

4. Environmental Setting

4.1. Biophysical

4.1.1. Geophysical

The HWWF site is located on the Chebucto peninsula, 4.5km from the Atlantic Ocean, and in turn included in Nova Scotia's Western Ecoregion. Slight variation in elevation change occur along this ecoregion, tilting towards the Atlantic Ocean; the HWWF site ranges from 50m to 70m above sea level (ASL) (Neily, 2005). The soil conditions associated with the ecoregion vary greatly however knowledge of the Project site suggests deep soils surrounding large boulders near the surface (Neily, 2005). Large granite outcrops and boulders also persist and 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).

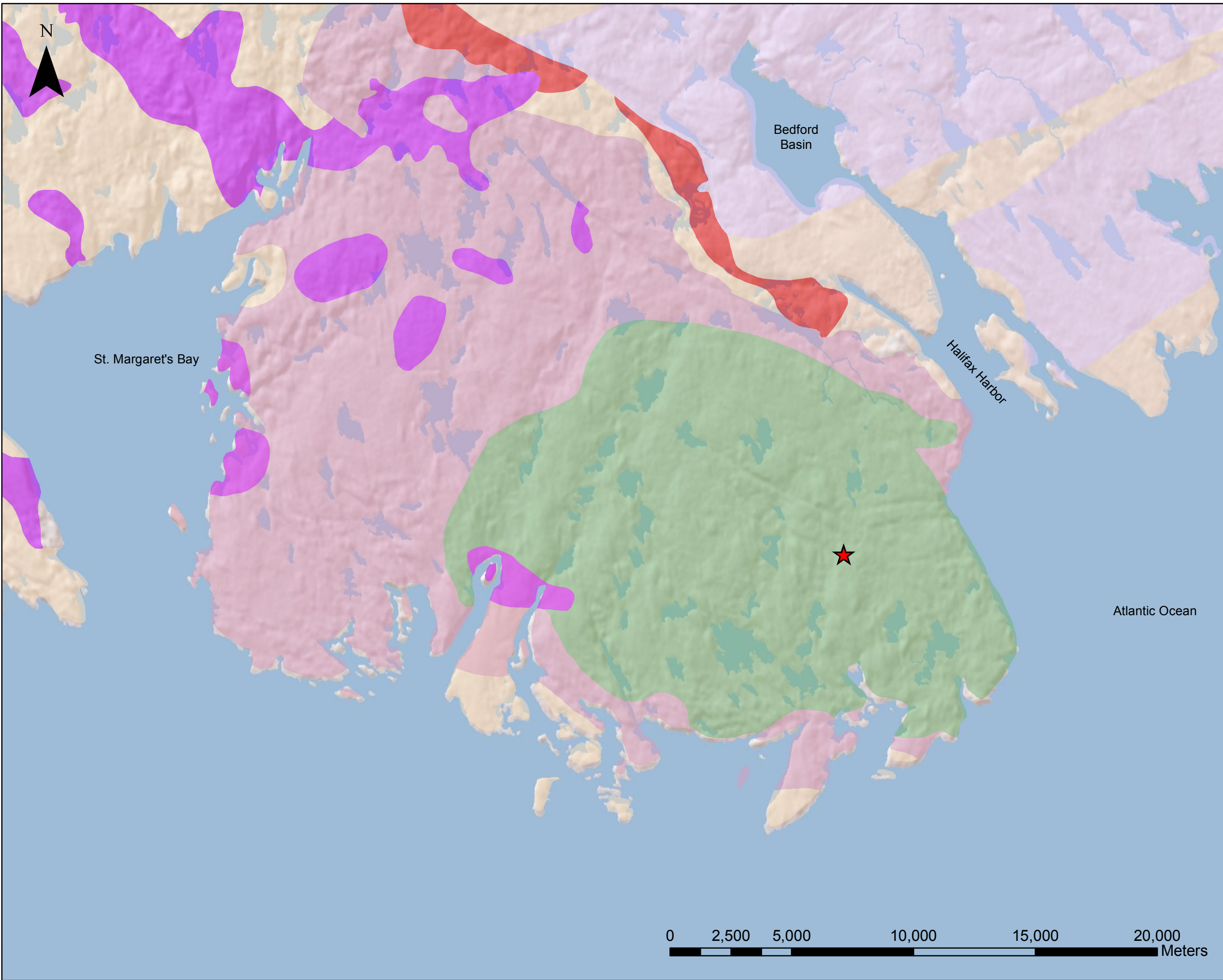
The Project site features Middle-Late Devonian muscovite biotite monzogranite bedrock (M-LDmbmg) and is not sulphide bearing. HWWF is approximately 10km south of the divide for the Halifax Formation bedrock (COMh) which is known for its sulphide bearing materials. Hence, no concern with acid generating bedrock is expected.

Installation of the meteorological tower at the site indicated that bedrock does not exist within two meters of the ground surface. This does not suggest however that bedrock will be avoided throughout the complete Project site. Section 2.5 details the procedures which will be taken should blasting be required for the construction the foundations or along the access road.

4.1.2. Atmospheric

The HWWF is located in what is known as the Atlantic Coastal Region. Climate data was analyzed from an Environment Canada weather station located at Halifax Stanfield International Airport, approximately 38km northeast of the site (Environment Canada, 2012). The climate averages, extremes and months of occurrences can be found in Table 4.1.

The setting is considered rural, with no to low presence of artificial lighting emitting from streetlights or shops. The main source of noise pollution in Harrietsfield and Williamswood emits from road traffic passing through each community on Old Sambro Road.



Legend

- ★ HWWF Location
- COMh
- COMg
- M-LDgd
- M-LDflmg
- M-LDmbmg
- M-LDlmg
- M-LDbmg

Figure 4.1
Geologic Formation

Drawn by: TAM	Date: 3/5/2015
Project #: 045	Scale 1:125 000



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

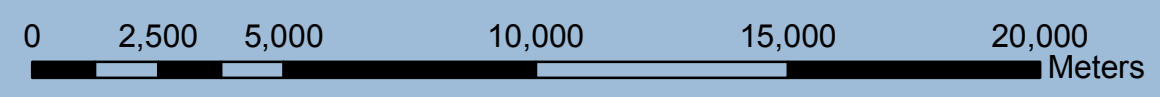


Table 4.1 Climatic Atmospheric Conditions

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 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.

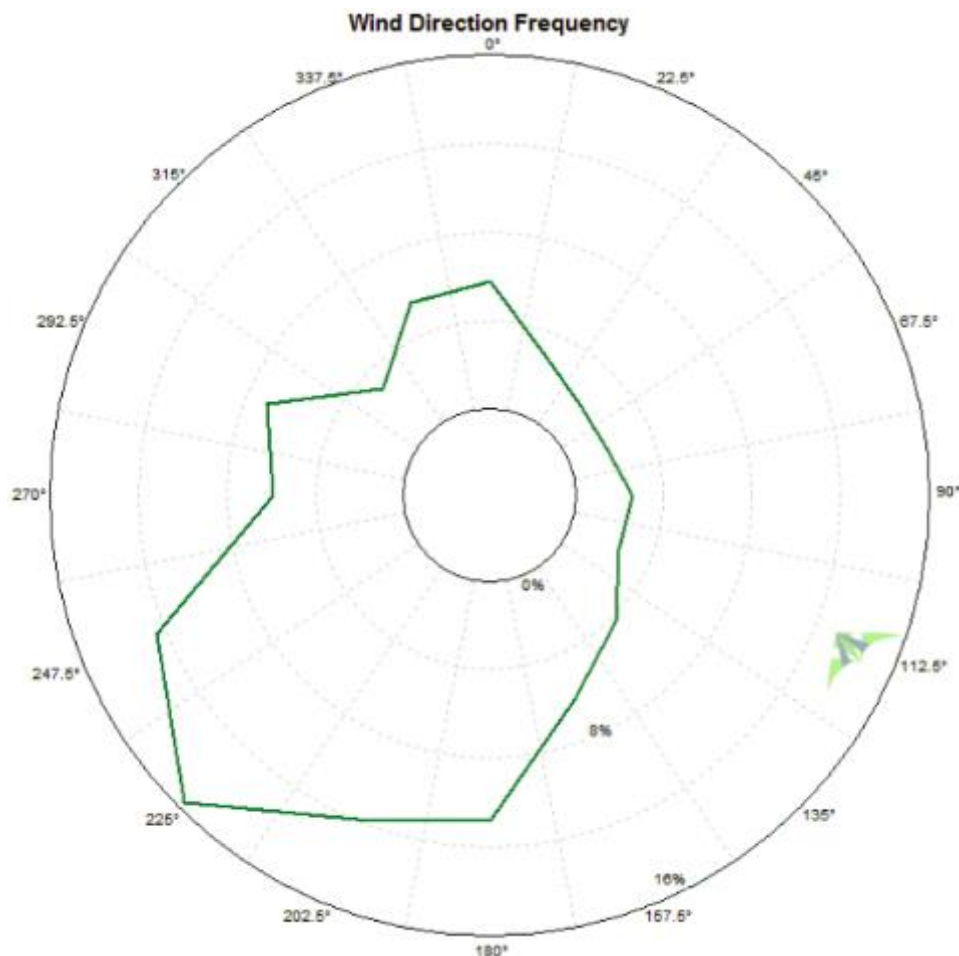


Figure 4.2 Wind Frequency Rose

4.1.3. Groundwater, Surface Water and Wetlands

The HWWF site is within the Sackville Primary Watershed that encompasses the majority of the Chebucto Peninsula. The Project site is within the catchment area of Ocean Run, a watercourse that flows into Grover Lake, some 2km southeast of the site. Upgradient of the site is Governor's Lake (about 2.5km N) and Moody Lake is in a separate catchment area (about 2.65km W).

There are small tributaries with wetland areas and intermittent drainage channels flowing into Ocean Run. After the catchment drains through Ocean Run to Grover Lake and then Sheehan Lake, the catchment joins the Pennant River Sub-watershed area in Grand Lake which exits to the Atlantic Ocean via Pennant River. The coastline is some 4.5km downgradient of the Project site.

There is one watercourse crossing required, i.e., a bridge is proposed to span Ocean Run in one location. No watercourse permits are expected to be required based on a crossing less than 15m and footings remaining out of watercourse. The surface water drainage on site flows in a meandering north to south direction towards Grover Lake, reflecting a low change in slope over the

Project property. No other watercourse crossings are required; however, culverts will be used as appropriate in the access road construction to maintain existing site drainage.

Information from Nova Scotia Well Logs Database on wells located on Fraser Road was reviewed 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 6 feet (ft). Wells depths range from 38ft to 62ft, inferring the depth where water bearing fractures were encountered.

NSDNR wetland inventory maps indicate that wetlands do occur on site with the majority occurring east of the Project site; 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 swamp. Finding additional wetlands, in comparison to NSDNR wetland inventory maps, is not unexpected as the inventory fails to recognize physically smaller wetlands.

The site location is on a rolling terrain with lowland areas where wetlands have been field identified along the proposed access route. The majority of wetlands can be identified as wooded swamps or shrub-treed bogs containing sphagnum mosses over organic soils. The access route was selected in part to minimize wetland interaction; as stated previously, two alterations are proposed (100m² of a treed bog where the access road proposes to cross at the narrowest location; 190m² of a treed swamp at the crossing of Ocean Run).

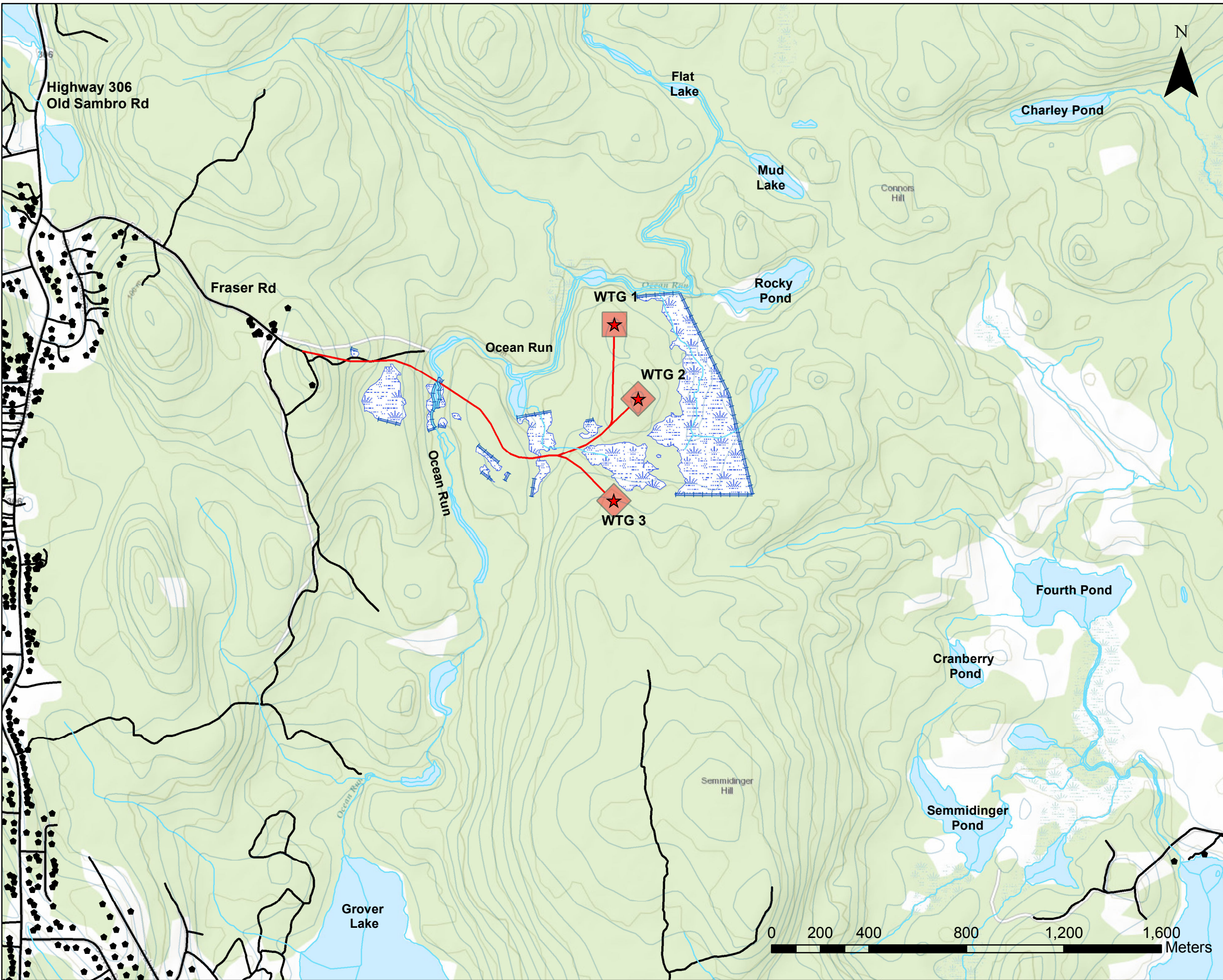
The East Coast Aquatics report which describes and presents additional site figures on surface water hydrology and wetlands found on and near the study area can be found in Appendix 8. Figure 4.3 shows the interaction of the proposed Project with the local hydrology; this is assessed in Section 6.

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 about 3km east of the Project site (a pre-construction migratory bird study in Bear Cove). In addition, these surveys were completed by an experienced birder, Andrew Horn (Halifax).

The HWWF site is located 4.5km inland from the Atlantic Ocean. The site is not located on a landform that would attract migrants on stopover, nor is the site located on known migration corridors or staging areas. No relevant information collected by birdwatchers at the Project site was found by Andrew Horn; local birders tend to focus on the activity closer to the coastline some 4.5km distant.

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



Legend

- Residential Dwelling
- ★ Turbine Location
- Existing Road
- Access Road
- Laydown Area
- Contour Lines
- Watercourse
- Unmapped Wetland Boundary
- ECA Mapped Wetlands

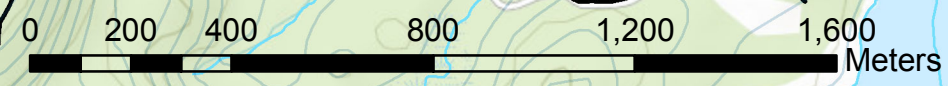
Figure 4.3

Surface Water Hydrology

Drawn by: TAM	Date: 3/2/2015
Project #: 045	Scale 1:10 000



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



specific to the HWWF 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, one Palm Warbler and one unidentified Warbler were noted as possible migrants. No other migrants were encountered that could be unambiguously distinguished from local breeding birds.
- During breeding bird survey, almost all species found were possible breeders because of localized movements, consistent presence and display or breeding behaviours.
- No species assessed as at risk by COSEWIC were found in the summer survey, but species ranked as Sensitive provincially were discovered.
- Breeding raptors on site included a potential Osprey (flying over site, but likely nest nearby) and Red-tailed Hawk.
- During fall transects, no species at risk or high concentrations of birds were found apart from two flocks of double-crested cormorants. Three provincially ranked Yellow species were found: Golden-crowned Kinglet, Grey Jay and a Boreal Chickadee.
- Six species of raptor were seen in fall surveys, limited to one or two individuals on each visit.

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 (three 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).

Results from the bird surveys at the HWWF site resemble the pre-construction spring and breeding surveys completed by Andrew Horn in Bear Cove (2012). This study was included in this EA to support the spring, summer and fall bird studies completed by Andrew Horn at the Project site. Spring migration surveys in Bear Cove encountered three unidentified Warblers and no obvious migrants; six individual raptor species were noted but showed no breeding evidence later in surveys. A widespread number of species were found breeding on site in Bear Cove but no species at risk were found. The spring migration and breeding bird surveys suggested that the Bear Cove site was also had a Site Sensitivity of Low.

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 forests in the area of the Project site identified a majority of mature softwood stands and limited hardwood stands located in the southeastern portion of the Project site. The dominant species of softwoods include Black spruce and Balsam Fir; Red maple and Balsam fir dominated the hardwood species. This forest community has suffered from a significant disturbance event thought to be Hurricane Juan in 2003. The deciduous forest understory consists of common plants such as Wild Sarsaparilla (*Aralia nudicaulis*), low bush blueberry (*Vaccinium angustifolia*), Gold thread (*Coptis trifolia*), Bunchberry (*Cornus Canadensis*) and Wild Lily-of-the-valley (*Maianthemum canadenses*).

The total list of vascular plants containing botanical finds of East Coast Aquatics (July 3, 2014 and August 26, 2014) are provided in Appendix 8. Field surveys completed within the Project study area discovered two rare species of concern; Wiegand's Sedge (*Carex wiegandii*) and Blue Felt Lichen (*Degelia plumbea*). 92 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 red spruce (*Picea rubens*), red maple (*Acer rubrum*), balsam fir (*Abies balsamea*) and yellow birch (*Betula allegheniensis*). 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 Western Ecoregion and situated within the St. Margaret's Bay Ecodistrict (Neily, 2003). Proximities to both the Atlantic Ocean and Bay of Fundy influence significant temperature variations across the ecoregion. Table 4.2 outlines climatic conditions common in the Ecodistrict, which drives flora growth and diversification.

Table 4.2 Climatic Data for Ecodistrict 780

Ecodistrict	Annual Precipitation (mm)	Mean Annual Temperature (°C)	Mean Summer Temperature (°C)	Mean Winter Temperature (°C)
St. Margaret's Bay	1300-1500	6.0	16.5	-3.5

Mainland moose populations persist in the Tobetic 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).

A Mainland Moose survey was conducted at the HWWF as a result of the ACCDC findings and knowledge on Moose populations. Three moose surveys were conducted, consisting of four transects during each visit on April 16th, 2014, February 4th, 2015 and February 18th, 2015. 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. A total of 220 detector nights were sampled with one detector collecting continuously data from sunset to dawn equalling one detector night.

The nearest known bat hibernaculum to the HWWF is Vault Cave, located approximately 106km away in Annapolis Valley. 421 underground abandoned mine openings exist in a 25km radius of the Project site (Fisher et al., 2008). Dr. Hugh Broders concluded that 8 of the abandoned mine openings around the Project site could potentially act as bat hibernacula.

A total of 129 acoustic files recorded were classified as bat-generated ultrasound files. Of the identified echolocation call sequences recorded during the survey period, 97% 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. The other 3% were attributed to the Hoary Bat and the Silver-haired Bat, 2 of each species respectively.

There was no acoustic evidence of bat hibernacula at the HWWF site, nor a significant movement of bats in the area through this study. 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

Desktop analysis on the Project site and surrounding areas was undertaken by East Coast Aquatics to identify key watercourse features in the area, directly and indirectly impacting fish quantity and habitat. The entire HWWF site, including access roads and turbine laydown areas are encompassed in the Ocean Run catchment area, a headwater leading to the Pennant River watershed (NSDNR, 2012). Ocean Run is largely sheltered, with minimal points of direct human access or impact due to landscape and dense forests. Ocean Run joins with the Pennant River and discharges into the Atlantic Ocean at Pennant Cove.

Fish and aquatic habitat in the Project area face many stressors challenging a healthy ecosystem, including: hydrologic change, surface erosion, acidification (acid rock drainage and acid rain) and decreased water quality. Hydrologic change and surface erosion causing sedimentation are identified by the Proponent as having the highest potential to impact aquatic habitat, specifically Ocean Run. The Project is proposed as having one watercourse crossing; the Proponent has identified a narrow water crossing that can be spanned from bank to bank, leaving no structure in

the watercourse. Surface erosion will be mitigated by the Proponent; the final EPP will address all sedimentation issues possibly caused by the Project.

Brook trout and American eel were known to exist in Ocean Run near the access road crossing of Ocean Run. In addition, Small mouth bass are known to exist in at least 188 lakes and rivers across Nova Scotia and the presence of Small mouth bass was documented in a headwater of the Pennant River (LeBlanc, 2010). During the September 15th field surveys, East Coast Aquatics identified Small mouth bass and American Eel in Ocean Run.

East Coast Aquatics utilized electrofishing and angling techniques to confirm the potential of fish in Ocean Run. A total of 11 Small mouth bass were caught and released representing a young class of Small mouth bass, suggesting successful spawning of bass in the catchment. Six American eels were caught and released and an additional 16 eels were observed in the watercourse. Mapping on angling and electrofishing areas are included in ECA's Biological Assessment in Appendix 8.

4.1.7. Species at Risk or of Concern

Desktop data on species at risk in the vicinity of the HWWF 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 both 100km and 5km radii 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 33 species that are known to occur in the general proximity of the Project (100km) and 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 4.3.

Flora

Two botanical studies were completed (July 3, 2014; August 26, 2014) at the HWWF 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.

Table 4.3 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	31; 27.4±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	4; 53.0±0.2	Roost individually in caves, buildings or trees.	Low
Charadrius melodus	Piping Plover	Animal	Endangered	Endangered	959; 9.9±0.5	Nest above the normal high-water mark on exposed sandy or gravel beaches.	Low
Sterna dougallii	Roseate Tern	Animal	Endangered	Endangered	62; 11.4±0.15	Islands off Atlantic Coast, specifically Brothers Islands, Grassy Island, and the Country Island complex.	Low
Calidris canutus rufa	Red Knot	Animal	Endangered	Endangered	583; 14.1±0.5	Migratory stopovers and wintering grounds are vast coastal zones such as sand flats; nest in Arctic.	Low

Caprimulgus vociferous	Whip-Poor-Will	Animal	Threatened	Threatened	12; 4.8±7.07	Brown leaf litter in open forest settings provide ideal breeding and roosting grounds.	Low
Glyptemus insculpta	Wood Turtle	Animal	Threatened	Threatened	125; 10.9±0.1	Moderately moving rivers with sandy soils and along nearby roadbeds.	Moderate
Chaetura pelagica	Chimney Swift	Animal	Threatened	Threatened	120; 10.2±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	623; 4.8±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	444; 4.8±7.07	Nests in riparian thickets, forest bogs, bushy ravines; any moist thickets.	Low
Chordeiles minor	Common Nighthawk	Animal	Threatened	Threatened	315; 4.8±7.07	Open habitats where the ground is free from vegetation (i.e. rocky outcrops)	Low
Contopus cooperi	Olive-sided Flycatcher	Animal	Threatened	Threatened	411; 7.4±7.07	Openings in rivers, swamps and ponds;	Moderate

						favour clear, open areas.	
Dolichonyx oryzivorus	Bobolink	Animal	Threatened	Vulnerable	297; 13.8±7.07	Open grasslands and hayfields.	Low
Histrionicus histrionicus	Harlequin Duck	Animal	Special Concern	Endangered	11; 14.1±2.15	Wintering in offshore islands, headlands and rocky coastlines.	Low
Euphagus carolinus	Rusty Blackbird	Animal	Special Concern	Endangered	165; 4.8±7.07	Prefer wet areas such as bogs, swamps, pond edges and flooded woods.	Moderate
Chelydra serpentina	Snapping Turtle	Animal	Special Concern	Vulnerable	93; 15.1±0.5	Shallow freshwater marshes, slow-moving streams and shallows of lakes and ponds.	Low
Falco peregrinus	Peregrine Falcon	Animal	Special Concern	Vulnerable	12; 27.8±0.5	Nest above steep cliff ledges over open waters.	Very Low
Lynx Canadensis	Canadian Lynx	Animal	Not at Risk	Endangered	2; 67.3±1.0	Moist boreal forests that can support mass amounts of small prey.	Very Low
Alces americanus	Moose	Animal	Not Listed	Endangered	7; 1.5±0.5	Mixed wood forests with wetlands; typically in higher elevations.	Moderate
Coregonus huntsman	Atlantic Whitefish	Animal	Endangered	Endangered	9; 76.3±1.0	Found in Tusket and Petite Riverie watersheds; little known on species.	Very Low

Martes Americana	American Marten	Animal	Not Listed	Endangered	1; 92.2±0.05	Population thought to be strictly confined to Cape Breton.	Very Low
Thamnophis sauritus	Eastern Ribbonsnake	Animal	Threatened	Threatened	350; 80.9±0.1	Lakeshores and wetland habitats.	Very Low
Alasmidonta varlicosa	Brook Floater	Animal	Special Concern	Threatened	5; 57.7±0.01	Freshwater mussel thriving in high relief streams.	Very Low
Emydoldea blandingii	Blading's Turtle	Animal	Endangered	Endangered	840; 89.7±0.01	Moist and wet areas, generally containing emergent vegetation and organic soils.	Very Low
Erioderma pedicellatum	Boreal Felt Lichen	Lichen	Endangered	Endangered	197; 12.5±0.5	Northerly exposed forest slopes in mature forest sites that are also rich in moisture-loving species, such as sphagnum mosses and Cinnamon Fern.	Moderate
Degelia plumbea	Blue Felt Lichen	Lichen	Special Concern	Vulnerable	27; 8.1±0.01	High humid forests, usually around swampy areas and damp valleys.	Moderate
Lilaeopsis chinensis	Eastern Lilaeopsis	Plant	Special concern	Vulnerable	149; 68.8±0.01	Semi-aquatic plant found in the intertidal zone.	Very Low
Lophlola aurea	Goldencrest	Plant	Special Concern	Vulnerable	414; 77.5±1.0	Perennial plant that thrives in wetlands	Very Low

						composed of peat and floating peat mats.	
<i>Thuja occidentalis</i>	Eastern White Cedar	Plant	Not Listed	Vulnerable	11; 14.0±7.07	Located along western Nova Scotia in riparian areas near streams and wetlands.	Low
<i>Lachnanthes caroliniana</i>	Redroot	Plant	Special Concern	Vulnerable	254; 95.5±0.05	Peat, gravel and sandy shorelines, usually grows towards the SW.	Very Low
<i>Scirpus longii</i>	Long's Bulrush	Plant	Special Concern	Vulnerable	24; 93.1±0.05	Hydrophilic plant found in wetlands, typically submerged over winter.	Very Low
<i>Potamogeton pulcher</i>	Spotted Pondweed	Plant	Not Listed	Vulnerable	18; 70.7±0.01	Freshwater aquatic plant thriving in highly acidic, nutrient poor wetlands.	Very Low
<i>Fraxinus nigra</i>	Black Ash	Plant	Not Listed	Threatened	65; 20.6±0.01	Typically grows in bogs, along streams or poorly drained areas.	Very Low

Based on two targeted searches by East Coast Aquatics, two provincially ranked species of concern were identified: Blue Felt Lichen (S2, and listed vulnerable) and Wiegand's Sedge (S3). These are mapped on Figure 3.1; both are outside of the Project footprint and the Blue Felt Lichen was identified incidentally as beyond study area. Despite a targeted survey completed by East Coast Aquatics (with support of Tom Neily) for Boreal Felt Lichen, this species at risk was not found on the Project site.

More information can be found in the East Coast Aquatics reports in Appendix 8. Impact assessment and follow up measures related to species at risk are discussed in Section 6.

Birds

During the pre-construction avian surveys (spring and fall migration and summer breeding), no listed species at risk were identified (despite the specific focus on two species at risk with moderate potential, i.e., Olive-sided Flycatcher and Rusty Blackbird).

Several Provincially Sensitive (NSDNR ranked Yellow) species were found at the Project site and are listed below in terms of sightings:

- Black-backed Woodpecker (spring: 2 of 8 visits; summer: 4 of 6 visits)
- Boreal Chickadee (spring: 2 of 8 visits; ; summer: 1 of 6 visits; fall: 2 of 10 visits)
- Golden-crowned Kinglet (spring: 4 of 8 visits; ; summer: 3 of 6 visits; fall: 3 of 10 visits)
- Gray Jay (spring: 1 of 8 visits; ; summer: 1 of 6 visits; fall: 4 of 10 visits)
- Ruby-crowned Kinglet (spring: 5 of 8 visits; summer: 4 of 6 visits)
- Tree Swallow (spring: 2 of 8 visits; summer: 2 of 6 visits)
- Yellow-bellied Flycatcher (spring: 1 of 8 visits; summer: 3 of 6 visits)

More information can be found in Andrew Horn's report (Appendix 5), including tabulation of number of individuals seen per visit (which were quite low). 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 2015 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 now both listed in Nova Scotia as Endangered. Bat activity recorded at the Project site targeted the *Myotis* spp. as it is typical of many bat studies completed in Nova Scotia.

More information can be found in Hugh Broders report (Appendix 6). Impact assessment and follow up measures related to bats are discussed in Section 6.

Reptiles

In terms of the Wood Turtle, ACCDC reports suggest they are not 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 communities of Harrietsfield and Williamswood are part of Halifax Regional Municipality, District 5. The residents of Harrietsfield and Williamswood live in ribbon developments along Old Sambro, and in small subdivisions scattered throughout each community. The community of Harrietsfield is located approximately 3km northwest of the Project site; 2.5km southwest of the Project site is Williamswood and is the closest community to the HWWF. A community meeting was hosted at the Harrietsfield Williamswood Community Center as discussed in Section 5.1.

There are approximately 18,746 residents living on the Chebucto Peninsula, of which no resident is located within 1km of a WTG that satisfies setback requirements implemented by HRM to mitigate socio-economic concerns. Increasing in distance from the Harrietsfield Williamswood Wind Farm, 12 dwellings located within 1.5km, all located on Fraser Road, and 13 dwellings within 2km. Harrietsfield Elementary School is located approximately 4km northwest of the Project site. Community consultation is discussed in Section 5.1.

The Project site is located on private land with Highway 306 to the west and Highway 349 to the east.

4.2.2. Cultural Resources, Heritage Sites and Archaeological Sites

Strum Consulting (Strum) was retained to perform the Archaeological Screening and Reconnaissance for the HWWF. Strum, in association with Boreas Heritage Consulting Inc. (BHCI), was issued a Heritage Research Permit A2015NS004 by the Special Places Program (SPP). Background research in the Project area was completed by BCHI Senior Archaeologist Sara Beanlands. Field reconnaissance has not been completed on site due to snow cover. Results of the desktop work concluded that there is a low risk for the HWWF and its Project components to impact archaeological resources. Strum made the recommendation to complete an archaeological field reconnaissance once the ground surface is free of snow.

Refer to Appendix 7 for the Strum report. Impact assessment and mitigative measures related to archaeology are discussed in Section 6. The Proponent has committed to completing the field reconnaissance in spring 2015.

4.2.3. Aboriginal Uses and Resources

The Project is located 15km southwest of IR30 Cole Harbour, a satellite community of Millbrook First Nation, 23km south of IR14A Wallace Hills, a satellite community of Shubenacadie First Nation (Sipekne'katik Band), and approximately 60km 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 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 HWWF site. Based on the various components of the background study including environmental setting, Native land use, property history and archaeological potential modelling, the vicinity of the study area is considered to exhibit low potential for encountering Pre-contact and/or historic archaeological resources.

Desktop and field surveys for flora and fauna did not find traditional use resources, such as Black Ash or Mainland Moose, on the Project site; though both were reported by ACCDC to be in the general area. There is known recreational fishing opportunities in Ocean Run (Brook Trout) and the downgradient watershed draining to the Pennant River. The electrofishing and direct angling surveys completed by East Coast Aquatics in Ocean Run in September 2014 caught American Eel and Small Mouth Bass (see Section 4.1.6, Section 4.1.7 and Appendix 8 for more information).

Even though the background and screening process revealed a low potential for Pre-contact and/or historic archaeological resources, Boreas Heritage Consulting Inc. recommends that archaeological reconnaissance be undertaken prior to construction to confirm the findings of the initial screening. The Proponent has committed to completing the field reconnaissance upon snow melt or during a winter thaw.

The interim Archaeological Screening Report has been provided to Sipekne'katik First Nation prior to EA submission for their review at their request. Consultation with the Mi'kmaq of Nova Scotia is further described in Section 5.2 and correspondence can be found in Appendix 12. A discussion of potential impacts on the Mi'kmaq of Nova Scotia are discussed in Section 6.

4.2.4. Sound

The Project site is located in rural HRM between two recognized highways, Highway 306 to the west and Highway 349 to the east. The WTGs at the HWWF are subject to the 1000m setback imposed under HRMs Land Use Bylaws, designed to mitigate environmental concerns such as sound.

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, found in Appendix 13, states that the maximum predicted noise level at the nearest receptor (Receptor R12) will be 34.60dBA, well below the 40dBA guidelines followed by NSE. Impact assessment and mitigative measures are discussed in Section 6.

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 HWWF. Approvals and communication with mandatory agencies can be found in Appendix 2. Impact assessment and mitigative measures are discussed in Section 6.

4.2.6. Ambient Light

Existing ambient light levels in the Project area are expected to be comparable to that found in similar rural communities across Nova Scotia. Other than lighting associated with roads and homes, there are no additional sources of artificial lighting near the Project site.

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 any WTG at the HWWF.

The report can be found in Appendix 13 and concludes that shadow flicker levels are not expected to exceed NSE guidelines. Receptor R1 will receive the largest predicted shadow hours per year, a cumulative 2 hours, 32 minutes. Receptor R12 will receive the largest predicted shadow hours per day at 0.12 hours.

Studies on aeronautical transportation and clearance have been completed prior to environmental assessment submission. All three WTGs will be required by Transport Canada to have aeronautical lighting as per Standard 621. Impact assessment and mitigative measures are discussed in Section 6.

4.2.7. Visual

The Project site is located in a zone greatly impacted by Hurricane Juan, which passed through the area in 2003. The visual aesthetics of the present day site encompasses large numbers of windfalls, stacked upon each other over time. Small granite outcrops and building-sized boulders appear

random and scattered throughout the proposed Project footprint. One watercourse, Ocean Run, transects the proposed access road route and will be spanned with a large bridge structure.

Three separate vantage points were selected to develop representative images of the HWWF site:

- Jacqueline Purcell Drive, Portuguese Cove (viewing northwest)
- Highway 349, Ketch Harbour (viewing northwest)
- Oakwood Drive, Williamswood (viewing northeast)

The vantage points were selected in an attempt to demonstrate the greatest visual impact the HWWF WTGs will have to humans living, or commuting in the area. Impact assessment and mitigative measures are discussed in Section 6.

4.2.8. Recreation

Regional recreational activities exist in the area, such as fishing in the watercourse Ocean Run, hiking, hunting and other outdoor pursuits. In specific, the Project site is a rough terrain with rolling hills and wet lowland areas resulting in less than optimal conditions for many human activities. In addition to this, Hurricane Juan's destruction to fauna hinders access to back lands.

Recreational anglers have utilized Ocean Run as a noted fishing location, observed by a painted rock with "fish river", a well-used foot path and the presence of litter, fishing line and lures on the banks. East Coast Aquatics discovered Small mouth bass and American eel during directed angling and electrofishing surveys, as well as mentioned the potential for Brook trout in Ocean Run.

Terence Bay Protected Wilderness Area and Long Lake Provincial Park are within 5km of the Project site, both with recreational attractions. Both areas provide many opportunities to humans to enjoy the outdoors, such as: hiking, birdwatching, angling, etc. As both areas are significant in size, they provide chances to explore on the Atlantic coast, in the forests or open fields.

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 at this time. The Project site is private land. Impact assessment and mitigative measures are discussed in Section 6.

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.

The Project site is located on the Chebucto Peninsula in the communities of Harrietsfield and Williamswood. The Chebucto Peninsula has a population of 18,746 and is located in rural Halifax, part of Halifax's Mainland South (Stantec, 2013).

Impact assessment and mitigative measures are discussed in Section 6.

5. Consultation

5.1. Community

On August 18, 2014, the Proponent engaged the communities of Harrietsfield, Williamswood and surrounding areas, hosting a community information session. The meeting was facilitated by the Proponent in Harrietsfield at the Harrietsfield Williamswood Community Center, located approximately 3 km northwest of the Project site. The meeting was advertised via individual mailouts to landowners within 2km of the Project, a notice placed in the Chebucto News and by posting on the notice board outside of the Community Center. 83 mailouts in total were delivered to the residents nearest to the HWWF, whom the Proponent believes were well informed of the August 18th community meeting.

During the August 18th information session, the Proponent provided preliminary Project information explaining the proposed location of the HWWF, 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 Harrietsfield, Williamswood and surrounding areas to share thoughts and any concerns with the Proponent.

Of the 83 mailouts sent and additional advertising completed, approximately 18 people were in attendance for the August 18th 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.

Past development in the community, possible increase in wind farm size and noise levels were the main concerns discussed at the August 18th meeting. The Proponent identified and addressed each concern separately during the meeting. Several meeting attendees raised concerns resulting from a past project regarding well water contamination. The Proponent ensured the community members who attended the meeting, and made follow up calls, that the Project will not create a significant negative effect to the community or the environment.

The HWWF is a COMFIT project and is limited in the amount of energy that can be output into the distribution system. The wind farm is proposed as a 4.6MW project, the maximum output possible into the grid. This being said, no future plans to expand this Project are proposed.

Sound levels of WTGs were addressed by the Proponent at the meeting through past experience in developing wind farms. Wind turbine 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.

The Proponent is committed to continuing to engage the residents of Harrietsfield, Williamswood and surrounding areas, and will do so through specified mailouts and via the Proponent webpage (<http://wattswind.com/portfolio/harrietsfield/>), 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 HWWF. 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. 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, and Millbrook First Nation, as well as the governmental department of the OAA. Table 5.1 outlines communications and meetings that were held between the Proponent and various First Nation representatives. Communication with OAA is presented in Section 5.3.2.

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 th , 2012	Informational letter and documentation	Addressed to Eric Christmas; Twila Gaudet	Initial Project information	N/A
Kwilmu'kw Maw-klusuaqn (KMK)	Wednesday June 4 th , 2014	Initial contact	Twila Gaudet	Request for meeting to discuss COMFIT projects	N/A
Sipekne'katik First Nation	Friday August 22 nd , 2014	Informational letter and documentation sent to Band Chief	Addressed to Chief Rufus Copage	See Appendix 12	N/A
Kwilmu'kw Maw-klusuaqn	Wednesday September 10 th , 2014	Follow-up to June 4 th email	Twila Gaudet	Provided COMFIT project details; request for	N/A

(KMK)				meeting	
Kwilmu'kw Maw- klusuaqn (KMK)	Thursday October 23 rd , 2014	Update on EA progress	Twila Gaudet	Offer to meet on COMFIT Projects, offer to provide Project Description	N/A
Sipekne'katik First Nation	Thursday October 23 rd , 2014	Email to Jennifer Copage	Jennifer Copage	Provided Project Description to Sipekne'katik	N/A
Sipekne'katik First Nation	Monday December 1 st , 2014	Letter from Sipekne'katik on HWWF	Chief Rufus Copage	Details on EA submission, Archaeological Report	N/A
Sipekne'katik First Nation	Wednesday December 10 th , 2014	Follow-up to letter from Sipekne'katik First Nation	Addressed to Chief Rufus Copage	Providing information on timing of EA submission, Archaeological Report request	N/A
Sipekne'katik First Nation	Wednesday February 18 th , 2015	Email to Sipekne'katik First Nation	Addressed to Chief Rufus Copage	Proponents plan for EA submission, request to meet	N/A
Sipekne'katik First Nation	Monday March 2 nd , 2015	Email to Sipekne'katik First Nation	Addressed to Chief Rufus Copage	Provided Archaeological Report for review, as requested	N/A
Millbrook First Nation	Wednesday March 4 th , 2015	Email to Millbrook First Nation	Addressed to Chief Bob Gloade	Provided information on timing of EA.	N/A

As noted in Table 5.1 above, engagement with Shubenacadie First Nation (i.e., Sipekne'katik) has been productive and ongoing. In a letter on September 10th, 2014 from Chief Rufus Copage, Sipekne'katik provided information regarding background information on their history, importance of the environment and Sambro Indian Reserve (IR) #15 Land claim in the vicinity of the proposed Project (5km from HWWF). In a follow up letter dated December 1st, 2014, Sipekne'katik requested information on whether an Environmental Assessment would be required for the Project and the expected date of registration. In addition to this, Sipekne'katik also requested the Archaeological Report to review prior to EA submission.

Watts Wind 4LP has and will remain open to meet with all First Nations throughout the EA process. No additional concerns have been discussed.

5.3. Regulatory

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

5.3.1. Municipal Consultation

The Proponent has engaged the office of Councillor Stephen Adams during the Summer 2014, providing the Project's proposed site map, community information session presentation and preliminary project details. The Proponent has also requested meetings with the Councillor and looks forward to a future meeting.

On numerous occasions, the Proponent has conversed with a development officer in HRM's Planning District 5 to discuss the HWWF. 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 of approval 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 HWWF project. The Proponent has either met or corresponded with NS Department of Energy (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

Date	Attendees	Method of Contact	Topic of Conversation
June 19, 2014	Mark Elderkin (NSDNR)	Email	Timing of rare plant surveys for COMFIT
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	Meeting time discussed to talk on COMFIT Projects
September 17, 2014	Beata Dera (OAA)	Email	Provided Project Description of HWWF
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)	Email	Mapping sent prior to meeting at NSE Offices
October 8, 2014	Mark Elderkin (NSDNR), Bridget Tutty (NSE)	Meeting at NSE Offices	Discussion on preliminary WTG siting, water crossing and design
February 11, 2015	Helen Yeh (NSE EA)	Informal Meeting as NSE Offices	Discussion on Project prior to EA submission

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

5.3.3. Federal Consultation

The Proponent has consulted with various Federal entities regarding the construction of the HWWF. Canadian Coast Guard, NAV Canada, Transport Canada and DND were all contacted regarding the development of the HWWF. Environment Canada (via CWS) will be contacted for bat and bird monitoring plan approval 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 HWWF 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 residents in the local area have private wells, e.g., Fraser Road. The ground and surface water interface on the site shows predominantly in the wetland features that formed in low lying areas of the rolling terrain. Accordingly, quality and quantity of both ground and surface water have been identified as a VEC.

The site is within the Governors Lake-Ocean Run river system which is a watershed area largely untouched by land development. This is within the Sackville Primary Watershed, and Pennant River sub-watershed which drains generally southward to Pennant River. Pennant River exits into Pennant Cove near Sambro toward the coast some 4.5km distant. Nearby lakes include Governor Lake, Moody Lake, and Grover Lake, the latter is about 2km south east and is directly downgradient of Ocean Run.

As shown on Figure 4.3, the surface water on the Project site drains to Ocean Run which is proposed to be spanned by a permanent bridge. The site is within the Ocean Run catchment area; portions drain direct to Ocean Run while some of Project footprint, e.g., the turbine pads, drains to the north and/or west toward nearby small wetlands and tributaries which lead to Ocean Run.

The closest residential wells are greater than 1300m from the nearest proposed turbine and about 100m from the proposed access road upgrade off of Fraser Road.

Table 6.1 Potential Linkages of Project and the Environment

	Site Preparation and Construction								Operation & Maintenance			Decommissioning		
	Clearing 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
Physical Components														
Ground and surface water	•	•	•	•			•	•			•	•	•	•
Radar and radio signals									•					
Ambient noise	•	•	•	•	•		•		•			•	•	
Ambient light						•			•					
Ecological Components														
Wetlands and watercourses	•	•	•	•			•	•			•			•
Fish habitat							•			•				•
Migratory and breeding birds	•	•							•					
Flora and fauna	•	•										•		
Species at risk & of concern	•	•							•					
Socio-economic Aspects														
Land use	•								•				•	
Aboriginal resources / uses	•	•	•	•										
Archaeological resource	•	•	•	•										
Recreation	•								•				•	
Vehicular traffic			•			•				•				
Landscape aesthetics	•					•			•					
Health and safety							•	•		•				•
Local economy	•	•	•	•	•	•	•		•	•		•	•	

A significant environmental effect would result if a substantive change attributable to the Project could be identified in water quality or quantity in Ocean Run, nearby wetlands or downgradient Grover Lake, or in groundwater immediate to the site, including the closest residential wells along Fraser Road.

- *Boundaries* – Spatial bounds include the local area, i.e., Ocean Run, small wetlands near and within the Project site and immediate down gradient area toward Grover Lake, as well as groundwater local to the site, e.g., at Fraser Road as residents have wells. 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 water quality include disturbance of sediments during the construction of the WTGs, the access road and the utility line. Pathways for ground and surface water effects are potential for accidental release of hazardous materials such as fuels, oils and lubricants during all phases of the Project.
- *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 from construction of the WTG pads and the access road;
 - Design permanent bridge spanning Ocean Run at its narrowest location to minimize impact to existing watercourse and be in line with the October 2014 procedure and regulations, including any approval required or notification required prior to bridge construction under *Activity Designation Regulations*;
 - Preliminary design of the span is 9.5m and will not be within the watercourse; this will be confirmed with the final design, however, no approvals are expected to be required based on the preliminary design.
 - Prepare detailed plan for construction to maintain drainage as per existing conditions to ensure minimal effect on local hydrology, including appropriately sized culverts under access road, specifically related to building road over the treed bog (see Section 6.3.1);
 - Define specific approach for work near or in wetlands including handling of surface water and sediment and erosion control and ensure all work in wetlands in accordance with NSE approvals under *Activity Designation Regulations* (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;
- Grade and stabilize the access road and WTG pads to 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; and
- complete in accordance with Regulations and do a pre-blast survey as required, i.e., within a minimum of 800m of proposed blast

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, as well as other wind energy facilities as per Section 2.10. Given the relatively small scale of this existing 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. Design and implementation will ensure existing local hydrology maintained using appropriately designed culverts and bridge span. 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; in any case, pre-blast surveys will be completed as appropriate and any documented effect will be rectified with well owner.

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. No permanent residual effect is anticipated on local hydrology or hydrogeology. 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 1300m of the three proposed wind turbines; within 1500m, there 12 receptors, and there are 13 receptors within a 2km radius (as per 4.2.1). Beyond residential receptors, there is an elementary school in the community but at a distance of 4km.

As shown in Appendix 13, conservative modeling was completed for the three 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 0.7) and topography data. While the specific WTG model has not been selected for the HWWF, 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 HWWF is 34.6 dBA at the closest receptor (on Fraser Road).

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, including construction but with a 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, e.g., those on Fraser Road; 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 3 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 30km of the site, there are four small wind energy projects existing or approved, as described in Section 2.10; these are too far to act cumulatively as the closest is 9km from the HHWF site (i.e., Terrence Bay, a 7.2MW project). 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 30km of the site, there are four small wind energy projects that are existing or approved, as described in Section 2.10, which are 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 three 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, shown on Figure 4.3, and detailed in Appendix 8.

Field surveys were completed of the study area in spring and summer 2014 during appropriate windows. 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. Liaison between the wetland consultant and the project developer occurred to optimize the locations of the WTGs and access road was completed in an iterative process (as described in Section 2.4). The objective was to minimize direct and indirect disturbance to wetlands and watercourses. The design changes resulted in over 80% reduction in proposed wetland area for alteration, and spanning of a watercourse with a permanent bridge outside of its banks.

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

- One watercourse, Ocean Run, is proposed to be spanned as part of this proposed access road associated with the Project. As discussed in Section 6.2.1, Ocean Run flows to Grover Lake which drains toward the coast some 4.5km distant of the Project site. The proposed bridge is anticipated to span the watercourse, i.e., no work will occur in the bed of Ocean Run. Detailed engineering is underway for this permanent bridge which is now proposed at 9.5m in length, but may change as part of detailed design.
- No identified Wetlands of Special Significance (WSS) are in vicinity of the site. The closest provincially-identified WSSs occur in separate and defined catchment areas about 3.3km to the north and 5.4km to the south of the site.
- One treed bog needs to be crossed as part of the access road; the area of proposed disturbance is about 100m². Iterative design and field work was completed in the summer and fall to ensure that this is unavoidable and the area of disturbance minimized (see Section 2.4 and Section 4.1.3).
 - The crossing is at the narrowest point of a shrub-treed bog. 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.
 - A Yellow-ranked plant was identified in this coniferous bog, Wiegand's Sedge (*Carex wiegandii*), however, it is beyond 50m upgradient of the proposed access road.

- Approval will be sought for work to alter this wetland under the Activity Designation Regulations.
- Field surveys informed a functional assessment which indicated that this wetland provided moderate ecosystem services with more value on aquatic and terrestrial support than fish, carbon, hydrologic or water quality.
- One riparian treed swamp is proposed for alteration near the permanent bridge proposed to span Ocean Run. The alteration is under 10m wide and an area of 190m². No species at risk or of concern were identified in this wetland. The area has been minimized and may be further optimized to minimize or eliminate alteration to this treed swamp.
 - The alteration as proposed falls under the exemption of linear development in the Nova Scotia Wetland Conservation Policy; however, the alteration of two wetlands with the access road requires compensation under the Activity Designation Regulations.
 - Field surveys informed a functional assessment which indicated that this wetland provided moderate ecosystem services with more value on aquatic and terrestrial support than fish, carbon, hydrologic or water quality.
- Several small wetlands were identified through mapping and field studies. These were delineated within the Project footprint as per Figure 4.3 and described in Section 4.1.3. All three WTGs are beyond 50m from the edge of these wetlands. Field surveys informed a functional assessment which indicated that these wetlands provide low-moderate ecosystem services.
- Overall East Coast Aquatics determined that the wetlands proposed for alteration are typical of numerous other encountered at landscape and regional scales.
- Pending successful release from the EA process, any required application will be submitted to NSE for under the Activity Designation Regulations. This may include bridge spanning Ocean Run if span is larger than 15m (now proposed as 9.5m) or the wetland alteration for the access road in the treed bog. At present, it is understood that one Wetland Alteration Approval is required for the 100m² alteration of the treed bog and the 190 m² alteration of the wooded swamp; however, no approvals are required based on current design and field work completed for spanning Ocean Run. It is understood that the loss of wetlands at the HWWF may result in a need for compensation to be facilitated by the Proponent should an approval be required.
- 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 areas 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 Ocean Run nor Grover Lake.

There is no direct alteration of watercourses as the proposed bridge is expected to span Ocean Run (i.e., no alteration to the stream bed). However, should direct alteration be unavoidable once final design is completed, an application would be made and an approval sought, or a notification, as appropriate under the current Activity Designation Regulations and associated Watercourse Alteration Program.

Two small areas of wetland alteration are unavoidable but are minimized with access road routing (i.e., 190m² of a small riparian treed swamp and 100m² of a treed bog). 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. Drainage would be maintained with culvert to maintain existing site hydrology. Approval will be sought and received before any work begins as defined in the Province's Activities Designation Regulations and the Nova Scotia Wetland Alteration Policy. It is anticipated that one approval will be required for the 290 m² for the access road.

- *Proposed Mitigative Measures* – Related to effect on wetlands and watercourses during construction, the mitigations include all those committed in Section 6.2.1 regarding protection of surface water and ground water, with special emphasis on the following:
 - Siting of the WTGs and laydown areas greater than 50m from watercourses and wetlands;
 - Design and construction of bridge spanning Ocean Run outside of stream bed if possible and appropriate approval application or notification as required under the October 2014 procedures and Activity Designation Regulations;
 - Delineating limits of work for access road (upgrade and construction) and construction of turbine laydown areas / pads to assist the Contractor to avoid

- sensitive areas and ensure commitments in this EA and the final EPP are maintained;
- Ensuring limits of work in the treed bog is of specific importance due to the presence of a species of concern (yellow ranked Wiegand's Sedge) more than 50m upgradient from the proposed alteration.
 - Design and 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, surface water handling and hazardous materials handling and management as per EPP to protect downgradient water quality;
 - All site work will be in compliance with 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; 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.
- *Cumulative Effects* – There is land development (rural residential) as well as small wind energy projects in the watershed of the Project site. While there are small alterations proposed to wetlands, the wetlands are lower to moderate functionality and similar to many others in the local and regional area. 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 to the extent practical. Wetland alteration has been minimized in the proposed Project footprint (i.e., 290 m² in total) and one watercourse crossing is proposed via a complete span of Ocean Run. NSE will be provided with additional detail on the proposed bridge and construction methods, and all work will be completed as per Provincial requirements, including any approvals as necessary under the *Activity Designation Regulations*.

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 and local; while the effect is not reversible or short term to that wetland itself, it is so small that one falls within the exemption of the Wetland Conservation Policy and the other is 100m². No effect is predicted to watercourses as the bridge is planned to span the watercourse. The environmental effect on wetlands and watercourses as a VEC is predicted to be negligible.

6.3.2. Fish Habitat

The Project site is within a watershed containing fish habitat, i.e., the Pennant River sub-watershed. The watercourse, Ocean Run, drains to Grover Lake. Brook Trout has been identified in this sub-watershed, as well as American Eel and Small mouth Bass. The watershed drains generally south toward the coast. During field work (electrofishing and directed angling) in area, these fish were observed (see Appendix 8).

The fishery is protected under the Federal *Fisheries Act*, and it is valued by recreational fishers and aboriginal communities should the area be used traditionally. 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 Ocean Run and Grover Lake.

- *Boundaries* – Spatial bounds include the catchment area draining into Ocean Run from the Project site and Grover Lake as it is within 2km downgradient. The temporal boundary is primarily during construction, as well as to a much lesser extent operational and decommissioning activities.
- *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 (within 4.5km) and proximate various lakes and wetlands. Desktop and field work was completed in 2014 in spring, summer and fall by Andrew

Horn as discussed in Section 4.1.4, with some additional spring and summer field work completed on a nearby site in 2012 (Bear Cove at a distance of about 3km). 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).

A general summary of these studies completed at the Project site is below, but specific key points were made in Section 4.1.4 (additional detail is found in Andrew Horn's reports in Appendix 5):

- Spring migration survey indicated few movements over the landscape; however a fall migration survey was recommended, as well as specific searches for higher potential species at risk (i.e., Olive-sided Flycatcher and Rusty Blackbird) in the breeding bird survey. Four species of raptors were seen but in low numbers, including a pair of Red-tailed Hawks with nearby probably nest.
- The breeding bird survey revealed many species that were all possible breeders but none listed as at risk or of concern by COSEWIC; however, several birds were found that are provincially ranked as sensitive (as per 4.1.7). Breeding raptors included Osprey and Red-tailed Hawk; both with probable nests nearby. Despite specific methodology, no signs of higher potential species at risk.
- Fall migration survey did not show indication of heavy movements of migrants through the area, which suggested that the site has a very low sensitivity for birds during migration; however, the Chebucto Peninsula can be used as a "short cut" for those following the coast in certain conditions. Six species of raptors were seen but only as one or two individuals per day.

The Project site is not near known staging areas, recognized important areas, raptor concentrations, or migration corridors, nor does it have a topographical feature, such as a ridge, bluff, or coast that might concentrate migrants. However, in terms of its value for breeding birds, the site's most distinctive ecological feature is its mature conifer forest where several provincially sensitive (yellow-ranked) species breed. The total area of impact for this Project is 6.5ha including turbine pads, access roads and other ancillary features.

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. Nova Scotia has identified sensitive species of concern, as well as listed species. There are sensitive species known to breed in the Project area. 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 6.5ha within an area already disturbed by hurricane force winds;
 - Minimizing wetland impacts to small treed swamp and treed bog (under 190m² and 100 m², respectively);
 - Clearing during fall or 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 are three existing wind energy projects some 30km away from the HWWF as noted in Section 2.10, plus a planned wind energy project within 10km (Terrance Bay). There could be some potential for cumulative interaction of these operating WTGs on birds; however, 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 wind blown 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., about 6.5 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 nearby roads, including Highway 306.

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, as well as nearby small wind energy projects. 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 5km identified records for 8 floral species to be of conservation concern with none listed federally or provincially.
- Based on ACCDC data beyond 5km and known habitat on the site, the Project site was studied specifically for Boreal Felt Lichen given its moderate likelihood of being found in the

study area. However, Boreal Felt Lichen was not found in the targeted survey completed by East Coast Aquatic (with support of Tom Neily).

- One rare vascular plant species was observed during the surveys in a coniferous bog, Wiegand's Sedge (*Carex wiegandii*) which is ranked as S3. This species was found upgradient of the proposed access road which crosses the same treed bog by a distance of over 50m.
- One rare lichen, Blue Felt Lichen (*Degelia plumbea*), which is ranked as S2 and listed as Vulnerable provincially, was observed in a wetland setting on a red maple and presence of this species indices a potential for a rich lichen diversity. The wetland with the Blue Felt Lichen is avoided by the access road.
- No other rare, endangered floral species or floral species of conservation concern were identified in the surveys.

Birds

- ACCDC data within 5km identified records for 6 bird species listed provincially or federally, which are records of birds over 4.5km distant, presumably at the coastline.
- Despite specific methodology to identify two listed species with moderate potential on the Project site (i.e., Olive-sided Flycatcher and Rusty Blackbird), no species at risk were identified during spring, summer or fall surveys.
- Seven provincially ranked species (NSDNR ranked yellow) were found in some of the site visits over spring, summer and/or fall (i.e., Black-backed Woodpecker, Boreal Chickadee, Golden-crowned Kinglet, Gray Jay, Ruby-crowned Kinglet, Tree Swallow and Yellow-bellied Flycatcher); however, their numbers are relatively low.

Mammals

- No evidence of moose were found based on lack of pellets and no evidence of browsing in spring 2014 and winter 2015 surveys.
- Closest known bat hibernacula are beyond 25km (i.e., Vault Cove over 100km distant). Of the abandoned mines, it was determined that 8 of the abandoned mine openings around the site could potentially act as bat hibernacula.
- Based on three bat detectors running continuously from August 1, 2014 through to September 26, 2014 and two detectors running into October and November, 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, the levels are comparable to

2013 levels and as expected for a forested ecosystem in this region. 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 125 records all within about 11km of the site (i.e., no records are within 10km radius); it has moderate potential for breeding within banks of tributaries near the Project site and also gravelly road shoulders 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 three WTGs are proposed to be located and the Project’s ancillary features (such as access road with utility line) 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 with potential to interact with the proposed Project. These interactions are as follows:
 - *Plants*: No listed floral species were identified in the early and late season site visits, except Blue Felt Lichen which was noted incidentally and is in a wetland beyond the Project footprint. One provincially ranked species was identified in the study area, i.e., Wiegand’s Sedge (S3). While not within the Project footprint (beyond 50m); the Wiegand’s Sedge is in same treed bog proposed for alteration, it is well beyond 50m away from edge of access road and upgradient from proposed alteration.
 - *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., about 6.5 ha of which 0.03 ha is proposed for alteration of a treed swamp and treed bog). In terms of Project operation, there are potential interactions, i.e., direct effect of collisions. Six species of concern were noted during field work but in low numbers, and WTG blade tips are beyond 50m from any wetland edge; 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. Data shows significant reductions due to white-nose syndrome but typical of post-2013 data and known hibernacula are more than 100km away though there are 8

potential hibernacula in abandoned mine openings in a 25km radius. While potential interaction is considered low, there is raised uncertainty and heightened concern due to white-nose syndrome.

- *Reptiles*: There is one proposed watercourse crossing (Ocean Run via a permanent bridge span that does not propose to alter watercourse). Potential interaction with Wood Turtle also exists during construction of access road by upgrades of existing road.
- *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 and Wood Turtle nesting season (late May - early July), as well as defining limits of work;
 - Maintain existing site hydrology while upgrading existing access road and construction of new access road and the WTG pads with special attention to alteration of the treed bog which has a provincially ranked (S3) species (Wiegand's Sedge) beyond 50m upgradient of proposed alteration; and
 - As per the EPP, education of the Project Contractor on the importance and the potential presence of species at risk and of conservation concern.

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 near the communities of Harrietsfield and Williamswood with rural residential development nearby along and off of Highway 306 (Old Sambro Road) as well as nearby Fraser Road off of the Highway. The existing land uses of the Project site is an upland forest that is on private land. The development density is quite low in keeping with the rural character of the area. There are no residential properties within 1300m of the proposed WTGs, and a total of 13 dwellings within 2km (of which 12 dwellings are within 1.5km) as presented in Section 4.2.1. In terms of the local community, there is a reasonable expectation of enjoyment of property on surrounding land; this is valued by the community. Terrance Bay Protected Wilderness area is within 3km of the site while Long Lake Provincial Park is about 5km north of the site.

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 existing wind turbines some 30km away from the HWWF and a planned wind energy project within 9km 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 and 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. While there is potential for gathering of fish resources in Ocean Run and waterbodies downgradient of the Project site, there is no predicted effect on water quality downgradient watershed from the proposed Project (as described in Section 6.2.1). Further no known traditional use floral or faunal species are known on the Project site (e.g., Moose or Black Ash).

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 intent to meaningfully consult with the Mi'kmaq on decisions that impact natural resources. The Project is on private land and is considered a relatively low impact activity.

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 as described in Section 4.2.2 (desktop only to date), the Project site is considered low potential for encountering Pre-Contact artefacts. As per Proponent's commitment, a reconnaissance will be completed in early spring (as soon as snow cover clears) to verify that potential is low.

- *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. Specifically the Proponent has committed to completing the archaeological study (i.e., the field reconnaissance) in the early spring (as soon as snow melt allows) and to completing any follow up work should it be recommended by Boreas Heritage and/or Communities, Culture and Heritage. Further, follow up consultation is planned with the nearby Sipekne'katik Banda and Millbrook First Nation, 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 desktop archaeological assessment; this will be confirmed with follow up field reconnaissance.

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 interim archaeological study completed (i.e., desktop only to date), 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* – As the field reconnaissance was not completed due to heavy snow cover, the Proponent commits to this and proposes that its completion be a condition of release from the EA process. This will be completed in early spring (as soon as conditions allow); this allows sufficient time for review by Communities, Culture and Heritage staff and completion of any follow up work if required before planned construction start in September 2015. 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 interim archaeological assessment, which is the anticipated outcome of the pending field reconnaissance based on desktop work completed and experience of the consulting archaeologist.

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 private land. There are no existing trails of the proposed Project site; however, an unofficial footpath has been observed along Ocean Run, as well as presence of litter and fishing lines/lures along the banks. Recreational fishing (angling) is known to occur and was observed in Ocean Run. Recreational activities do also exist in the broader area, i.e., on a watershed scale as briefly described in Section 4.2.8, as part of Terrence Bay Wilderness Area and Long Lake Provincial Park. 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 east of Highway 306 (Old Sambro Road) and Fraser Road, which 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 45 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 three proposed WTGs are set near the communities of Harrietsfield and Williamswood up on a knoll with an approximate maximum elevation of 60-70m ASL. There are rural residential neighbours beyond 1300m (i.e., 12 are within 1500m which are along Fraser Road).

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 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 constraints; 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 hurricane damage (blow over). 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 three 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	IRR	Long	Local	Negligible
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
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 HWWF 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:

- Complete field reconnaissance by a qualified archaeologist in early spring (upon snow clearing) under existing Permit to verify that there is low potential for archaeological resources to be disturbed by Project activities as per recommendation in Appendix 7. Share complete report with the Province, Sipekne'katik First Nation and Millbrook First Nation, and the KMK. Complete any follow up recommendations from the additional reconnaissance (though low potential). Ensure that the report is accepted by Communities, Culture and Heritage before any construction activity begins.
- Design and installation of the bridge over Ocean Run to span the watercourse and not disturb its bed. Any approval or notification will be completed prior to this work as per the October 2014 Watercourse Alteration Program and in compliance with the Activity Designation Regulations.
- 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 of 50m from blade tip to adjacent wetlands.
- Implement the mitigation sequence of avoidance, minimization and compensation as per the Nova Scotia Wetland Conservation Policy (2011) in interaction with the treed swamp and treed bog identified on this site as requiring an unavoidable alteration by the access road. Proposed linear alteration of the treed swamp and treed bog has been minimized to approximately 290 m². The Proponent will liaise with NSE and apply for requisite approvals if required, i.e., Wetland Alteration Approval under the Activity Designation Regulations, complete necessary compensation activities if required, and ensure requisite approvals are in place before any alteration of wetlands occurs.

- Clearly define limits of work in all areas with special attention to the area of proposed alteration of the treed bog as Wiegand's Sedge (*Carex wiegandii*) was identified upgradient of the Project footprint (beyond 50m).
- Install culverts as required for access road to facilitate and maintain local drainage with emphasis on retaining existing localized drainage patterns, especially in terms of nearby wetlands.
- Clear during fall or winter months to avoid nesting timeframes for most birds, i.e., before April 15 and after August 31.
- Preparation of a plan for bird monitoring and carcasses searches (bird and bat) and implementation of the plan once approved by EC and CWS (i.e., prior to construction).
- 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, the EPP when finalized, and compliance with the expected NSE Terms and Conditions of EA Approval.
- 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 Harrietsfield Williamswood 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 Harrietsfield Williamswood 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: April 6, 2015

Signature: 

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Title: President

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