freshwater lakes account for 11.1%. Table 4.3 outlines climatic conditions common in the ecodistrict, which drives flora growth and diversification.

Table 4.3 Climatic Data for Ecodistrict 430

<b>Ecodistrict</b>	<b>Annual Precipitation (mm)</b>	<b>Mean Annual Temperature (°C)</b>	<b>Mean Summer Temperature (°C)</b>	<b>Mean Winter Temperature (°C)</b>
Eastern Interior	1400-1500	6.0	16.5	-5.0

Mainland moose populations persist in the Tobeatic Region, Chebucto Peninsula, Cobequid Mountains, Pictou-Antigonish Highlands, and the interior of the eastern shore from Tangier Grand through to Guysborough (NSDNR, 2009b). A number of reasons are purported for the low number (1000 animals) of mainland moose populations, including disease (i.e., *P. tenuis* (brain worm)), illegal kill and poaching, calf predation by black bears, habitat alteration and increased access, disturbance and possibly climate change (NSDNR, 2009b). The Project site is not in the immediate area where it is suggested Mainland Moose persist; however, a Mainland Moose survey was

conducted at the PLWF site as a precaution. Three moose surveys were conducted, consisting of three transects during each visit between January 30, 2014 and April 10, 2014. The transects were set up by Jody Hamper with the use of Google Earth and Department of Natural Resources land classification maps. Each transect was approximately 1km in length and one meter on each site was observed. All habitat, including cutovers and lowland areas, were covered. No evidence of moose was recorded.

Preliminary examination of data collected through Acoustics and Anabat surveys at the Project site suggest that there is no significant movement of bats throughout the study area. The nearest known bat hibernaculum to the PLWF is an abandoned mine at Lake Charlotte, located approximately 31km away. All of the identified echolocation call sequences recorded during the survey period could be attributed to the two species of *Myotis* spp. bats known to occur in Nova Scotia, the little brown bat and the northern long-eared bat. Dr. Hugh Broders, in association with Lynne Burns, suggests that these activity levels are amongst the lowest they have recorded anywhere but that the activity levels of *Myotis* spp. bats must be interpreted with caution. Discussion of listed bat species is within Section 4.1.7.

The East Coast Aquatics report which describes methodology and results of floral surveys in the study area can be found in Appendix 8. Reports on bats and moose are found in Appendix 6 and Appendix 10, respectively. The predicted interaction with the proposed Project is assessed in Section 6.

#### **4.1.6. Fish and Fish Habitat**

No direct alteration of watercourses is expected on the site; however, electrofishing and directed angling was conducted by East Coast Aquatics. The complete survey originated from the outlet of Forked Pond and continued south towards Highway 107. No fish were caught or observed during the survey. East Coast Aquatics report can be found in Appendix 8.

#### **4.1.7. Species at Risk or of Concern**

Desktop data on species at risk in the vicinity of the PLWF was compiled and reviewed as collected from ACCDC. ACCDC is part of the NatureServe network and maintain data for the Atlantic Canadian Provinces. Data reflects known occurrences for rare and endangered flora and fauna. As per NSDNR requirements, data is presented within 100km radius and ACCDC cannot specify exact location for mapping; however, distances of known location to site are noted. In addition, Environment Canada's species at risk mapping for Species at Risk Act (SARA) Schedule 1 (Government of Canada, 2012b) was accessed to support the ACCDC data. The typical habitat for the species was reviewed based on online information from Environment Canada and NSDNR.

There are 26 species that are known to occur in the general proximity of the Project are designated under Schedule 1 of SARA and/or the Nova Scotia Endangered Species Act (Government of Nova Scotia, 2013). These are tabulated below with Provincial and Federal designations listed. From

ACCDC data, observations and known distances from site are noted. Based on the specialists' site visits and the desktop review, a comparison was completed of the known habitat for the species at or near the Project area. This can assist in determining the likelihood of the species at risk being present at or near the Project works. The risk will be defined at either very low, low, moderate, or high. This is shown in Table 4.4.

## Flora

Two botanical studies were completed (July 2, 2014; August 25, 2014) at the PLWF study area by East Coast Aquatics Inc. (East Coast Aquatics). The field studies were completed after East Coast Aquatics reviewed the ACCDC listing (Appendix 9) for plants to ensure that they were aware of reports in the area to have minimum target species for searches, as well as to verify timing of field visits were appropriately scheduled to identify the rare flora. The review of the ACCDC listing given the site characteristics is included in the reporting of East Coast Aquatics.

Based on two targeted searches by East Coast Aquatics, none of the Federal or Provincial listed flora species were found in the study area.

## Birds

During the pre-construction avian surveys (spring and fall migration and summer breeding), two listed species at risk were identified:

- one Common Nighthawk (*Chordeiles minor*) was heard circling over Forked Pond;
- one Rusty Blackbird (*Euphagus carolinus*) was identified by its flight call heading west to east over the north side of Forked Pond.

In addition to the listed species, four other species of concern (NSDNR Yellow ranking) were identified: Grey Jay, Tree Swallow, Golden-crowned Kinglet and Ruby-crowned Kinglet.

Impact assessment, mitigation and follow up measures related to birds are discussed in Section 6.

## Mammals

During field work completed for moose in the winter 2014 and spring 2014, no evidence of moose was found (pellets or evidence of browsing). Impact assessment and mitigative measures related to moose are discussed in Section 6.2.

Occurrence of Little Brown Bat (*Myotis lucifugus*) and Northern Long-eared Bat (*Myotis septentrionalis*) were recorded as part of the work completed by Dr. Broders; these are both Yellow listed in Nova Scotia. Bat activity recorded at the Project site was strictly related to the *Myotis* spp. as it is typical of many bat studies completed in Nova Scotia. Impact assessment and follow up measures related to bats are discussed in Section 6.

Table 4.4 Potential for Species at Risk

Scientific Name	Common Name	Taxonomy Group	Federal Status (COSEWIC)	Provincial Status	Number of Observations; Distance (km)	Typical Species Habitat	Potential of Presence at or near Project works
Myotis lucifugus	Little Brown Myotis	Animal	Endangered	Endangered	37; 21.5±0.5	Found roosting in man-made structures, trees, under rocks and sometimes in caves.	Low
Myotis septentrionalis	Northern Long-eared Myotis	Animal	Endangered	Endangered	5; 31.1±0.2	Roost individually in caves, buildings or trees.	Low
Charadrius melodus	Piping Plover	Animal	Endangered	Endangered	435; 8.2±7.07	Nest above the normal high-water mark on exposed sandy or gravel beaches.	Low
Sterna dougallii	Roseate Tern	Animal	Endangered	Endangered	70; 11.5±0.2	Islands off Atlantic Coast, specifically Brothers Islands, Grassy Island, and the Country Island complex.	Low
Calidris canutus rufa	Red Knot	Animal	Endangered	Endangered	266; 9.2±0.5	Migratory stopovers and wintering grounds are vast coastal zones such as sandflats; nest in Arctic.	Very Low

Caprimulgus vociferous	Whip-Poor-Will	Animal	Threatened	Threatened	10; 10.5±7.07	Brown leaf litter in open forest settings provide ideal breeding and roosting grounds.	Low
Glyptemus insculpta	Wood Turtle	Animal	Threatened	Threatened	132; 5.0±2.35	Moderately moving rivers with sandy soils and along nearby roadbeds.	Moderate
Chaetura pelagica	Chimney Swift	Animal	Threatened	Threatened	140; 10.4±0.15	Generally airborne, when it lands it clings to the inside of chimneys, hollow trees or caves,	Low
Hirundo rustica	Barn Swallow	Animal	Threatened	Endangered	632; 3.7±7.07	Open areas such as fields and water, close to man-made structures where they nest.	Low
Wilsonia Canadensis	Canada Warbler	Animal	Threatened	Endangered	530; 3.7±7.07	Nests in riparian thickets, forest bogs, bushy ravines; any moist thickets.	Low
Chordeiles minor	Common Nighthawk	Animal	Threatened	Threatened	337; 3.7±0.05	Open habitats where the ground is free from vegetation (i.e. rocky outcrops)	Moderate
Contopus cooperi	Olive-sided Flycatcher	Animal	Threatened	Threatened	527; 6.8±0.05	Openings in rivers, swamps and ponds;	Low

						favour clear, open areas.	
Dolichonyx oryzivorus	Bobolink	Animal	Threatened	Vulnerable	281; 8.2±7.07	Open grasslands and hayfields.	Low
Histrionicus histrionicus	Harlequin Duck	Animal	Special Concern	Endangered	24; 43.0±2.15	Wintering in Nova Scotia and offshore islands, headlands and rocky coastlines.	Very Low
Euphagus carolinus	Rusty Blackbird	Animal	Special Concern	Endangered	200; 10.5±7.07	Prefer wet areas such as bogs, swamps, pond edges and flooded woods.	Moderate
Chelydra serpentina	Snapping Turtle	Animal	Special Concern	Vulnerable	77; 8.2±10.0	Shallow freshwater marshes, slow-moving streams and shallows of lakes and ponds.	Low
Falco peregrinus	Peregrine Falcon	Animal	Special Concern	Vulnerable	28; 13.3±0.15	Nest above steep cliff ledges over open waters.	Very Low
Lynx Canadensis	Canadian Lynx	Animal	Not at Risk	Endangered	2; 95.5±1.0	Moist boreal forests that can support mass amounts of small prey.	Very Low
Alces americanus	Moose	Animal	Not Listed	Endangered	14; 30.1±0.5	Mixed wood forests with wetlands; typically in higher elevations.	Low
Erioderma pedicellatum	Boreal Felt Lichen	Lichen	Endangered	Endangered	334; 13.4±0.5	Northerly exposed forest slopes in mature forest sites that are also rich in	Low

						moisture-loving species, such as sphagnum mosses and Cinnamon Fern.	
Degelia plumbea	Blue Felt Lichen	Lichen	Special Concern	Vulnerable	36; 6.3±0.01	High humid forests, usually around swampy areas and damp valleys.	Very Low
Lilaeopsis chinensis	Eastern Lilaeopsis	Plant	Special concern	Vulnerable	134; 95.5±0.01	Semi-aquatic plant found in the intertidal zone.	Very Low
Isoetes prototypus	Prototype Quillwort	Plant	Special Concern	Vulnerable	13; 91.2±0.05	Fully submerged aquatic perennial of small, nutrient poor, usually cold spring-fed lakes.	Very Low
Thuja occidentalis	Eastern White Cedar	Plant	Not Listed	Vulnerable	9; 18.7±7.07	Located along western Nova Scotia in riparian areas near streams and wetlands.	Low
Potamogeton pulcher	Spotted Pondweed	Plant	Not Listed	Vulnerable	8; 54.4±2.5	Freshwater aquatic plant thriving in highly acidic, nutrient poor wetlands.	Low
Fraxinus nigra	Black Ash	Plant	Not Listed	Threatened	68; 19.6±0.01	Typically grows in bogs, along streams or poorly drained areas.	Very Low

## **Reptiles**

In terms of the Wood Turtle, ACCDC reports suggest they are known to occur within 5km of the Project site. No incidental observations of the Wood Turtle were recorded during any of the field surveys completed at the Project site. Impact assessment and mitigative measures related to Wood Turtles are discussed in Section 6.

## **4.2. Socio-Economic**

### **4.2.1. Community**

The community of Porters Lake, and neighboring Lake Echo, are part of Halifax Regional Municipality, District 2. The residents of Porters Lake and Lake Echo each surround their respective lake, with small subdivisions scattered throughout each community. The community of Porters Lake is located approximately 3km northeast of the Project site; northwest of the Project site is Lake Echo is the closest community, approximately 2.5km, and most populous community to the PLWF. A community meeting was hosted at the Lake Echo Community Center as discussed in Section 5.1.

There are approximately 7000 residents in the communities of Porters Lake and Lake Echo, of which no resident is located within 1km of a WTG that satisfies setback requirements implemented by HRM to mitigate socio-economic concerns. As noted above, zero dwellings are located within 1km of site, 31 dwellings located within 1.5km, and 134 dwellings within 2km, most of which are separated by roadways. An elementary school is located approximately 2.5km northeast of the Project site, in Porters Lake. Community consultation is discussed in Section 5.1.

The Project site is located on Crown Land with Highway 7 to the north and Highway 107 to the south.

### **4.2.2. Cultural Resources, Heritage Sites and Archaeological Sites**

Strum Consulting (Strum) was retained to perform the Archaeological Screening and Reconnaissance for the PLWF. Strum, in association with Boreas Heritage Consulting Inc. (BHCI), was issued a Heritage Research Permit A2014NS067 by the Special Places Program (SPP). Field reconnaissance was conducted on the site on the 5<sup>th</sup> of August, 2014. Results of the desktop and field work concluded that there is a low risk for the PLWF and its Project components to impact archaeological resources. Strum made the recommendation to halt work if archaeological resources or human remains are encountered within the PLWF study area and make immediate contact with the Coordinator of Special Places, Communities Culture and Heritage, Sean Weseloh McKeane. Refer to Appendix 7 for the Strum report.

### **4.2.3. Aboriginal Uses and Resources**

The Project is located 14km northeast of IR30 Cole Harbour, a satellite community of Millbrook First Nation, and 35km east of IR14A Wallace Hills, a satellite community of Shubenacadie First Nation (Sipekne'katik Band), and approximately 40km from the main community of Sipekne'katik. The Proponent has informed various First Nation groups of Project specifics, including: Kwilmu'kw Maw-klusuaqn (KMK), Sipekne'katik Band and Millbrook First Nation. The Proponent has also exchanged information with the Office of Aboriginal Affairs (OAA) on several different occasions. Refer to section 5.2 for detailed communication references.

Strum performed desktop research and analysis into the potential for Pre-contact and historic Native archaeological resources, as well as historic Euro-Canadian archaeological resources within the boundaries of the PLWF site. Based on the various components of the background study including environmental setting, Native land use, property history and archaeological potential, the vicinity of the study area is considered to exhibit low potential for encountering Pre-contact and/or historic archaeological resources.

Grand Lake, located approximately 2km southeast of the Project site, and the watercourses connecting Grand Lake to the Atlantic Ocean would have been an important transportation route facilitating travel inland and also support fish harvesting. Yet, the PLWF site area is not connected to Grand Lake by navigable waters nor by fish-bearing streams; therefore, the area would have been a less suitable location for Mi'kmaq settlement.

### **4.2.4. Sound**

The Project site is located in rural HRM between two recognized highways, Highway 7 to the north and Highway 107 to the south. The WTGs at the PLWF are subject to the 1000m setback imposed under HRMs Land Use Bylaw, designed to mitigate environmental concerns such as sound. With this setback, many of the dwellings closest to the PLWF are separated by one of the roadways. Noise pollution from motor vehicle use in the area is evident at the Project site, especially during peak traffic hours of the morning and late afternoon.

NSE requires that predicted noise levels do not exceed 40dBA at any dwelling. Noise propagation from WTGs is influenced by vegetative cover, atmospheric conditions, local topography and propagation distance (Haugen, 2011). Strum conservatively modelled the potential noise levels emitting from the WTGs taking into account these variables and determined noise levels are not expected to exceed NSE guidelines at any existing receptor. Strum's report can be found in Appendix 13.

### **4.2.5. Radio and Radar Communication**

The Proponent has contacted all mandatory stakeholders listed in the guidance document prepared by the Canadian Wind Energy Association (CanWEA) and the Radio Advisory Board of Canada (RABC) (CanWEA, 2007). Positive responses have been received from all agencies who replied to

date. The Proponent will continue to engage with appropriate radio-communication, radar and aviation operators throughout the duration of the development, construction and operation of the PLWF. Approvals and communication with mandatory agencies can be found in Appendix 2.

#### **4.2.6. Ambient Light**

Existing ambient light levels in the Project area have not been monitored by the Proponent; however, predicted impacts associated with rotating WTG blades have been analyzed by Strum, an independent consultant, using industry standard modelling software. Strum studied the worst case scenario leading to potential impact of shadows cast by WTG blades at identified receptors within a 2km radius of either WTG. The report can be found in Appendix 13 and concludes that shadow flicker levels are not expected to exceed NSE guidelines.

Studies on aeronautical transportation and clearance have been completed prior to environmental assessment submission. The two WTG will be required by Transport Canada to have aeronautical lighting as per Standard 621.

#### **4.2.7. Visual**

The Project site is located in a zone greatly impacted by the Porters Lake Fire of 2008. The visual aesthetics of the present day site encompasses charred trees and stumps remaining from pre-2008 wood harvesting. Granite outcrops and building-sized boulders appear as pillars randomly spread across the landscape. There is a cell tower standing near the entrance of the site, and access will be shared between the tower and the PLWF. The Project site is also centered between two roadways, one being a 100-series highway.

Three separate vantage points were selected to develop representative images of the PLWF site and results can be found in Sturm's report in Appendix 14. The vantage points were selected in an attempt to demonstrate the greatest visual impact the PLWF WTGs will have to humans living, or commuting in the area.

#### **4.2.8. Recreation**

Regional recreational activities exist in the area, such as fishing in the Porters Lake and Grand Lake areas, hiking, swimming and other outdoor pursuits. In specific, the Project site is a rough terrain with granite outcrops and wet lowland areas resulting in less than optimal conditions for many human activities. In addition to this, the area has previously been subject to wood harvesting prior to the large forest fire that swept through the area.

The property under option does not have trails constructed for the use of all-terrain vehicles or snow mobiles, nor does the terrain support these activities. Public walking trails are also nonexistent within or near the Project boundary.

#### **4.2.9. Economic Development**

Halifax Regional Municipality is a growing economic community in Nova Scotia and forecasts a bold and vibrant economic future. HRMs Economic Strategy (2014) is focused on five goals to sustain HRM as an economic engine in the region:

- build a vibrant and attractive Regional Center;
- promote a business climate that drives and sustains growth;
- create a welcoming climate for new talent to showcase and open great opportunity;
- create a unique, international city brand; and
- maximize growth opportunities.

According to Statistics Canada (2011), Halifax Regional Municipality had a population of 390,096 in 2011, a percent change of 4.7% from 2006. Nova Scotia's average yearly income per resident is approximately \$42,700, 13.6% lower than the Canadian average of \$48,517. Of the working age population in Nova Scotia, 8.6% are unemployed.

## 5. Consultation

### 5.1. Community

On July 18, 2013, the Proponent engaged the communities of Lake Echo, Porters Lake and surrounding areas. The meeting were facilitated by the Proponent in Lake Echo at the Lake Echo Community Center, which is located approximately 3 km northwest of the Project site. The meeting was advertised via individual mailouts to landowners within 2km of the Project. 795 mailouts in total were delivered to the residents nearest to the PLWF, whom the Proponent believes were well informed of the July 18<sup>th</sup> community meeting.

During the July 18<sup>th</sup> information session, the Proponent provided preliminary Project information explaining the proposed location of the PLWF, the COMFIT program and opportunities for local ownership and investment. The floor was opened to comments and questions on each topic were discussed. The community information session was an opportunity for members of Porters Lake, Lake Echo and surrounding areas to share their thought and concerns with the Proponent.

Of the 795 mailouts sent, approximately 15 people were in attendance for the July 18<sup>th</sup> meeting. A large map (i.e. 32 inch by 48 inch) was displayed by the Proponent at the community meeting for the local residents to view the proposed turbine locations, municipal setbacks and relative locations of their houses and properties from the Project. Proponent contact information was provided for the attendees of the meeting and a sign-in sheet was used to collect attendee contact information.

Viability of WTG technology, decreased property value and noise levels were the main concerns discussed at the July 18<sup>th</sup> meeting. The Proponent identified and addressed each concern separately. WTG technology has greatly improved in recent years and WTG suitability for the site will be determined following the completion of a wind resource assessment, using data collected from the MET tower erected on site. Also, sound levels of WTGs were addressed by the Proponent through past experience in developing wind farms. Setbacks in place by HRM, the largest in Nova Scotia, were noted by the Proponent and following an independent noise study (Strum, Appendix 13), sound levels are expected to be well below NSE accepted guidelines.

An informative community mailout was sent to the nearest residents (795 residents located within a 2km radius) on November 19, 2014 to update on the progress of the Project, specifically the desktop studies and fieldwork associated with the completion of an EA. The mailout also contained notification of the Porters Lake EA registration in early December, as well as advanced notice for the next community information session, scheduled for January, 2015.

The Proponent is committed to continuing to engage the residents of the Porters Lake – Lake Echo area, and will do so through specified mailouts and via the Proponent webpage (<http://wattswind.com/portfolio/porters-lake/>), in conjunction with further community meetings.

The Proponent is committed to open and transparent communication with residents and stakeholders affected by the operation of the PLWF. The possibility of forming a community liaison committee (CLC) was suggested by the Proponent at the most recent community meeting. Residents were encouraged to contact the Proponent if there is interest in forming a CLC. A CLC will be formed if sufficient interest exists in the community.

Community engagement, including meetings, mailouts and use of the website, will continue as the Project proceeds. The Proponent has scheduled another meeting in January, 2015 following the holiday season and included this information in the most recent community mailout. Refer to Appendix 11 for supporting materials of the community consultation details to date.

## 5.2. Aboriginal Peoples

The Proponent has engaged and continues to engage various aboriginal stakeholders in Nova Scotia including; KMK, Sipekne'katik First Nation, Millbrook First Nation and the OAA. Table 5.1 outlines communications and meetings that were held between the Proponent and various First Nation representatives.

Table 5.1 Summary of Aboriginal Engagement Activities

First Nation Entry	Date	Action	Attendees	Meeting Topic	Location
Kwilmu'kw Maw-klusuaqn (KMK)	Wednesday January 18 <sup>th</sup> , 2012	Informational letter and documentation	Addressed to Eric Christmas; Twila Gaudet	Initial Project information	N/A
Kwilmu'kw Maw-klusuaqn (KMK)	Wednesday June 4 <sup>th</sup> , 2014	Initial contact	Twila Gaudet	Request for meeting to discuss COMFIT projects	N/A
Office of Aboriginal Affairs (OAA)	Wednesday August 20 <sup>th</sup> , 2014	Supply Project Description	Beata Dera	Discuss COMFIT projects, supply PLWF Project description, request meeting	N/A
Sipekne'katik First Nation	Friday August 22 <sup>nd</sup> , 2014	Informational letter and documentation sent to Band Chief	Addressed to Chief Rufus Copage	See Appendix 12	N/A
Kwilmu'kw	Wednesday	Follow-up to	Twila Gaudet	Provided COMFIT	N/A

Maw-klusuaqn (KMK)	September 10 <sup>th</sup> , 2014	June 4 <sup>th</sup> email		project details; request for meeting	
Office of Aboriginal Affairs (OAA)	Wednesday October 8 <sup>th</sup> , 2014	Formal Meeting	Beata Dera, David Mitchell, Helen Yeh	Review of Project and engagement completed to date.	OAA Offices
Kwilmu'kw Maw-klusuaqn (KMK)	Thursday October 23 <sup>rd</sup> , 2014	Update on EA progress	Twila Gaudet	EA update; offer to meet and offer to provide Project Description	N/A
Sipekne'katik First Nation	Thursday October 23 <sup>rd</sup> , 2014	Answered questions and provided Project Description document	Addressed to Jennifer Copage (Sipekne'katik Consultation Coordinator)	Update on Project to date; questions on whether EA will be completed	N/A
Millbrook First Nation	Thursday November 13 <sup>th</sup> , 2014	Informational letter and documentation sent to Band Chief	Addressed to Chief Bob Gloade	See Appendix 12	N/A

As noted in Table 5.1 above, engagement with Shubenacadie First Nation (specifically Sipekne'katik) has been productive and ongoing. In a letter from Chief Rufus Copage, Sipekne'katik displayed interest in the process and asked whether the Project warranted an Environmental Assessment as part of the approval process. Information was shared with regard to past gathering of fish resources from Lake Echo and Grand Lake, as well as the river connecting Grand Lake and Porters Lake. Also, the Proponent's offer to meet was accepted. A follow up email was sent to Jennifer Copage, Sipekne'katik Consultation Coordinator, containing a seven page project description of the Project, as well as extending the offer to meet at their convenience. If questions pertaining to the project description arose, Jennifer noted she would be in touch. No additional concerns have been discussed.

### 5.3. Regulatory

The Proponent has consulted with numerous Municipal, Provincial and Federal representatives regarding the proposed PLWF. Consultations to date and future plans are described in the following sections.

### 5.3.1. Municipal Consultation

On January 23, 2012, the Proponent received a letter from Mr. Paul A. Kent, CEO and President of the Greater Halifax Partnership, supporting Watts Wind Energy's Porters Lake Wind Project. Mr. Kent recognized the importance of projects such as the PLWF with the potential to inject economic growth, local employment opportunity and generate tax revenue for the Greater Halifax region.

On numerous occasions, the Proponent has conversed with a development officer in HRM's Planning Districts 8 & 9 to discuss the PLWF. The discussions focused on the Land Use By-laws governing the installation of a single meteorological tower and also the wind turbines, combined in full as a wind energy facility. Through this process a development permit was obtained with conditions to meet for the permit to remain valid.

The Proponent will continue to engage the Municipality as appropriate as the Project progresses.

### 5.3.2. Provincial Consultation

The Proponent has met with various Provincial regulators regarding the development and construction of the PLWF project. The Proponent has either met or corresponded with NSDOE, NSE, OAA and NSDNR. These interactions have assisted the Proponent in scoping the EA, including defining the appropriate field work and consultation activities, and in Project planning and design.

A summary of significant contact with Provincial regulators can be found in Table 5.2 below.

Table 5.2 Significant Contact with Provincial Regulators

<b>Date</b>	<b>Attendees</b>	<b>Method of Contact</b>	<b>Topic of Conversation</b>
June 19, 2014	Mark Elderkin (NSDNR)	Email	Timing of rare plant surveys
August 20, 2014	Beata Dera (OAA)	Email	COMFIT projects update, request for meeting
August 20, 2014	Mark Elderkin (NSDNR)	Email	COMFIT projects update, request for meeting
September 10, 2014	Beata Dera (OAA)	Email	Project Description provided, meeting time discussed
September 18, 2014	Beata Dera (OAA), David Mitchell (OAA), Helen Yeh (NSE EA)	Meeting at OAA Offices	COMFIT projects, First Nation engagement
September 26, 2014	David Mitchell (OAA)	Email	Information regarding

			First Nation satellite communities
October 8, 2014	Mark Elderkin (NSDNR), Bridget Tutty (NSE)	Meeting at NSE Offices	Discussion on WTG siting, avian and wetland studies
November 17, 2014	Mark Elderkin (NSDNR), Bridget Tutty (NSE), Jason Dauphinee-Muise (NSE)	Email	Pre-EA submission on WTG siting update, wetland mitigation

The Proponent will continue to engage Provincial regulators throughout the development, construction and operation of the PLWF.

### 5.3.3. Federal Consultation

The Proponent has consulted with various Federal entities regarding the construction of the PLWF. Canadian Coast Guard, NAV Canada, Transport Canada and DND were all contacted regarding the development of the PLWF. Environment Canada (via CWS) will be contacted as appropriate prior to Project construction. Like their Provincial counterparts, these have assisted in the preparation of this EA and Project planning and design.

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

## 6. Analysis

### 6.1. Interaction of the Project and the Environment

Identifying those VECs and socio-economic aspects that may be subject to environmental effect from Project activities is the keystone of the EA process. Following the presentation of the Project activities as described in Section 2, the environmental and socio-economic setting in Section 4, and the review of issues arising from consultation as per Section 5, the interaction of the project activities with the VECs can be completed.

This interaction matrix is presented in Table 6.1. This graphically shows the potential interaction between Project activities and each biophysical VEC or socio-economic aspect.

Accordingly, seventeen VECs and socio-economic aspects have been identified as potentially being affected by the proposed Project. These interactions are presented in the following sub-sections in terms of potential environmental effects of Project activities including accidents and malfunctions, as well as proposed mitigations, cumulative effects, and finally the level of significance of residual effects. This assessment is completed in accordance with the methodology presented in Section 3.

### 6.2. Assessment of Physical VECs

#### 6.2.1. Ground and Surface Water

Maintenance of ground and surface water regimes is important to support ecological systems. It is also directly related to human health if the groundwater was to be effected as some residents in the local area have private wells. The ground and surface water interface on the site shows predominantly in the wetland features encountered during field surveys that are linear in shape and formed in exposed bedrock ridges that traverse the site. Accordingly, quality and quantity of both ground and surface water have been identified as a VEC.

The flow is generally in the south eastern direction toward culverts which convey surface water down the catchment area toward Grand Lake, which is about 1.5km downgradient. As shown on Figure 4.3, the surface water pathway is from the Project site to Grand Lake through a culvert under Highway 107 and via tributaries flowing to Long Pond. Forked Pond does not receive surface water flow from the proposed Project footprint.

The closest residential wells are greater than 1000m from the nearest proposed turbine and about 300m from the proposed access road upgrade off of Highway 7.

A significant environmental effect would result if a substantive change attributable to the Project could be identified in water quality or quantity in tributaries that lead to Grand Lake, or in groundwater immediate to the site, including the residential wells along Highway 7 to the west of the proposed access road.



Table 6.1 Potential Linkages of Project and the Environment

	Site Preparation and Construction								Operation & Maintenance			Decommissioning		
	Cleaning and Grubbing	Access Road and Laydown Area	Turbine Foundation	Power Pole and Line & U/G Electrical	Crane Pad Construction	Turbine Installation	Site Restoration & Commissioning	Accidents and Malfunctions	Turbine Operation	Inspection and Maintenance	Accidents and Malfunctions	Infrastructure Demolition	Site Reclamation	Accidents and Malfunctions
<b>Physical Components</b>														
Ground and surface water	•	•	•	•			•	•			•	•	•	•
Radar and radio signals									•					
Ambient noise	•	•	•	•	•		•		•			•	•	
Ambient light						•			•					
<b>Ecological Components</b>														
Wetlands and watercourses	•	•	•	•			•	•			•			•
Fish habitat							•			•				•
Migratory and breeding birds	•	•							•					
Flora and fauna	•	•										•		
Species at risk & of concern	•	•							•					
<b>Socio-economic Aspects</b>														
Land use	•								•				•	
Aboriginal resources / uses	•	•	•	•										
Archaeological resource	•	•	•	•										
Recreation	•								•				•	
Vehicular traffic			•			•				•				
Landscape aesthetics	•					•			•					
Health and safety							•	•		•				•
Local economy	•	•	•	•	•	•	•		•	•		•	•	

- *Boundaries* – Spatial bounds include the local area, i.e., watercourses within the Project site and down gradient toward Grand Lake, as well as groundwater local to the site. The temporal boundary focuses on Project construction but includes all phases of the Project with respect to unplanned releases.
- *Potential Project Impacts* – Pathways that may adversely affect surface quality include disturbance of sediments during the construction of the WTGs, the access road and the utility line, and potential for accidental release of hazardous materials such as fuels, oils and lubricants during all phases of the Project. The Project site is not in an area of acid generating bedrock.
- *Proposed Mitigative Measures* – Related to erosion and sedimentation, these mitigations include:
  - Prepare an erosion and sedimentation control plan as part of detailed engineering design including diverting clean water off site;
  - Define specific Environmental Construction Plan (ECP) for the wetland alterations including handling of surface water and sediment and erosion control (see Section 6.3.1);
  - Install and maintain temporary erosion control measures as per plan, e.g., sediment fences, rock check dam, mulch, etc., prior to grubbing;
  - Responsible storage and handling of excavated materials to avoid erosion;
  - Define limits of work associated with construction activities to minimize Project footprint;
  - Install appropriately sized culverts installed where access roads cross wetlands to ensure minimal effect on local hydrology (all work in wetlands in accordance with NSE approvals under *Activity Designation Regulations* (see Section 6.3.1);
  - Grade and stabilize the access road and WTG pads to maintain existing hydrology and minimize total suspended solids in run off;
  - Both during construction and prior to site stabilization, complete visual monitoring to ensure that any resulting turbidity due to suspended solids in surface waters draining from construction is minimal and to provide feedback into sediment and erosion control mechanisms upstream;
  - Timely re-vegetation of disturbed areas after construction;
  - Removal of temporary erosion control measures once the surfaces are stabilized; and
  - Compliance with the project-specific EPP and pertinent legislation.

In term of potential blasting, the Proponent will:

- abide by the Blasting Safety Regulations of Nova Scotia and the HRM Blasting Bylaw B-600.

Related to accidental release, these mitigations include:

- All hazardous materials to be used at the site will be labeled and contained according to applicable regulations;
  - No hazardous materials will be stored within 50m of a wetland or watercourse;
  - Frequent inspection and maintenance of equipment will be undertaken to identify and repair any fuel leaks;
  - Used oil, filters and other products associated with equipment maintenance shall be collected and disposed of in accordance with regulatory requirements; and
  - Spills shall be immediately reported as per legislation and as identified in the EPP.
- *Cumulative Effects* – There is land development (rural residential) in the general watershed of the Project site. Given the scale of this activity relative to the small scale of this construction and proposed mitigative measures, it is very unlikely that a significant adverse residual environmental effect on surface water and ground water would result from these activities acting cumulatively.
  - *Significance of Residual Effects* – Erosion and sedimentation, if they occur, will be temporary, since all areas to be disturbed by construction will be stabilized both during and after construction. The likelihood of an accident or malfunction resulting in a release is quite low; should it occur, the volume is anticipated to be very small, i.e., below reportable levels. Should blasting occur, the point of blast is not expected to be within 800m of a residential well.

The Project is not anticipated to have a significant residual environmental effect on the local ground and surface water. While any effect will be negative, it will be small in magnitude, reversible, short duration, and local. The environmental effect on ground and surface water is predicted to be negligible.

### **6.2.2. Radar and Radio Signals**

Radar and radio signals are important in terms of communication and safety of navigation. Radio communication systems include cellular networks and point-to-point systems. Radar systems are used for several purposes including, but not limited to, weather prediction, Canadian Air Defence System, and air traffic control systems. Accordingly, maintenance of radio and radar communications has been identified as a VEC.

A significant environmental effect would result if a substantive interference attributable to the Project could be identified in radar and radio communication.

- *Boundaries* – Spatial bounds consist of the local area, i.e., potential area of influence of the WTGs to interfere with communications. The temporal boundary is Project operation.

- *Potential Project Impacts* – Pathways that may adversely affect radar and radio communications are limited to interference from WTG operation. Consultation was completed as recommended within the document, *Technical Information and Guidelines on the Assessment of the Potential Impact of Wind Turbines on Radio Communication, Radar and Seismoacoustic Systems* (CanWEA, 2007). Responses from the Coast Guard, Department of National Defence, Environment Canada, Transport Canada and NAV Canada have not found any concerns associated with interference given the size and location of the Project (see Appendix 2).
- *Proposed Mitigative Measures* – No noticeable effect is predicted on radio and radar. Accordingly, no specific mitigations are recommended. Should the locations of the WTGs change, the new coordinates will be sent to the appropriate authorities for evaluation. Also the Proponent will continue to update the agencies as per their specific requests, e.g., NAV Canada.
- *Cumulative Effects* – As no effect is predicted, by definition, there cannot be other activities acting cumulatively.
- *Significance of Residual Effects* – Interference with radar and radio systems is not expected to occur.

The Project is anticipated to have no environmental effect on communications via interference with radar or radio signals.

### **6.2.3. Ambient Noise**

Sound pressure is perceived via the vibrations transferred to the receptor in air or another medium. Sound pressure level (SPL) is measured on the decibel scale which is logarithmic. Values are often presented as A-weighted decibel to adjust for human perception, i.e., dBA.

The SPLs decrease with distance from source; however, this attenuation is a function of many factors including:

- climatic conditions, such as humidity, wind speed and direction, and temperature;
- frequency, where lower frequency sounds have less attenuation over distance;
- building materials which reduce interior SPLs, though this attenuation is less for lower frequency sounds;
- ground characteristics, where hard ground reflects sound and ground cover absorbs sound; and
- terrain, where features may obstruct sound.

Noise is by definition unwanted sound. Perception of noise by a receptor is a function of many factors, including attitude toward to source of the sound. If a sound is a reminder of an unwanted

activity or development, the perception of that sound will be influenced accordingly. Further, ambient sound levels at the Project site and nearby residential properties are expected to be moderately low in keeping with the rural character of the area but considering the nearby highways. Accordingly, ambient noise has been identified as a VEC.

There are no dwellings or other sensitive receptors within 1100m of the two proposed wind turbines; within 2000m, there 134 receptors as per 4.2.1. As shown in Appendix 13, conservative modeling was completed for the two operating WTGs using industry standards (i.e., ISO 9613-2). Model assumptions included turbine model (i.e., GE 1.6-82.5), wind speed where this WTG model emits the highest SPL output (i.e., 10 m/s), climatic conditions (10°C and 70% humidity), ground cover (using a conservative estimate of 0.5) and topography data. While the specific WTG model has not been selected for the PLWF, this model represents the largest SPL of models considered. The other model inputs, e.g., ground cover factor, climatic conditions, etc., also represent conservative assumptions.

The model results show that with these conservative inputs, the SPL does not reach 40 dBA at any receptor (see Drawing 1, Appendix 13). The highest predicted SPL from the operation of PLWF is 35.5 dBA at the closest receptor. While not included in the consultant's report, the model was also run using a value of '0' as the ground cover factor while keeping all other assumptions the same; the resulting SPL at the closest receptor was still below 40 dBA.

A significant environmental effect would result if a substantive change in SPL attributable to the Project could be identified at the nearby residential dwellings. A guideline 40dBA for the additional SPL at the outside of residential dwellings is widely adopted and has been shown as protective of human sleep based on literature review; this maximum SPL of 40 dBA based on modeling of wind turbine operation has been adopted by Nova Scotia. Hence a predicted SPL from Project activities that is over 40dBA at residential dwellings would be considered a substantive change.

- *Boundaries* – The spatial boundary is the local area, i.e., neighbouring properties within 2km radius. The temporal boundary is all Project activities with focus on operational phase.
- *Potential Project Impacts* – Pathways that may adversely affect ambient noise levels include sound pressure that will be generated during site preparation and construction, as well as decommissioning activities, i.e., trucks, equipment. There is also a potential for blasting during construction if required to construct the WTG foundations. As distance from the site increases, noise levels will be attenuated. Nevertheless noise from construction activities may be heard by the nearby residents; certainly vibrations from blasting will be observed by nearby residents should blasting occur. Construction noise may also temporarily disrupt the short term activities of fauna and birds at or in the vicinity of the Project site. In summary, noise resulting from construction activities may cause some temporary inconvenience.

During operation, sound pressure is emitted from the nacelle, i.e., the hub of the turbine, as well as the spinning blades. In order to predict the resulting sound pressure at the nearby residences, a prediction of sound was completed as presented in Appendix 13 and summarized above for the 2 WTGs. Using conservative assumptions for the operating WTGs, the predicted attenuation of SPLs at nearby residences are well below the 40dBA.

- *Proposed Mitigative Measures* – Related to effect on ambient noise levels during construction, the mitigations include:
  - Adherence to EPP related to timing of construction activities in daytime hours wherever possible to minimize nuisance to nearby properties;
  - Communication of construction plan with nearby residents in terms of construction activities and schedule, as well as contact information should residents have concerns;
  - Preparation of a blasting plan and notification system in the event that blasting is required to build WTG foundations; and
  - Maintenance of construction equipment and vehicles to reduce noise emissions.

Related to WTG operation, the mitigations include:

- As already completed, siting of WTGs includes the minimum separation distances as per Municipal bylaw which can be conservatively shown to have SPLs resulting from WTGs is under 40dBA;
  - Ongoing consultation with community including nearby residences on Project as a whole, as well as sharing contact information should residents have concerns; and
  - As per the EPP, a conflict resolution plan will be in place should nearby residents have concerns about ambient noise levels.
- *Cumulative Effects* – There are existing roadways in the vicinity of the site which creates some baseline sound as described in 4.2.4; this is primarily during peak traffic hours. Within 25km of the site, there is a small wind energy project, as described in Section 2.10, which is too far to act cumulatively. Given relative scale of the Project and existing setbacks, it is very unlikely that these activities might act cumulatively to increase the likelihood of a significant adverse environmental effect on ambient noise levels in the local area, especially during nighttime hours.
  - *Significance of Residual Effects* – Annoyance caused by noise during construction, if it occurs, will be temporary and short term. Concerns of residents over noise during Project operation is expected to be minor, if it occurs, based on predicted SPL levels well below 40dBA at residences and the Proponent's early and ongoing Project consultation.

The Project is not anticipated to have a significant residual environmental effect on the ambient noise levels. While any effect will be negative, it will be small in magnitude, reversible, and local;

however, relative to the operating WTGs, any effect will be long in duration, i.e., operational Project phase. The environmental effect on ambient noise is predicted to be minor.

#### **6.2.4. Ambient Light**

Ambient light levels at the Project site and nearby residential properties are expected to be fairly low during nighttime hours in keeping with the rural character of the area. For aviation safety, the WTGs have to be marked in accordance with Standard 621 under the Canadian Aviation Regulations. When wind turbine blades rotate in front of a low-level sun, shadows may be created which alter with flickering light. The impact depends on specifics of the site, including location of receptors (distance and direction) relative to WTGs and the height and angle relationship (i.e., geometric). Accordingly, the ambient lighting condition has been identified as a VEC.

As described in Section 4.2.6 and as shown in Appendix 13, shadow flicker was modeled using conservative inputs, such as constant sunshine during daylight hours and WTGs as always operational. The boundary was mapped of the maximum exposure guideline for 30 minutes per day and 30 hours per year. This boundary is well distant from the nearby residences even with the conservative assumptions used in the model. As shown in Drawing 2 in Appendix 13, the receptors are well within the guidelines adopted by Nova Scotia; indeed all receptors were well under 10 hours per year of shadow flicker.

A significant environmental effect would result if a substantive change in ambient lighting attributable to the Project could be identified at the nearby residential dwellings, if shadow flicker exceeded Nova Scotian guidelines or if an appreciable change could be noted in migratory birds' flight patterns due to Project lighting.

- *Boundaries* – The assessment is within the local area, i.e., 2 km radius, as well as the area of influence for migratory birds and wildlife due to effect of lighting. The temporal boundary is all Project activities with focus on operation.
- *Potential Project Impacts* – Pathways that may adversely affect ambient light levels include lighting from and for equipment and vehicles during site preparation and construction, as well as decommissioning activities. Light from construction activities may be observed by the nearby residents and may cause some temporary, short term inconvenience.

During operation, lighting of the WTGs is required for aviation safety as regulated by Transport Canada. This has the ability to affect migratory birds, other wildlife and be observed by nearby residents; however, WTGs are lit only to extent required for aviation safety. Shadow flicker is a potential outcome at nearby receptors during certain conditions; however, maximum exposure is well under the guidelines as per modeling shown in Appendix 13.

- *Proposed Mitigative Measures* – Related to effect on ambient light levels during construction, the mitigations include:
  - Adherence to EPP related to timing of construction activities in daytime hours wherever possible to minimize nuisance of lighting at night to nearby properties;
  - Use of only necessary lighting to support construction activities; and
  - Communication of construction plan with nearby residents in terms of types of construction activities and schedule, as well as sharing contact information should residents have concerns.

Related to WTG operation, the mitigations include:

- As already completed, siting of WTGs beyond separation distances as per Municipal bylaws will minimize visibility of aviation WTG lighting by nearby residents;
  - Potential effects of shadow flicker have been considered as part of the Project siting, hence the predicted effects are within guidelines and no specific mitigation in operation is required;
  - Ongoing consultation with community including nearby residences on the Project as a whole, as well as sharing contact information should residents have concerns;
  - Consideration of lighting approaches that meet Transport Canada requirements but also minimize potential to impact nearby residents, birds or wildlife will be undertaken as part of WTG specification, including use of a LED based technology; and
  - As per the EPP, turbine lighting plan will be prepared in consultation with CWS and Transport Canada.
- *Cumulative Effects* – There are existing roadways in the vicinity of the site which creates some baseline ambient lighting. Within 25km of the site, there is a small wind energy project, as described in Section 2.10, which is too far to act cumulatively. Given relative scale of the Project or distance from the Project, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on ambient light levels in the local area.
  - *Significance of Residual Effects* – Annoyance caused by lighting during construction, if it occurs, will be temporary and short term. Concerns of residents over lighting and shadow flicker during Project operation is expected to be limited, if it occurs.

The Project is not anticipated to have a significant residual environmental effect on the ambient light levels. While any effect will be negative, it will be very small in magnitude, reversible, and local. Relative to construction, any effect is short term; however, relative to the operating WTGs, any effect will be long in duration, i.e., operational Project phase. The environmental effect on ambient lighting is predicted to be negligible.

## 6.3. Assessment of Ecological VECs

### 6.3.1. Wetlands and Watercourses

Maintaining ground and surface water quality and quantity was analyzed in Section 6.2.1; the residual environmental effect was predicted to be negligible in terms of potential releases of sediment and hazardous materials or changes to local hydrology. While maintaining ground and surface water quality and quantity is essential for the ecological function of wetlands and watercourses, the Project could also interact in terms of direct alteration wetlands and watercourses.

Wetlands and watercourses are both protected by Provincial legislation and are valued by society due to their ecological function. Watercourses themselves hold ecological value by providing habitat for fish and aquatic flora and fauna. Wetlands provide or support a wide range of important ecological, social and economic functions and services in our watersheds. This value is the underlying principle for NSE's Nova Scotia Wetland Conservation Policy. Alteration of watercourses or wetlands requires the approval of the Province unless works fall within a few specific circumstances identified as exceptions by NSE.

Within the study area which includes the WTGs and the access road (as shown on Figure 3.1), wetlands and watercourses have been identified as part of the desktop and field work completed; this field work and the outcome is summarized in Section 4.1.3 and detailed in Appendix 8.

Field surveys were completed on July 2, July 23 and August 25, 2014 of the study area. The field work provided a general characterization of the area, identification of wetlands in the study area and delineation those wetlands which intersected with proposed Project footprint, and collection of soil, vegetation and site details to support future wetland alteration approval applications after EA approval. Follow up delineation was completed on October 17, 2014 to delineate wetlands in a new location of the eastern WTG (as described in Section 2.4); this area had been previously visited in July and August for preliminary identification of wetlands and a floral survey but the wetland delineation occurred in October.

Key points to emphasize from the ECA report (Appendix 8) relative to the proposed wetland alteration and general footprint of the proposed PLWF in terms of other wetlands and local hydrology:

- No watercourses will be altered as a result of this proposed Project. As discussed in Section 6.2.1, Forked Pond is about 200m away and is not downgradient of the Project site. Grand Lake is about 1.5 km downgradient and is separated by culverts under Highway 107. No tributary watercourses are located on the Project site (see Figure 4.3).
- No Provincially identified Wetlands of Special Significance are in vicinity of the site. The closest occur in separate and defined catchment areas about 3.3km to the north and 5.4km to the south of the site.

- A 5 hectare low shrub aquatic vegetation marsh / fen was identified and delineated adjacent to Forked Pond. The closest WTG is now 192m from the edge of this wetland.
- Field surveys identified additional wetlands that are defined as shrub and treed pocket bogs that developed in poorly drained depressions within the bedrock providing low-moderate ecosystem services based on the functional assessment of the principal wetland located at the centre of the study area.
- Based on delineations and design changes as explained in Section 2.4, a combined area of 3500m<sup>2</sup> is proposed for alteration of several small shrub and treed bogs as part of access road widening and development, and laydown areas of two WTGs; this area has been minimized to the extent feasible.
- The design changes resulted in over 45% reduction in proposed wetland area for alteration. This represents the optimization of the design and reflects the wetland mitigation sequence of avoidance, minimization and compensation as per the 2011 Wetland Conservation Policy.
- Pending successful release from the EA process, an application will be submitted to NSE for alteration of these small shrub and treed bogs. It is understood that the loss of wetlands at the PLWF will result in a need for compensation to be facilitated by the Proponent.
- Species at risk and of conservation concern are discussed as a separate VEC; however, as shown in this EA report, no species at risk or of conservation concern are found in the wetlands proposed for alteration.

Accordingly, wetlands and watercourses have been identified as a VEC. A significant environmental effect would result if a substantive change in ecological function of watercourses or wetlands on the Project site could be identified and attributable to the Project.

- *Boundaries* – Spatial bounds are the limits of work associated with the Project, i.e., watercourses and wetlands within or immediately downgradient of the Project site. The temporal boundary is focused on Project construction activities.
- *Potential Project Impacts* – Pathways that may adversely affect ecological function of wetlands and watercourses are primarily related to their physical alteration during site preparation and construction, though the same effect could occur during decommissioning activities. Both quality and quantity of ground and surface water were assessed separately and residual effect is predicted to be negligible; therefore, this pathway is not included in the assessment of wetlands and watercourses. Hence no effect is predicted on Grand Lake nor its tributaries or Forked Pond. There is no alteration of watercourses; however, wetland alteration is unavoidable (i.e., 3500m<sup>2</sup> of small treed/shrub bogs). Physical alteration would include crossing wetlands with vehicles or equipment, excavating wetlands, and infilling wetlands with materials such as gravel or excavated material from the site. Alterations to

wetlands require an approval as defined in the Province's Activities Designation Regulations.

- *Proposed Mitigative Measures* – Related to effect on wetlands and watercourses during construction, the mitigations include:
  - Siting of the WTGs and laydown areas greater than 50m from watercourses (i.e., tributaries to Grand Lake);
  - Maintaining committed distance of over 150m to the wetland adjacent to Forked Pond (i.e., fen);
  - Delineating limits of work for access road (upgrade and construction) and construction of turbine laydown areas /pads to ensure no more than 3500 m<sup>2</sup> of small treed / shrub bogs are altered and to assist the Contractor to avoid sensitive areas;
  - Development of an Environmental Construction Plan (ECP) specific to wetland alteration to minimize effect on each small bog using advice of wetland experts who have studied the site and understand the hydrology;
  - As part of ECP, install appropriately sized culverts to maintain hydrology under access roads and design drainage of the WTG pads to maintain existing hydrology of the site to extent possible;
  - Mitigations will include sediment and erosion control and water handling as necessary to protect downgradient water quality;
  - Necessary assessment and analysis will be completed as part of the formal Wetland Alteration Approval which will be submitted to NSE upon expected EA approval;
  - All site work will be in compliance with Nova Scotia Activity Designation Regulations and in compliance with the Wetland Alteration Approval when received - no work will occur in wetlands until approval is received from NSE;
  - Necessary compensation will be completed for the loss of wetlands at the PLWF via restoration of off-site wetlands using the services of a qualified professional to undertake the compensation activities at a site approved by NSE; and
  - Education of the Contractor via the EPP on importance of protecting wetlands and minimizing alteration to area necessary and general measures to protect watercourses and wetlands during access road construction, as well as other mitigative measures to protect ground and surface waters as noted in Section 6.2.1.
  
- *Cumulative Effects* – There is land development (rural residential) in the watershed of the Project site. With mitigative measures in place in accordance with legislation and policies (i.e., Wetland Conservation Policy) and given the small scale of this work, it is very unlikely that a significant adverse residual environmental effect on ecological function of wetlands and watercourses would result from these activities acting cumulatively.

- *Significance of Residual Effects* – Project planning has aimed to avoid direct alteration of wetlands and watercourses where possible, this has been achieved for watercourses and higher functioning wetlands, i.e., fen near Forked Pond; to the extent possible, wetland alteration has been minimized in the proposed Project footprint (i.e., under 3500 m<sup>2</sup> of treed / shrub small bogs). NSE will be provided with additional detail in the Wetland Alteration Approval Application and all work will be completed as per Provincial requirements.

The Project is not anticipated to have a significant residual environmental effect on the ecological function of watercourses and wetlands. While any effect will be negative, it will be very small in magnitude, short term, and local; while the effect is not reversible to that wetland itself should alteration occur, compensation will be completed as required under the NSE Wetland Conservation Policy. No effect is predicted to watercourses. The environmental effect on wetlands and watercourses as a VEC is predicted to be minor.

### **6.3.2. Fish Habitat**

The Project site is within a watershed containing fish habitat, i.e., the Musquodoboit Primary Watershed and the Porters Lake Secondary Watershed. Griswold Lake is an adjacent catchment. The watercourses downgradient of the Project site itself do not drain to Forked Pond; these tributaries drain toward Grand Lake via culverts under Highway 107. These watercourses north of the Highway 107 provide poor fish habitat and some are seasonal water flow. Grand Lake itself would have fish habitat but is some 1.5km downgradient. Prior to the redesign to minimize wetland impact, Forked Pond was planned to receive some surface drainage from the proposed Project site; during field work in July (electrofishing and directed angling) at outlet of Forked Pond, no fish were observed (see Appendix 8).

Fish habitat is protected under the Federal *Fisheries Act*. Accordingly, fish habitat has been identified as a VEC. A significant environmental effect would result if a substantive change in fish and their habitat could be attributed to the Project downgradient of the Project site, including Grand Lake.

- *Boundaries* – Spatial bounds include the catchment area draining into Grand Lake from the Project site. The temporal boundary is primarily during construction.
- *Potential Project Impacts* – Pathways that may adversely affect fish habitat include release of sedimentation or hazardous materials, and physical alteration of watercourses during site preparation and construction, as well as to a much lesser extent operational and decommissioning activities.

Both pathways were assessed as other VECs, i.e., ground and surface water (physical) and wetlands and watercourses (ecological). Residual effects on both VECs were predicted to be

negligible; therefore, these pathways are not included in the assessment of fish habitat. No other pathways exist to affect fish habitat from this Project.

- *Proposed Mitigative Measures* – No effect is predicted on fish habitat. Accordingly, no specific mitigations are recommended outside of mitigative measures as proposed for the VECs of ground and surface water and wetlands and watercourses.
- *Cumulative Effects* – As no effect is predicted, by definition, there cannot be other activities acting cumulatively.
- *Significance of Residual Effects* – Effect on fish habitat is not expected to occur.

The Project is anticipated to have no environmental effect on fish habitat.

### **6.3.3. Migratory and Breeding Birds**

The Project site is moderately near the coast and proximate various lakes and wetlands. Desktop and field work was completed in 2013 and 2014 by Andrew Horn as discussed in Section 4.1.4. Based on results of spring and fall migration surveys and summer breeding bird survey, the site sensitivity is defined as low and the Project is small, i.e., as per Environment Canada the resulting Level of Concern Category is 1 (see Appendix 5).

Key points from these studies:

- Fall migration survey (2013) did not find any species at risk or high concentrations of birds which suggested that the site has a very low sensitivity for birds during migration; eight species of raptors were seen but none in large numbers.
- In fall survey, three priority species were found each only once during individual events (one Common Loon, one Golden-crowned Kinglet, and two individual Gray Jays together).
- Spring migration survey (2014) did not detect any migrants that could be unambiguously distinguished from local breeding birds (e.g., no flocking, flying in a single direct flight, etc.).
- Specific searches were completed during breeding season (2014) for the Common Nighthawk and Rusty Blackbird as explained in Horn's spring and breeding bird report.
  - Common Nighthawk was found once during a specific site visit during morning twilight when the species is most easily detected; none were detected during the regular surveys. The bird was heard to the south of Highway 107 mostly but for several minutes sounded like it was circling over Forked Pond.
  - A Rusty Blackbird was identified from its flight call only once flying over Forked Pond; this species was not encountered on any other visit despite repeated efforts to locate it using playback during each visit in May, June and into July. Based on follow

up verification, Horn's opinion is that Rusty Blackbirds weren't breeding on the site, and if that bird was a Rusty Blackbird, then it was presumably a migrant or a local bird that bred off the site (pers. comm., A. Horn, October 14, 2014).

- Four other species with provincial statuses were encountered once each (i.e., Grey Jay, Tree Swallow, Golden-crowned Kinglet, and Ruby-crowned Kinglet); however, these were not believed by Horn to breed on the site.
- The breeding bird survey revealed only one species at risk or provincially sensitive species that might breed on the site, the Common Nighthawk; while Horn identified it as a possible breeder, he noted that it should have been identified more than once if the species actually nested at the site, i.e., low potential.

Environment Canada is responsible for implementing the *Migratory Birds Convention Act* (MBCA), which provides for the protection of migratory birds, their eggs and nests through the Migratory Birds Regulations. Accordingly, migratory and breeding birds have been identified as a VEC. A significant environmental effect would result if a substantive change could be identified in numbers of breeding or migratory birds or their habitat attributable to the Project. Species of birds that are identified as at risk or of special concern are assessed as a separate VEC.

- *Boundaries* – The spatial bounds include the area where the WTGs and access roads are proposed to be located and extending to include the areas that are frequented by birds that may be impacted by the Project. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect birds during construction include disturbance from clearing activities: direct effects, such as tree removal and wetland alteration, and indirect effects, such as noise and lighting. Residual environmental effects of noise and light from construction were predicted to be negligible; therefore, it is not included for additional assessment on birds.

During operation, the rotation of the blades may cause individual fatalities. Operation of the WTGs has the ability to affect migratory birds in terms of direct effects, such as collisions, and indirect effects such as noise and lighting. Residual effect of lighting was predicted to be negligible; therefore, it is not considered in the assessment on birds.

- *Proposed Mitigative Measures* – Related to effect on migratory and breeding birds during construction, the mitigations related to clearing include:
  - As already completed, siting and design of the Project to limit areas disturbed to under 5ha within an already disturbed area by recent forest fire;
  - Minimizing wetland impacts to small treed / shrub bogs (under 3500 m<sup>2</sup>) and maximizing distance (greater than 150m) to a higher functioning wetland (i.e., fen near Forked Pond);

- Clearing during winter months to avoid nesting timeframes for most birds, i.e., before April 15 and after August 31; and
- Adherence to EPP related limits on area of work to minimize the cleared area.

Related to WTG operation, the mitigations include:

- Siting of the Project in an area where the sensitivity was determined to be low based on field studies by Andrew Horn;
  - Design a monitoring plan and carcass survey methodology in accordance with Environment Canada and CWS, and implement the plan including completion of annual reporting; and
  - Notification of the Project Manager if carcasses are found by site personnel during regular site visits as defined in EPP, including logging information and notification of CWS by the Project Manager.
- *Cumulative Effects* – Other than rural development in the local area, there is an existing wind turbine some 25km away from the PLWF as noted in Section 2.10. Given relative distance of the Project and from this larger installation and the smaller size of the Project itself, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on migratory and breeding birds.
  - *Significance of Residual Effects* – Disturbance of birds during construction, if it occurs, will be temporary and short term; no disturbance of nests will occur due to timing of clearing. Effect on birds during Project operation via mortality from collisions is expected to be low in number based on low sensitivity of the site, if they occur; monitoring will verify the effect in accordance with regulatory requirements.

The Project is not anticipated to have a significant residual environmental effect on migratory and breeding birds. While any effect will be negative, it will be small in magnitude, reversible, and local; however, relative to the operating WTGs, any effect will be long in duration, i.e., operational Project phase. The environmental effect on migratory and breeding birds is predicted to be minor.

#### **6.3.4. Flora and Fauna**

As discussed in Section 4.1.5, the Project site is located within a fire-charred upland coniferous forest. While the habitat is not particularly unique, the area does host flora and fauna that are of value in Nova Scotia (e.g., black bear, deer, etc.). Accordingly, flora and fauna has been identified as a VEC.

A significant environmental effect would result if a substantive change could be identified in population of a flora or fauna species that was attributable to the Project. Species of flora and fauna that are identified as at risk or of special concern are assessed as a separate VEC, including faunal species (such as bats and mainland moose) and rare or listed bird and floral species.

- *Boundaries* – The spatial bounds includes the area where the WTGs and access road are proposed, and for fauna specifically, extending to include the areas that are frequented by fauna that may be impacted by the Project. The temporal boundary focuses on Project construction.
- *Potential Project Impacts* – Pathways that may adversely affect flora and fauna primarily include clearing of land during construction; however, this area is relatively small (i.e., under 5 ha) in relation to similar habitat in local area. Fauna in immediate area of the clearing may relocate to avoid impact though habitat that will be lost – again a small area relative to local habitat and this area is bounded by Highway 107 and Highway 7.

During operation, noise from the WTGs may affect fauna that use the area as part of their habitat. Given the predicted residual significant effect on ambient noise levels as minor in relation to residents, the parallel effect on fauna is expected to be negligible given the adaptability of fauna and the extent of similar habitat; therefore, this pathway is not further considered in this assessment.

- *Proposed Mitigative Measures* – Related to effect on flora and fauna during construction, the mitigations include:
  - Adherence to EPP related to minimizing disturbance of wildlife, including no tolerance for harassing wildlife; and
  - Limitation on areas cleared as already noted in this document and in the EPP.
- *Cumulative Effects* – There are known disturbed land use near the Project site such as highways and rural residential development. Given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on flora and fauna.
- *Significance of Residual Effects* – Annoyance of fauna caused during Project construction, if it occurs, will be temporary and short term. Effect on habitat due to the clearing required for this Project is extremely small relative to similar habitat on the Project site and in the local area in general.

The Project is not anticipated to have a significant residual environmental effect on flora and fauna. While any effect will be negative, it will be very small in magnitude, reversible, local, and short term. The environmental effect on flora and fauna is predicted to be negligible.

### **6.3.5. Species at Risk and of Concern**

Listed species at risk receive legal protection (i.e., Federal Species at Risk Act and Provincial Nova Scotia Endangered Species Act), and species of concern are valued and a focus of sustainable project planning within an EA. The potential for species at risk and of concern was scoped initially via desktop surveys (i.e., short listed), including the observations reported by ACCDC (Appendix 9) and

general knowledge of habitat on and near the site. This assisted in defining the field studies for species at risk and of concern along with consultation with regulators as appropriate. The methodology of the field studies and the results are presented in Section 3.2 and Section 4.1.7, respectively. The details of all studies are shown in specialists' reports in Appendix 5 (birds), Appendix 6 (bats), Appendix 8 (flora) and Appendix 10 (moose).

Below are key summaries of the findings in context of the assessment.

### **Plants**

- ACCDC data within 20km identified records for 36 floral species to be at risk or of conservation concern.
- Based on ACCDC data, no at risk species were identified in the 5km radius and three were identified that were of conservation concern. These were either very low likelihood (Canada Germander, S3) or moderate likelihood (Hairy Lettuce, S2, or Canada Rice Grass, S2) of being found in the study area.
- Field surveys documented a total of 83 species across the site in six habitats. All of the identified species had a General Status Ranking of S4 – Secure / Not at Risk (78 taxa) or Exotic (5 taxa).
- No rare, endangered or species of conservation concern were identified in the surveys.

### **Birds**

- As per Section 6.3.3, breeding bird survey revealed only one listed species at risk that might breed on the site, the Common Nighthawk. It was not identified in regular surveys and only identified once in a targeted survey (as this species is known for its use of burned-over areas for habitat); it was mostly heard from south of Highway 107. Based on the experience of the ornithologist, Andrew Horn, it was deemed to be low potential to breed on the site.
- Other species with provincial statuses (i.e., Grey Jay, Tree Swallow, Golden-crowned Kinglet, and Ruby-crowned Kinglet) identified during one event each were also believed not to breed on the site.
- Based on specific field work completed for Rusty Blackbirds, it was Horn's opinion is that this species was not breeding on the site; an individual Rusty Blackbird was only once seen flying over Forked Pond without stopping.

### **Mammals**

- No evidence of moose were found based on lack of pellets and no evidence of browsing in winter and spring 2014 surveys.

- Closest hibernacula are beyond 25km (i.e., an abandoned mine at Lake Charlotte and a smaller hibernaculum, known as Cave of Bats, in the area of Dutch Settlement – both are approximately 31 km away).
- Based on bat detectors running continuously from July 21 through to November 4, 2014, the majority of the records were attributable to two species of *Myotis* bats at levels that are exceptionally low; while problematic to assess due to white-nose syndrome, there was no acoustic evidence of a significant movement or concentration of bats through the area investigated during this pre-construction survey of bat activity.

## Reptiles

- As per ACCDC records, Wood Turtle has been identified in 132 records within 8km of the site; it has moderate potential for breeding within sandy banks of tributaries near the Project site and also gravelly road shoulders, including Highway 7, during its nesting season (i.e., late May - early July).

Accordingly, species at risk and of concern has been identified as a VEC. A significant environmental effect would result if an identified species or their habitat was irreversibly harmed by an activity that was attributable to the Project, or an individual of a SARA listed species.

- *Boundaries* – The spatial boundary includes the area where the WTGs are proposed to be located and the Project's ancillary features extending to include the areas that are used by species at risk or of concern that may be impacted by the Project. Temporal boundary includes all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect species at risk and of concern include habitat disruption during site preparation and construction and direct effects of operation of the WTGs, i.e., collision with birds or bats. Specifically, several species of concern have been noted during the desktop review and field work as moderately likely to interact with the proposed Project. These interactions are as follows:
  - *Plants*: All plants were either secure (not at risk) or exotic; no rare floral species or species of concern were identified in the early and late season site visits – therefore no impact is predicted.
  - *Birds*: The construction activities are not expected to interact as clearing will be outside of nesting season; however, there is a loss of some habitat (i.e., under 5 ha of which 0.35 ha are small treed / shrub bogs) yet the only species listed or of concern are not believed to breed on the Project site based on breeding bird survey including targeted field work for Common Nighthawk and Rusty Blackbird. In terms of Project operation, there are potential interactions, i.e., direct effect of collisions. Six list species or species of concern were noted during field work and only once each; so potential interaction is considered low.

- *Mammals*: There is no evidence of Mainland Moose on the Project site. In terms of bats, there is a similar potential as with birds, i.e., direct effect of collisions; while data shows significant reductions and known hibernacula are more than 25km away, there is raised uncertainty and heightened importance due to white-nose syndrome.
- *Reptiles*: There are no watercourse crossings but potential interaction with Wood Turtle exists during construction of access road by upgrades at Highway 7 and of existing road; potential is considered moderate.
- *Proposed Mitigative Measures* – Related to effect on species at risk and of concern during Project construction, the mitigations include:
  - Mitigations proposed previously related to other physical and biophysical VECs, such as watercourses, wetlands, birds, flora and fauna, including minimizing footprint of the Project and clearing outside of bird nesting period;
  - Schedule to minimize civil works during Wood Turtle nesting period (late May - early July); and
  - As per the EPP, education of the Project Contractor on the importance and the potential presence of Wood Turtle.

Related to WTG operation, the mitigations include:

- Bird and bat carcass searches as already committed as per the EC / CWS approved plan; and
- Notification of DNR and CWS as applicable via the Project Manager of bird and bat carcasses found outside of searches as per EPP.
- *Cumulative Effects* – There are known disturbed land uses near the Project site such as highways and rural residential development. Given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on species of risk and of concern.
- *Significance of Residual Effects* – Effects on species at risk and of concern has largely been avoided by appropriate siting and design of the Project.

The Project is not anticipated to have a significant residual environmental effect on species at risk or of concern. While any effect will be negative, it will be very small in magnitude, local and generally short term in potential interaction (i.e., construction). While the effect could be irreversible, this is extremely unlikely based on desktop, field work and this assessment. Hence the residual environmental effect on species at risk and of concern is predicted to be negligible.

## 6.4. Assessment of Socio-Economic Aspects

### 6.4.1. Land Use

The proposed Project is set in near the communities of Porters Lake and Lake Echo with rural residential development nearby along and off of Highway 7. The existing land uses of the Project site is a burned over upland forest that is Crown Land. The development density is quite low in keeping with the rural character of the area .There are no residential properties within 1100m of the proposed WTGs, and approximately 31 dwellings are within 1.5km as presented in Section 4.2.1. The site is bounded by Highway 107 to the south and Highway 7 to the north. In terms of the local community, there is a reasonable expectation of enjoyment of property on surrounding land; this is valued by the community.

Accordingly, land use has been identified as a VEC. A significant environmental effect would result if a substantive change in current land uses and development trends in the local area that could be attributable to the Project.

- *Boundaries* – The Project site where the WTGs are proposed to be located and ancillary features, as well as surrounding properties to a 2km radius, define the spatial boundaries related to land use assessment. The temporal boundaries include all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect land use during construction may include any temporary disturbance associated with noise and light, especially blasting if that occurs. Changes to land via construction activities on the Project site will occur but will be confined to the footprint of the site. During operation, pathways that may adversely affect land use include effects from operation of the WTGs relating to human perception of changes to land use, such as sound, light, aesthetics, health and safety, etc.; these are distinct aspects that are assessed separately in this document. Potential effect of the Project on recreation is assessed separately.
- *Proposed Mitigative Measures* – Related to effect on land use, the mitigations are those proposed for the VECs and socio-economic aspects that relate to land use as explained above, including maintaining over 1000m distance from habitable dwellings as per the Halifax bylaw requirements; the other Project mitigative measures are not repeated here.
- *Cumulative Effects* – Other than rural development in the local area, there is an existing wind turbine some 25km away from the PLWF as noted in Section 2.10. Given relative scale of the Project and these other activities in terms of scale and distance, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on land use in the local area.

- *Significance of Residual Effects* – Pathways to impact land use relate to other VECs and socio-economic aspects that are assessed separately; these were determined to have negligible or minor residual environmental effects.

The Project is not anticipated to have a significant residual environmental effect on the land use in the local area. While any effect will be negative, it will be very small in magnitude, reversible, and local; however, where the effect relates to the operating WTGs, it will be long in duration. The environmental effect on land use is predicted to be negligible.

#### **6.4.2. Aboriginal Resources/Uses**

Based on the archaeological study completed, the Project site and nearby area are considered to exhibit low potential for encountering Mi'kmaq resources as described in Section 4.2.3. In particular, Sipekne'katik Band members have gathered fish resources in waterbodies downgradient of the Project site, in particular Lake Echo and Grand Lake and the unnamed watercourse flowing from Grand Lake to Porters Lake. As described in Section 6.2.1, there is no predicted effect on water quality in Grand Lake from the proposed Project.

As described in Section 5.2, the Proponent engaged the Mi'kmaq of Nova Scotia at early Project stages and has continued to share information. This engagement is in keeping with the Province's requirement to meaningfully consult with the Mi'kmaq on decisions that impact natural resources. The Project is considered a relatively low impact activity; however, it does propose to lease Crown land.

Accordingly, Mi'kmaq resources and traditional uses by the Mi'kmaq have been identified as a VEC. A significant environmental effect would result if a substantive change occurred in Mi'kmaq access to traditionally used land, if the availability of traditional resources substantively declined or if a loss or destruction occurred of an artefact of Pre-Contact origin.

- *Boundaries* – The area where the WTGs are proposed to be located, and their ancillary features, could impact aboriginal resources or uses; hence, this defines the spatial boundary. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect traditional Mi'kmaq uses and resources are primarily based upon those ecological VECs including wetlands and watercourses, fish habitat, migratory and breeding birds, flora and fauna, and species at risk or of concern, as well as the socio-economic aspect of land use; of these, all effects were predicted to be negligible, whereas no effect was predicted on fish habitat while the effect on migratory and breeding birds was predicted to be minor. Also in terms of construction, direct impact to Pre-Contact artefacts is a potential effect; based on the archaeological screening and reconnaissance as described in Section 4.2.2, the Project site is considered low potential for encountering Pre-Contact artefacts.

- *Proposed Mitigative Measures* – Related to effect on Mi'kmaq resources and traditional uses by the Mi'kmaq, the mitigations are those proposed for the ecological VECs and land use as explained above; they are not repeated here. Further, follow up consultation is planned with the nearby Sipekne'katik Band, as well as the KMK as per Section 5.2. In addition, the EPP includes protocols should artefacts or human remains be discovered during construction, including contact information for the KMK in the unlikely event that the discovery is considered to potentially be of Pre-Contact significance.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site, including residential development; however, given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on Mi'kmaq resources and traditional uses by Mi'kmaq.
- *Significance of Residual Effects* – Pathways to impact Mi'kmaq resources and traditional uses by Mi'kmaq primarily relate to ecological VECs and land use that are assessed separately and determined to have no impact or negligible or minor residual environmental effects. The potential to discover a Pre-Contact artefact is very unlikely given the low potential identified in the archaeological assessment.

The Project is not anticipated to have a significant residual environmental effect on the Mi'kmaq resources and traditional uses by Mi'kmaq. While any effect will be negative and irreversible, it will be small in magnitude, short term, and local, as well as very unlikely. The environmental effect on Mi'kmaq resources and traditional uses by the Mi'kmaq is predicted to be negligible.

### **6.4.3. Archaeological Resources**

Based on the archaeological study completed, the Project has low risk to impact archaeological resources as described in Section 4.2.2 and as detailed in Appendix 7. Protection of cultural resources is required by Provincial legislation, e.g., *Special Places Protection Act*. Accordingly, archaeological resources have been identified as a VEC. A significant environmental effect would result if an irreversible loss or destruction of an archaeological resource that resulted from Project activities.

- *Boundaries* – The area where the WTGs are proposed, and their ancillary features, could impact cultural resources; hence, this defines the spatial boundary. The temporal boundary is primarily the construction phase.
- *Potential Project Impacts* – A pathway that may adversely affect archaeological resources is direct impact to cultural resources during construction activities, such as earth works and excavation.

- *Proposed Mitigative Measures* – The EPP includes protocols should artefacts or human remains be discovered during construction, including contact information for the Province and the KMK in the unlikely event that a discovery is made.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site; however, given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on archaeological resources.
- *Significance of Residual Effects* – The potential to discover an artefact is very unlikely given the low potential identified in the archaeological assessment.

The Project is not anticipated to have a significant residual environmental effect on the archaeological resources. While any effect will be negative and irreversible, it will be small in magnitude, short term, and local, as well as very unlikely. The environmental effect on archaeological resources is predicted to be negligible.

#### **6.4.4. Recreation**

The Project is proposed on Crown Land that is a recent burn-over area (2007). There are no existing trails or recreational use of the proposed Project site; it is bound by Highway 107 and Highway 7. Recreational activities do exist in the broader area, i.e., on a watershed scale in Porters Lake, Lake Echo and Grand Lake, as briefly described in Section 4.2.8. Accordingly, recreation has been identified as a VEC. A significant environmental effect would result if a substantive change in recreation occurred that was attributable to the Project.

- *Boundaries* – The area where the WTGs and the access road are proposed to be located, as well as immediately surrounding properties, define the spatial boundaries related to assessment of recreation. The temporal boundaries include all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect recreation during construction may include any temporary disturbance associated with noise and light, especially blasting if that occurs, as well as effect on ground and surface water, land use and fish habitat; these are distinct and are assessed separately in this document. During operation, pathways that may adversely affect recreation include effects from operation of the WTGs relating to human perception of changes to land use, such as noise, light, aesthetics, health and safety, etc. as well as effect on land use itself; these are distinct aspects that are assessed separately in this document.
- *Proposed Mitigative Measures* – Related to effect on recreation, the mitigations are those proposed for the VECs and socio-economic aspects that relate to recreation as explained above; they are not repeated here. No other pathways of potential impact have been

identified. As residual effects are negligible, no effects to recreation are predicted and no mitigation is required.

- *Cumulative Effects* – As no effect is predicted, by definition, there cannot be other activities acting cumulatively.
- *Significance of Residual Effects* – Effect on recreation is not expected to occur.

The Project is anticipated to have no environmental effect on recreation.

#### **6.4.5. Vehicular Traffic**

The Project site is just north of Highway 107 and south of Highway 7; Highway 7 will be the access point for vehicles to the site during all Project phases. Movement of concrete, gravels and turbine components is part of the construction phase as described in Section 2.5. All roads that will be used to transport the turbine components will be reviewed with TIR to ensure the ability to handle the movement of the large loads. In terms of WTG and crane component delivery to the Project site, approximately 35 flatbed truck loads are expected on average along this route.

Traffic can often be an issue of community concern. Accordingly, vehicular traffic has been identified as a socio-economic aspect. A significant environmental effect would result if either substantive damage to the existing road system occurred that was attributable to the Project or a substantial delay in traffic flow could be attributable to the Project.

- *Boundaries* – The spatial boundaries are those roads that will be used through the construction phase of the Project. The temporal boundaries are those associated with Project construction, as well as decommissioning Project phase.
- *Potential Project Impacts* – Pathways that may adversely affect traffic include transportation of turbine components and construction materials, such as concrete for turbine foundations, as well as removal of turbine components during decommissioning activities.
- *Proposed Mitigative Measures* – The Proponent will work closely with TIR, HRM and the local community to evaluate the most practical approach to ensure road integrity, the safety of the travelling public, and minimal inconvenience to travellers. Indeed the Proponent must seek permits from TIR including Working within Highway Right-of-Way as well as a Transportation Study and Traffic Management Plan, Sign Permit, and a Special Move: Over-Dimension Permit.
- *Cumulative Effects* – The other known works taking place in the area, or in the vicinity of the site, are not expected to occur simultaneously, and therefore, they will not act cumulatively to increase the likelihood of a significant adverse environmental effect on vehicular traffic at the nearby residents.

- *Significance of Residual Effects* – Annoyance caused by delay in road traffic during construction, if it occurs, will be temporary and short term. By working with TIR, work will be completed to ensure integrity of road structures remains intact.

The Project is not anticipated to have a significant residual environmental effect on vehicular traffic patterns. While any effect will be negative, it will be small in magnitude, reversible, short term and local. The environmental effect on vehicular traffic is predicted to be negligible.

#### **6.4.6. Landscape Aesthetics**

The proposed WTGs are set near the communities of Porters Lake and Lake Echo up on a knoll with an approximate maximum elevation of 50m ASL. The proposed Project site is bounded by Highway 107 and Highway 7. There are rural residential neighbours beyond 1100m.

It is important for members of the community to visualize the potential impact to landscape aesthetics. View planes were assessed as described in Section 4.2.7. This included selecting three locations to analyze: the first vantage point is from Highway 7 near the closest residential property looking south at the proposed WTGs, while the second vantage point is from Sandy Lane to the east of the Project site and the third vantage point is from Highway 107 looking north at the proposed WTGs. The three existing and predicted view planes are shown in Appendix 14.

Accordingly, landscape aesthetics has been identified as a socio-economic aspect. A significant environmental effect would result if a substantive change of a view plane that is highly valued for its contribution to economic value, e.g., tourism, or its uniqueness in the region.

- *Boundaries* – The area surrounding the propose Project where the WTGs are visible defines the spatial boundaries related to assessment of landscape aesthetics. The temporal boundaries include Project operation.
- *Potential Project Impacts* – Pathways that may adversely affect landscape aesthetics simply relates to visibility of WTGs. Visibility decreases with distance and relates to relative topography and ground cover which may act as obstructions to visibility.
- Members of the community and the public at large have varying opinions on the visual impact of WTGs. To some they represent progress of renewable energy, to others they represent large industrial installations that create a negative effect on the landscape, and some are indifferent. They do represent change in the landscape which can cause short term reactions (positive or negative); these reactions often decrease over time.

No specific concerns have been shared with the Proponent to date on visibility of turbines.

- *Proposed Mitigative Measures* – The Proponent has carefully selected this Project site in consideration of a variety of constrains; community acceptance is one constraint which includes landscape aesthetics. The specific siting of WTGs has also taken into account the

bylaw regarding separation distance and other considerations which minimize extent of visual impact on nearby residents. As described in Section 5.1, community consultation has and will continue to occur. No further mitigations are planned.

- *Cumulative Effects* – The nearby land uses, including residential and highway, have some aesthetic disturbance to the natural landscape as well as the fire in 2007. These aspects are unlikely to act cumulatively on landscape aesthetics; therefore, there is an extremely low likelihood of a significant adverse environmental effect on landscape aesthetics in the local area due to cumulative effects.
- *Significance of Residual Effects* – The perspective on aesthetics of WTGs is subjective. In terms of this assessment, it has been determined that effects may be perceived by some as negative; however, these perceptions are often a response to change and often decrease over time, i.e., be temporary and short-term.

The Project is not anticipated to have a significant residual environmental effect on the landscape aesthetics. While the effect can be negative, it will be very small in magnitude, reversible, short term and local. The environmental effect on landscape aesthetics is predicted to be negligible.

#### **6.4.7. Health and Safety**

The health and safety of the public are of utmost concern in any project. Related to operation of WTGs, there are specific aspects that are typically a concern to the community. These aspects of potential concern specifically include noise and low frequency vibration, ice throw and shadow flicker. The protection of workers and the public during construction and decommissioning activities is a core priority of the Proponent. Occupational health and safety is protected under Provincial legislation.

Accordingly, health and safety has been identified as a socio-economic aspect. A significant environmental effect would result if a substantive increase in risk to human health and safety could be attributable to Project activities.

- *Boundaries* – The spatial bounds include the immediate areas of the Project and the zone of influence of pathways for impact. The temporal boundary is all Project activities.
- *Potential Project Impacts* – During any construction project, there are health and safety risks to site personnel. As this Project is not atypical in terms of occupational health and safety and as the Proponent has a health and safety plan and works in compliance with legislation, this specific pathway is not evaluated as part of this assessment.

Similarly, the very unlikely interaction of Project construction with the general public is not further considered in this assessment. By appropriately managing construction traffic and WTG transportation as well as limiting the public's access to the construction site, there is

an extremely low level of risk to the public health and safety during the Project construction and decommissioning.

The pathways of impact related to operation are discussed below:

- *Noise and low frequency vibration*: The guidelines for 40dBA at the outside of residential dwellings is considered protective of health in terms of audible noise and its potential effect on stress levels and sleep; this was addressed as a separate VEC in Section 6.2.3. Project design to limit exposure to SPLs at these levels is also considered protective in terms of low frequency vibration. Hence this pathway is not assessed specifically here as it was addressed in a separate VEC; residual environmental effect was predicted to be minor.
- *Ice throw*: A guideline for a safe distance with respect to ice throw is  $1.5(2R + H)$  where R is rotor (blade) radius and H is hub height. Hence for a typical WTG under consideration with a hub height of 80m and a blade length of 40m, the maximum distance of ice throw is 240m. Ice throw will only occur in specific climatic circumstances.
- *Shadow flicker*: As described in Section 6.2.4, shadow flicker was modeled and the boundary was mapped of the maximum exposure guideline for 30 minutes per day and 30 hours per year. This boundary is well distant from the nearby residences even with the conservative assumptions used in the model. Hence this pathway is not assessed specifically here as it was addressed in a separate VEC; residual environmental effect was predicted to be negligible.
- *Proposed Mitigative Measures* – Related to effect on health and safety during operation, the mitigations for ice throw include:
  - Educate site personnel and land owner on risk of ice throw under certain climatic conditions;
  - Restrict personnel in the immediate area of the WTGs following an icing event, wherever practical; and
  - Post signage at Project site gate to identify potential concerns with ice throw in the radius of potential interaction from the WTGs.
- *Cumulative Effects* – There are known other works taking place in the vicinity of the site; however, due to the nature, location and size, these are not expected to act cumulatively to increase the likelihood of a significant adverse environmental effect on health and safety.
- *Significance of Residual Effects* – Based on Project planning and design, potential safety risk due to ice throw is not a concern on residential properties and appropriate signage will educate site personnel and visitors on the potential risk of ice throw. Noise was assessed separately and the effect predicted to be minor; shadow flicker was assessed separately and the effect predicted to be negligible.

The Project is not anticipated to have a significant residual environmental effect on human health and safety. While any effect will be negative, an unplanned interaction via ice throw is very unlikely and possible timeframe of occurrence very short term; however, as it relates to the operating WTGs, it will be long in duration. The environmental effect on health and safety is predicted to be negligible.

#### **6.4.8. Local Economy**

The proposed Project will contribute to the local tax base for the life of the Project, as well as the local economy primarily during the construction phase. As this Project is funded in part via a CEDIF as explained in Section 1.1, investment in this Project is open to members of the local community; investment is RRSP eligible and provides additional income tax benefits to eligible investors as it is registered as a CEDIF.

Accordingly, the local economy has been identified as a socio-economic aspect. A significant environmental effect would result if a substantive change employment levels or the local economic base could be attributable to the Project.

- *Boundaries* – The spatial boundary is the Halifax Regional Municipality to which taxes are paid and where the local businesses and workers primarily reside. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Predicted impacts are positive in terms of the local economy. Pathways that may benefit the local economy include local contracts and short term employment during site preparation and construction, as well as decommissioning activities. Outside of direct contracts or employment, economic spin off is expected in the local area during construction (e.g., accommodation, gasoline, dining, etc.).

During operation, pathways are primarily related to ongoing taxes paid to the HRM with some ongoing contracts or employment related to the operating wind farm. In terms of potential investment, members of the community have the opportunity to make use of the CEDIF structure to invest in a local project and receive tax benefits.

- *Proposed Mitigative Measures* – Where practical, the Proponent will utilize local labour and businesses. This is often cost-effective for the Proponent but it also roots the development in the community; indeed it is a community-owned Project.
- *Cumulative Effects* – There are known other works taking place in the vicinity of the site that might act cumulatively to increase the likelihood of a positive effect on the local economy; however, cumulative effects are unlikely to be significant.
- *Significance of Residual Effects* – Local economy is predicted to be positively affected due to Project activities over the life of the Project.

The Project is anticipated to have a significant residual environmental benefit on the local economy; however, it will be small in magnitude, reversible, and local; however, relative to the operating stage, i.e., municipal taxes, the effect will be long in duration. The benefit on local economy is predicted to be minor.

## **6.5. Effect of the Environment on the Project**

Several environmental factors, e.g., fire, extreme weather, including climate change, could have an adverse effect on the Project. These factors have all influenced the design criteria for the WTGs under review for purchase.

Fire and extreme weather could adversely affect the proposed turbines as they could damage the installed facilities, reduce productivity and/or cause the turbines to be shut down. The spatial boundaries for these effects are restricted to the footprint of the proposed WTGs. Temporal boundaries include all Project phases: construction, operation and decommissioning.

Fire and extreme weather events could adversely impact the Project schedule, but such events are likely to be of short duration. The adverse effect is unlikely to be significant. During operation, a fire in the area could be instigated by both natural events, e.g., a lightning strike, or by humans. In addition to temperature related alarms on the turbines and transformers, there are fire watches during the most sensitive dry summer months in the region. It is therefore likely that any fire would be quickly detected and a prompt emergency response instigated. The turbine towers are also sufficiently high that damage to the nacelle is unlikely. Damage to power poles would be quickly repaired.

Extreme weather events, including any such events aggravated by global warming, including ice formation, hail or lightning strikes, could damage the turbines. Due to elevation of the site, sea level rise is not an issue. During extreme high winds, or ice formation, the design is such that the wind turbines will cut out. These factors have been taken into consideration and relatively small losses to productivity are not a concern to the Project. The turbine towers will be equipped with lightning protection, and damage to turbines from such an event is considered a very rare event. The turbines are also designed to withstand severe events including hurricanes. In conclusion, extreme weather events are unlikely to pose a significant adverse effect on Project operation.

The effects of fire and extreme weather events during project decommissioning are likely to be comparable to those described for Project construction. Such effects are unlikely to be significant.

In summary, extreme environmental events are not anticipated to have a significant residual environmental effect on the Project, i.e., the impact is predicted to be negligible.

## 6.6. Summary of Residual Environmental Effects

The following table, Table 6.2 Summary of Residual Environmental Effects, presents a qualitative summary of the effect of each VEC and socio-economic aspect that are affected with the following assessment criteria:

- nature of effect, i.e., positive (+), negative (-), or stated as “No impact” where none predicted;
- magnitude of effect on background levels, i.e., small, moderate or large;
- reversibility of the effect, i.e., reversible (REV) or irreversible (IRR);
- timing of effect, i.e., during construction (short) or operation (long) term; and,
- aerial extend of the effect, e.g., area of construction (local) or watershed (regional).

Based on the prior assessment, the residual environmental effects were predicted. As per below, two are predicted to not be affected (radar and radio signals and fish habitat), two are predicted to have minor effects (ambient noise and migratory and breeding birds), while the others are predicted to have negligible effects, of which one is positive (local economy). As described in Section 3.3, monitoring and follow up initiatives are normally not required where an effect is predicted to be negligible. Where a minor effect is predicted, monitoring and follow up initiatives should be considered.

Table 6.2 Summary of Residual Environmental Effects

	Nature	Magnitude	Reversibility	Timing	Extent	Predicted Residual Effect
Groundwater and surface water	-	Small	REV	Short	Local	Negligible
Radar and radio signals	No impact					None
Ambient noise	-	Small	REV	Long	Local	Minor
Ambient light	-	Small	REV	Long	Local	Negligible
Wetlands and watercourses	-	Small	REV	Short	Local	Minor
Fish habitat	No impact					None
Migratory and breeding birds	-	Small	REV	Long	Local	Minor
Flora and fauna	-	Small	REV	Short	Local	Negligible
Species at risk and of concern	-	Small	IRR	Short	Local	Negligible
Land use	-	Small	REV	Long	Local	Negligible
Aboriginal resources / uses	-	Small	REV	Long	Local	Negligible
Archaeological resources	-	Small	IRR	Short	Local	Negligible
Recreation	No impact					None
Vehicular traffic	-	Small	REV	Short	Local	Negligible
Landscape aesthetics	-	Small	REV	Long	Local	Negligible

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Health and safety	-	Small	REV	Long	Local	Negligible
Local economy	+	Moderate / Small	REV	Long	Regional	Minor

In summary, it can be concluded from this EA that the Project can be implemented without significant long term adverse effects on valued physical and ecological components or valued socio-economic aspects of the environment.

## 7. Mitigative Measures, Follow-Up and Monitoring

The Proponent is committed to planning and executing the PLWF in a sustainable manner – this includes fulfilling its environmental, social and economic responsibilities. The Proponent will honour the commitments made in this EA and will comply with all applicable laws and regulations.

To ensure these commitments are transferred to the contractors, employees and other site personnel, a draft EPP has been developed for the construction and operation phases of the Project (Appendix 3); this will be updated to address comments from regulators, other stakeholders and the public on this EA. Watts Wind is committed to training contractors, employees and other site personnel on the requirements of the EPP in relation to their responsibilities. The main commitments for mitigative measures, follow up and monitoring include but are not limited to:

- Installation of sediment and erosion control measures prior to earth works and maintained during construction, and visual monitoring of receiving water as appropriate until site is stabilized;
- Maintain separation distance well beyond the minimum DNR-identified distance (i.e., 150m) from the fen adjacent to Forked Pond as committed in this EA;
- Implement the mitigation sequence of avoidance, minimization and compensation as per the Nova Scotia Wetland Conservation Policy (2011) in interaction with the small treed/shrub bogs identified on this site; while proposed area of alteration has been minimized to approximately 3500 m<sup>2</sup>, avoidance of these wetlands is not feasible – the Proponent will liaise with NSE and apply for requisite approvals, i.e., Wetland Alteration Approval, complete necessary compensation activities, and ensure approvals are in place before any alteration of wetlands occurs;
- Install culverts as required for access road to facilitate local drainage in small pocket treed/shrub bogs in accordance with pertinent regulations and necessary Wetland Alteration Approval;
- Preparation of a plan for bird monitoring and carcasses searches (bird and bat) and implementation of the plan once approved by EC and CWS;
- Proper handling, storage and disposal of hazardous and non-hazardous wastes;
- Implementation of protocols should an unplanned event occur, such as discovery of suspected artifacts, structures of cultural significance or human remains, unplanned release of deleterious material as per the EPP presented in draft in Appendix 3;

- Continued consultation with the community, the Mi'kmaq and regulators to maintain information flow and open dialogue to ensure that any additional questions or concerns with respect the Project construction and operation are understood and addressed;
- Update to regulators and other stakeholders should any changes be identified to the description of environment and project scope as outlined in this EA to ensure that the analysis presented in this EA report remains applicable;
- Maintenance of all other commitments as laid out in this EA report and compliance with the expected NSE Terms and Conditions of EA Approval; and
- If necessary, development of plans to monitor noise and / or shadow flicker to the satisfaction of NSE if requested by NSE should complaints occur and monitoring be an appropriate component of approach to complaint resolution.

As this is a locally owned and operated project organized as a CEDIF, community outreach is uniquely integrated into the Project. Beyond the consultation already completed and ongoing consultation, i.e., open houses and mail outs, a Project website and signage will be implemented and maintained as part of project construction and operation. This will facilitate communications and provide community members with contact information is questions or concerns arise.

In addition, the Proponent will continue to engage the Mi'kmaq of Nova Scotia via existing contacts made during initial engagement to provide information, continue to offer meetings and answer any questions.

## 8. Closure

The Porters Lake Wind Farm is a community-based project which will provide renewable energy to the distribution grid and local economic benefit with minimal impact to the environment. Upfront planning has minimized environmental effects while maximizing distance from residences and retaining excellent wind regime and moderate construction costs.

Typical construction mitigative measures will result in minimal adverse impact to the environment. Operational impacts are expected to be minimal and follow up and monitoring measures will occur as indicated. A draft EPP has been developed for construction and operation of the Project to ensure the appropriate mitigative measures, monitoring and follow up; this will be finalized prior to construction and submitted to NSE.

As outlined in this EA document, the Project can be executed without significant adverse effects on biophysical VECs and socio-economic aspects. The Proponent is committed to undertaking the Project to the mutual benefit of the investors, the community and the Province while eliminating or minimizing environment effects to the extent possible. This is achievable by adhering to the commitments as laid out in this document, including the EPP, and all pertinent legislation, as well as the future requirements of NSE's conditions of approval and other approvals and permits.

The contents of this Porters Lake Wind Farm Environmental Assessment document are the responsibility of the Proponent. They have been prepared in accordance with the *Environment Act* and its associated regulations.

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Date: November 26, 2014

Signature: 

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