

3.0 APPROACH TO THE ASSESSMENT

3.1. Scoping and Bounding of the Assessment

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

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

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

Table 3.1 Identified VECs and Aspects

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

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

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

3.2. Desktop and Fieldwork Completed

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

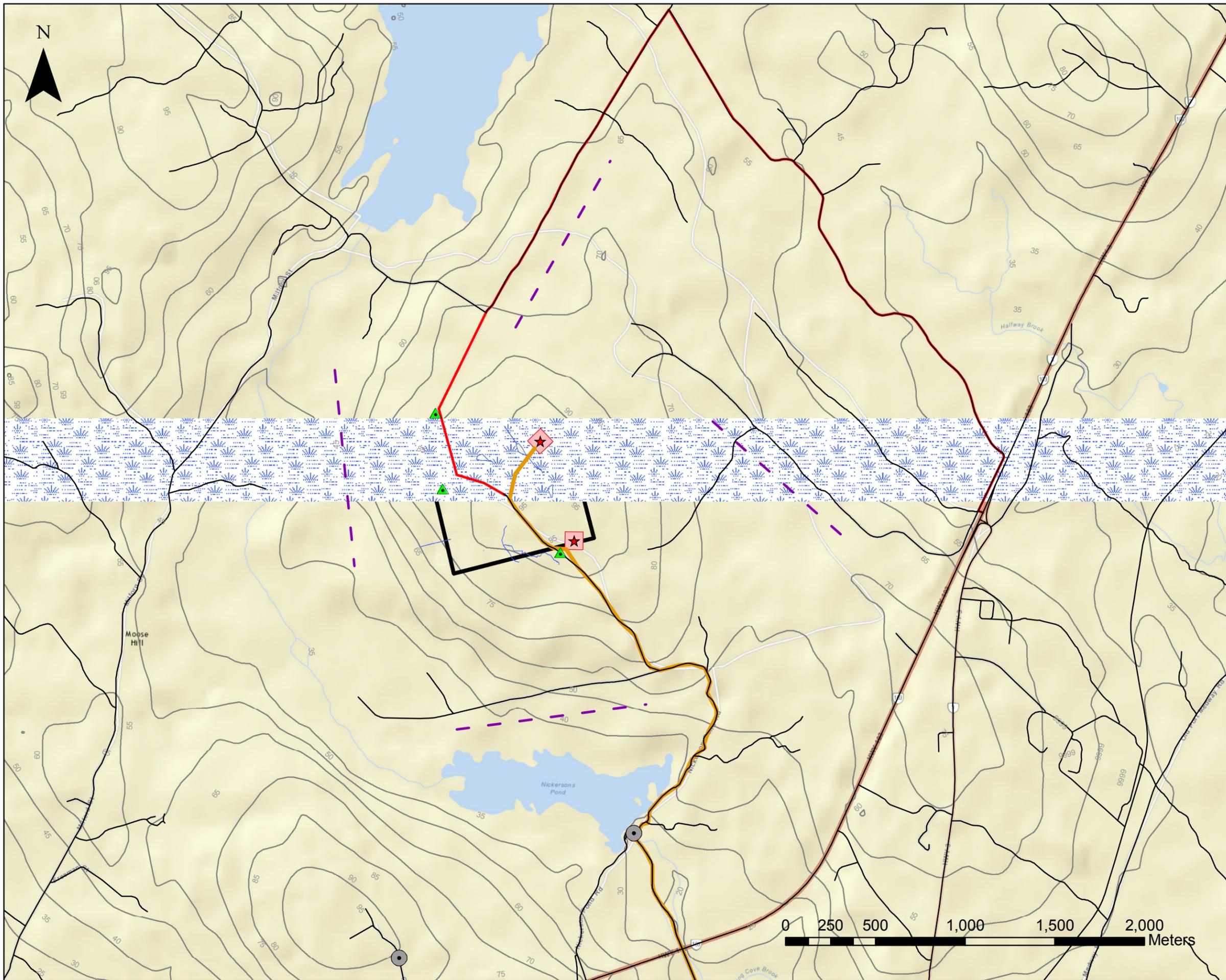
- Nova Scotia Department of Natural Resources (NSDNR);
- Service Nova Scotia and Municipal Relations (SNSMR);

- Atlantic Canada Conservation Data Center (ACCDC);
- Species at Risk Act (SARA);
- Committee of the Status of Endangered Wildlife in Canada (COSEWIC);
- Maritime Breeding Bird Atlas (MBBA); and
- Geobase, a database of Canadian GIS information.

Field programmes were conducted between April 2014 and February 2015. All consultants were familiar with documented protocols related to the completion of a Nova Scotia wind energy registration document. The lead proponents of the field investigations can be found in Table 3.2. Key locations executed during field work activities are displayed in Figure 3.1.

Table 3.2 Field Programme Consultants

Field Study	Field Programme	Major Consultant (Company)
Ambient Sound and Light	ISO 9613-2 Acoustics and WindPro v. 3.0 Software	Scott Dickey (Strum Consulting)
Archaeological Investigation	Archaeology Screening and Reconnaissance	Melanie Smith (Strum Consulting), in association with Stephen Garcin (Boreas Heritage Consulting Inc.)
Bat Monitoring	Wildlife Acoustics (SM2 Bat+) and Anabat detectors	Dr. Lynne Burns and Dr. Hugh Broders (St. Mary's University)
Avian Surveys	Spring & Fall migration counts and Summer breeding survey	Andrew Horn and Ron d'Entremont (Dalhousie University)
Moose Survey	Moose Tracks and Pellet Group Inventory Surveys	Jody Hamper (Independent Consultant)
Rare Plant, Wetland & Watercourse Surveys	Early & Late season rare plant survey, wetland identification and delineation, electrofishing.	Andrew Sharpe (East Coast Aquatics Inc.)
Visual Impact Study	Representative photograph collection and predictions using GIS Software and Digital Elevation Model points	Andy Walter (Strum Consulting)



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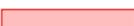
-  Turbine Location
-  Bat Detector
-  Visual Impact Location
-  Moose Transects
-  Existing Roadway
-  Utility Routing
-  Access Road
-  Laydown Areas
-  Wetland Delineation
-  Field Study Focus Area
-  Contours

Figure 3.1
Field Programmes

Drawn by: TAM

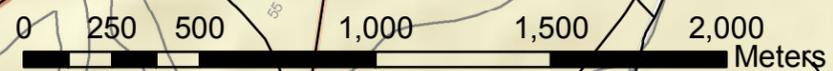
Date: 8/27/2015

Project #: 122

Scale 1 : 20 000



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



3.2.1. *Ambient Sound and Light*

Strum Consulting was retained to perform a sound impact study for the Project. Currently there are no regulations or guidelines with respect to noise generated by wind farm. However, Nova Scotia Environment does require that the noise levels be predicted, and that they do not exceed 40dBA, at identified residential dwellings, daycares, hospitals, and schools.

Sound levels were predicted at receptors (i.e., all structures identified using provincial topographic mapping and aerial imagery) within a 2000m radius of the initially proposed WTG locations. The 2000m radius used in the model was based on the originally planned three WTG wind farm at the Project site. The decrease from three to two WTGs resulted in an increase in setback distances with the nearest setback distance now being 2300m.

The “Decibel” module of the WindPro v. 3.0 software package was used to complete the acoustic assessment. The assessment model followed the ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method and calculations. This calculation method assumes meteorological conditions that are ideal for noise generation, and a conservative ground factor of 0.7 was applied to the model. Meaning, the calculation and modelling methods used account for worst case scenario for the WTGs. The Strum report outlining all calculation input information, collected data, and mapping can be found in Appendix M.

Strum Consulting also studied the predicted shadow flicker (i.e., intermittent shadow perceived as change in light intensity to an observer) created by the WTGs. There is currently no municipal, provincial, or federal guidelines related to shadow flicker; however, NSE have adopted a standard of no greater than 30 minutes of shadow flicker on the worst day and no more than 30 hours of shadow flicker per year.

The potential impact of shadows was predicted at the same receptor locations used in the sound level predictions. Using the “Shadow” module in the design software WindPro v. 3.0, Strum assessed the worst case scenario conditions that could potentially occur at the LWF. The complete report outlining the worst case conditions for the WTGs that were assumed, along with data collected and mapping, can be found in Appendix M. As discussed with the ambient sound testing, the original site plan of three WTGs was used for the ambient light testing as well.

3.2.2. *Archaeological Investigation*

Strum Consulting (Strum) was retained to undertake archaeological screening and reconnaissance of the proposed LWF. The objective of the archaeological assessment was to

evaluate archaeological potential within the area that may be impacted by development of the Project. Strum Consulting, in association with Boreas Heritage Consulting Inc., developed a work plan that consisted of a background study including a review of previous archaeological research and data to identify areas of archaeological potential, and archaeological reconnaissance of the areas that could be affected by development activities. The Strum Consulting report containing cultural resource management recommendations, if any, can be found in Appendix G.

3.2.3. *Bat Monitoring*

A desktop review was completed for potential hibernacula near the study area. This included examining available literature and the Nova Scotia Abandoned Mines Opening (AMO) Database. The records in the AMO Database were assessed using four criteria to determine if there were likely hibernacula. The literature also identified the most proximate known hibernacula to the study area.

Bat monitoring was completed by Dr. Hugh Broders of St. Mary's University. His studies involved the use of two Wildlife Acoustics (SM2 Bat+) detectors and an Anabat detector. All were placed along edge roadways within the forested study area. The two SM2 Bat+ detectors were raised 1.5-2m above the ground and the microphone of the Anabat detector was raised 0.5m off the ground.

The seasonal timing of sampling corresponds to the end of summer residency period, movement of resident species to local hibernacula, and to fall migration by migratory species. The three detectors were deployed from July 28, 2014 to October 9, 2014 (i.e., 219 continuous detector nights). The ultrasonic acoustics recorders passively recorded echolocation calls of bat species at three separate locations on the Project site. Species were identified by comparison of recorded echolocation call sequences to the known species echolocation sequences using software packages associated with the detector types. Since recent comparisons have shown that the two detector types vary in amount of bat calls recorded, these differences were incorporated into the interpretations and inferences of the data.

The complete background, methodology, results and analysis of the field program conducted by Dr. Hugh Broders can be found in Appendix F.

3.2.4. *Bird Surveys*

As a precautionary measure, and due to the possibility of the Project site have breeding potential for several species of concern, the location was initially treated as one of High

Sensitivity. The Level of Concern for this size scale project, selected using Environment Canada guidelines, was determined to be Category 2. Environment Canada (2007b) recommends “basic surveys spread over a one-year period”.

A breeding bird survey, spring migration survey and autumn migration survey were carried out by Andrew Horn and Ron d’Entremont, both experienced birders. The study was designed using Canadian Wildlife Services *Recommended Protocols for Monitoring Impacts on Wind Turbines on Birds* (Environment Canada, 2007a). EC protocols suggest near-weekly visits spread throughout spring and autumn migration periods. Recommendations for breeding bird surveys also include several visits during the main breeding period, and that at a minimum two of the latter visits include point counts and occur at least 10 days apart.

For the spring migration survey and the breeding birds survey, the site was visited approximately weekly from April 26, 2014 to June 8, 2014. The majority of the visits (8 of 12) involved point counts that were completed between 05:45 and 09:00. The point counts were conducted from ten stations located approximately 250m apart, and included the proposed WTG locations. For a period of ten minutes, all birds seen or heard within 50m, 100m and greater than 100m of the observer were recorded. Breeding evidence was also noted on all visits. The three additional visits that were completed in July focused on species at risk. Visits on July 3, 2014 and July 12, 2014 focused on suitable habitats located within and around the perimeter of the site. Playback was used for Olive-sided Flycatcher, Canada Warbler, and Rusty Blackbird. The last survey on July 13, 2014 was specific to Common Nighthawk and was completed from mid-afternoon to dusk during conditions with warm weather and abundant flying insects

The autumn bird migration survey involved eight site visits from August 30 to October 20, 2014. During each visit, the observed conducted four hour long area searches that covered a transect following all habitat patches on the Project site, and included the proposed turbine locations. One half of the site visits also included a four hour watch from a point overlooking the site. All encounters were listed, as well as the flight height and direction of birds flying overhead.

Final reporting for the spring migration, breeding birds survey, and the autumn bird migration survey can be found in Appendix E.

3.2.5. Moose

Jody Hamper was retained to complete a Moose Pellet Group Inventory Survey (PGI) and Monitoring Survey to assess moose population numbers. Approximately one kilometer long

transects were located in expected suitable moose habitat locations within the Project site and surrounding area. A distance of one meter on either side of the transect lines was searched for moose pellets and moose tracks. The same four transect lines were used in all three site visits.

The moose pellet survey was completed on April 18, 2014, and two moose track surveys were completed on February 1, 2015 and March 9, 2015. For the map outlining the transect line locations, and the findings during the surveys, refer to Appendix J.

3.2.6. *Rare Plant, Wetland and Watercourse Identification*

East Coast Aquatics Inc. (ECA) performed a rare plant inventory and wetland identification at the LWF site. The surveys were designed based on knowledge of the specialists and the ACCDC report found in Appendix I. Two botanical field surveys were conducted on the Project site, one for the early season survey (July 9, 2014) and the second for the late season (August 29, 2014). These dates were selected to maximize opportunities to identify botanical species in accordance with the NSE Guide to Addressing Wildlife Species and Habitat in an EA Registered Document (NSDNR, 2009a). The site visits included the identification of all vascular plants and characterization of ecological habitats they were found, as well as delineation of wetlands in the Project area. No rare, endangered or species of conservation concern were identified. The final report on botanical finds can be found in ECA's report in Appendix H.

Field surveys for wetland identification and delineation occurred on July 9, August 29, and September 16, 2014, with the surveys undertaken by ECA's qualified wetland delineators. The objectives of the field surveys were to:

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

Through ongoing discussions with regulators, micro-siting is determined in a way to assist with minimizing the impact to wetlands. The complete delineation and final report of ECA on wetland identification can be found in Appendix H.

3.2.7. *Visual Impact Assessment*

Strum Consulting completed the predicted visual impact of the Project by collecting representative photos from vantage points within the community. Photos were taken from three different locations with GPS waypoints to assist in the construction of a 3D view using

Geographical Information System (GIS) software. The vantage points were selected based on locations where the LWF could pose the greatest concern to aesthetics in the area. Again, the calculation and modelling methods account for worse case scenarios for the initially proposed three WTGs. Strum's simulated results, as well as a complete report, can be found in Appendix N.

3.3. Methodology of Assessment

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

An "environmental effect" is defined in Nova Scotia's *Environment Act* as:

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

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

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

- *Significant:* Potential effect could threaten sustainability of the resource in the study area and should be considered a management concern;
- *Minor:* Potential effect may result in a small decline of the quality of the resource in the study area during the life of the project, as such, research, monitoring and/or recovery initiatives should be considered;
- *Negligible:* Potential effect may result in a very slight decline of the quality of the resource in the study area during the life of the project, as such, research, monitoring and/or recovery initiatives would not normally be required; and

- *Beneficial:* Potential effect is expected to enhance the specific VEC or socio-economic aspect.

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

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

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

4.0 ENVIRONMENTAL SETTING

4.1. Biophysical

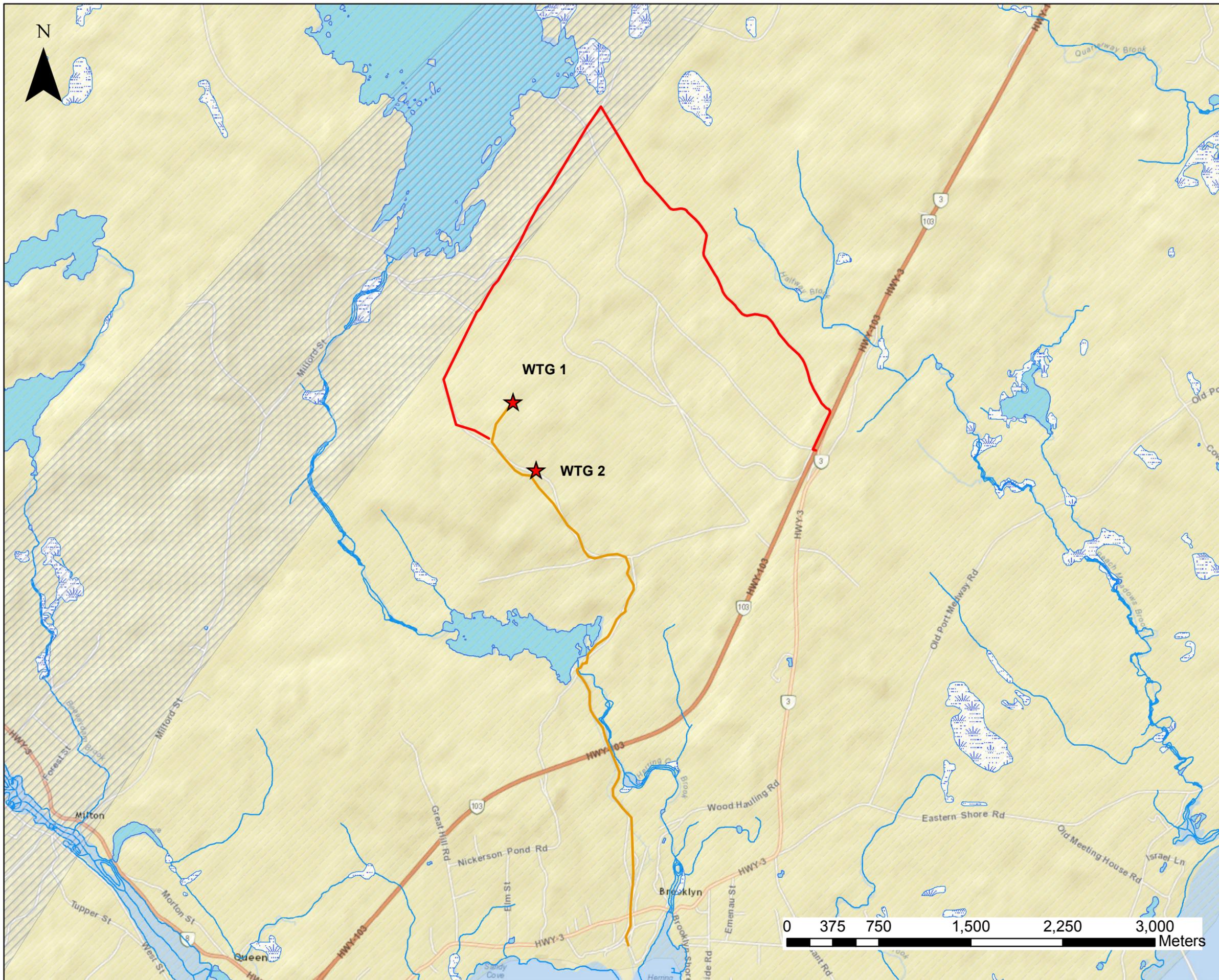
4.1.1. *Geophysical*

The LWF site is located within the Western Ecoregion which extends from Yarmouth to Windsor. The Rossignol Ecodistrict, the ecodistrict within the ecoregion where the Project area is located, is characterized by elevations of 100 to 300m above sea level (ASL), with an underlain bedrock consisting of principally Meguma quartzite and soils. The soils are described as shallow, stony, and moderately coarse – resulting in unsuitable soil for agriculture (Neily, 2003).

Generation of acidic run-off occurs when sulphide-bearing slates of Halifax Formation are excavated and exposed to air. NSDNR (2004a) Mineral Resource Land-Use Map geological mapping reports show a band of sulphide-bearing slates occur on the northwest boundary of the Project area, intersecting with an existing access road. Figure 4.1 shows the location of intersection of the sulphide-bearing slate bands with the existing access road. No blasting, excavation, or other disturbance to the bedrock is expected to occur at, or near, the area of intersection of the slates of Halifax Formation at the Project site.

Furthermore, East Coast Aquatics Inc. desktop studies showed that more recent geological mapping reports the entire Project area to be in an area having low potential for generation of acid rock drainage (NSDNR, 2013). No bedrock testing was completed in the Project area; therefore, a conservative assumption that the access roads will intersect the Halifax Formation will be made with respect to the Project works.

Installation of the meteorological tower at the site found that bedrock exists 0.50-2.7m from the surface. Section 2.5 details the procedures which will be taken should blasting be required for the construction the foundations.



Legend

-  Turbine Location
-  Access Road
-  Utility Routing
-  Watercourse
-  Waterbody
-  NSDNR Wetland
-  Halifax Formation
-  Goldenville Formation

Figure 4.1

Geologic Formations

Drawn by: TAM

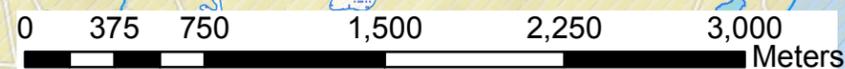
Date: 8/27/2015

Project #: 122

Scale 1:30 000



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



4.1.2. Atmospheric

The LWF is located in what is known as the Western Ecoregion. Climate data was analyzed from an Environment Canada weather station located at Liverpool Big Falls, approximately 17km northwest of the site (Environment Canada, 2012). The climate averages, extremes and months of occurrences can be found in Table 4.1.

Table 4.1 Site Atmospheric Conditions

Parameter	Time Period	Data Source	Value
Average Daily Temperatures (°C)	Yearly Average (1981-2010)	Environment Canada	7.7
Extreme Maximum Temperature (°C)	May 22, 1992	Environment Canada	36.0
Extreme Minimum Temperature (°C)	February 7, 1993	Environment Canada	-34.0
Average Total Rainfall (mm)	Yearly Average (1981-2010)	Environment Canada	1305.6
Average Total Snowfall (cm)	Yearly Average (1981-2010)	Environment Canada	180.6
Extreme Daily Rainfall (mm)	October 25, 1959	Environment Canada	115.8
Extreme Daily Snowfall (cm)	February 18, 2004	Environment Canada	49
Extreme Snow Depth (cm)	February 19, 2003	Environment Canada	71
Predominant Wind Direction	Average	meteorological (MET) tower analysis	SW

The setting is considered rural, with no to low presence of artificial lighting coming from streetlights or shops. The main source of noise in the community emits from the roads surrounding the Project, including Fishermen’s Memorial Highway and Nickerson Pond Road.

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.

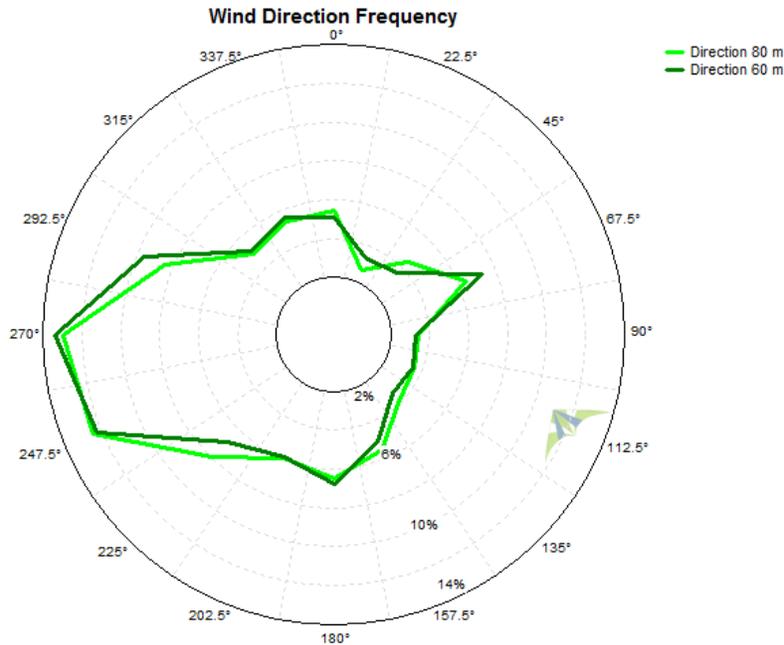
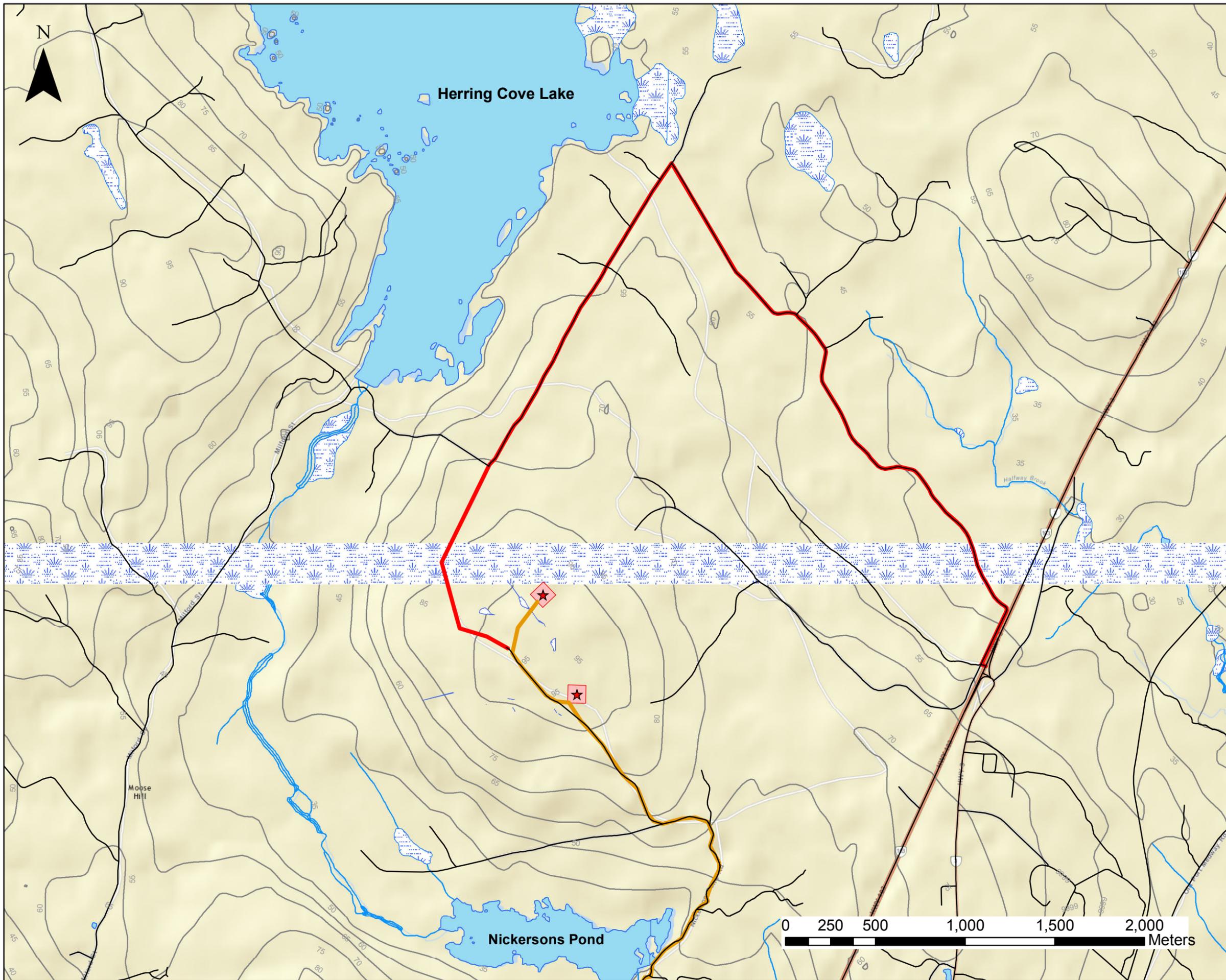


Figure 4.2. Wind direction “rose” generated using data collected from the MET tower.

4.1.3. Groundwater, Surface Water and Wetlands

The LWF site is within the Herring Cove/Medway watershed. The proposed Project area will not impact any watercourses. The most significant watercourses in the surrounding area, and the approximate distances, are: Halfway Brook (400m northeast); Herring Cove Lake (500m northeast); Herring Cove Brook (1000m west); and Nickerson’s Pond (1000m south). The two WTGs will be located on a height of land between the Herring Cove Brook and Beach Meadows Brook secondary watersheds – both of which discharge to the Atlantic Ocean (NSDNR, 2009).

The Nova Scotia Well Logs Database was referenced for wells located in Brooklyn to gain insight on 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 12.5 feet (ft). Wells depths range from 30ft to 440ft, inferring the depth where water bearing fractures were encountered (NSE, 2014).



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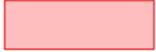
-  Turbine Location
-  Existing Roadway
-  Utility Routing
-  Contours
-  Access Road
-  Laydown Areas
-  Watercourse
-  Waterbody
-  NSDNR Wetland
-  Wetland Delineation

Figure 4.3

Surface Water Hydrology

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Date: 8/27/2015

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Scale 1 : 20 000



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

The Nova Scotia Department of Natural Resources Provincial Significant Species and Habitats database (NSDNR, 2004b) suggests that a number of freshwater wetlands, small isolated tree swamps, and an 11ha low shrub/graminoid marsh are within one kilometer of the Project site. There are no Wetlands of Special Significance in the area, with the closest occurring in separate and distinct catchments approximately 5km to the southeast, 7km to the northeast, and 8km to the northwest of the site. ECA field surveys identified several small isolated wetlands in the vicinity of the Project area; however, this result is not unusual as it is recognized that the database is limited in its ability to recognize physically smaller wetlands, and shrub and treed wetlands.

ECA used the Canadian Wetland Classification System to classify the wetlands observed in the area, with the majority in the area determined to be shrub and treed swamps. Several linear drainage features were observed, with widths ranging from three to six meters. The features broadened into small definable wetlands with surface areas of 0.2 to 0.3ha, before narrowing out again.

The field studies conducted by ECA determined a number of small wetlands in the initial proposed locations for the WTGs. The locations for the WTGs were revised based on these findings in order to avoid the impact of laydown areas on the wetlands. In an effort to minimize environmental impacts, the process of further refining the locations of the project infrastructure is ongoing.

An unavoidable impact to approximately 60m² of treed wetland is anticipated. An access road (total width of 10m) to one of the WTG must cross a linear wetland feature. ECA determined the wetland corridors to have a width of three to six meters. A conservative estimate, using six meter road width, anticipates that 0.006ha of wetlands will be impacted by the construction of the access road. No other wetland disturbance is anticipated.

4.1.4. Migratory and Breeding Birds

The Project site is located approximately four kilometers back from the coast and is not located on a topographical feature that would accommodate migrating birds (e.g. ridge, cliff, shoreline, etc.). Therefore, it is unlikely that the site lies on a heavily used migration corridor. Pre-existing information on migratory species near the site was collected by birders while exploring the coast, a distance of at least four kilometers away.

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. These surveys were completed

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

The key findings during the surveys are, as follows:

- Spring migration surveys suggest the proposed Project site does not concentrate migrants in the spring;
- An intensive search during the breeding bird survey did not encounter any species at risk;
- Four provincially sensitive species breed or might breed in the coniferous forest present on the site; however two of these species, Gray Jay (*Perisoreus Canadensis*) and Boreal Chickadee (*Poecile hudsonicus*), likely only have one territory each on the site. The other two species, Golden-crowned Kinglet (*Regulus satrapa*) and Red Crossbill (*Loxia curvirostra*) appear more common on the site. Any effect on these species populations would be through the cumulative effects of multiple similar projects, rather than this particular small size project alone;
- Fall migrations surveys showed that migrants of several species pass through the Project site but not in exceptionally high numbers for the province at that time of year;
- Two species at risk, a group of Barn Swallows (*Hirundo rustica*) and a Bicknell's Thrush (*Catharus bicknellii*), were detected passing over the site on two separate occasions during the fall migration surveys. This finding was also considered not significant; and
- Findings of the migration survey were consistent with the initial assumption that the site does not concentrate migrants or serve as a stopover site. This is likely due to the site's unexceptional habitats and its setting approximately four kilometers away from the coast.

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

4.1.5. Flora and Fauna

The forests within this ecodistrict are vulnerable to fire and wind damage, with considerable blowdown occurring from hurricanes. The dominant species include the Red Spruce (*Picea rubens*), Red Maple (*Acer rubrum*), and Eastern Hemlock (*Tsuga Canadensis*). The forest heights range from 12 to 20m, with a crown closure of 30 to 75 percent. The Project site is on lands formerly part of the Bowater Mersey forestry operations, where a network of gravel roads are already in place. There are regular cut blocks and forest stands of varying ages from the past operations.

The block of coniferous and mixed woods, where the Project site is located, includes: Mature Red spruce, Eastern hemlock, Balsam fir, Red maple, and Yellow birch. The thick canopy limits the ground plant species to ferns: Lady-Fern (*Athyrium filix-femina*), Eastern hay-scented fern (*Dennstaedtia punctilobula*), Interrupted fern (*Osmunda claytoniana*), and Cinnamon fern (*O. cinnamomea*), as well as tree seedlings, mosses, and other species that are tolerant of low light levels.

Previously cleared property boundaries and logging roads provide increased light levels for a more diverse number of species, including: Hay sedge (*Carex argyrantha*), Finged sedge (*Carex crinite*), Shallow sedge (*Carex lurida*), and Pointed broom sedge (*Carex scoparia*). Ruderal species, including Tiny all seed (*Radiola linoides*) and Pearly everlasting (*Anaphalis margaritacea*), also can be found along the logging roads.

The total list of botanical finds of East Coast Aquatics (July 7, 2014 and August 29, 2014) are provided in Appendix H. Field surveys completed within the Project bounds discovered no rare, endangered, or species of conservation concern. A total of 90 species across the site had a General Status Ranking of 4-Secure/Not at Risk (85 taxa) or 5-Exotic (5 taxa). Discussions of plant species at risk and of concern is within Section 4.1.7.

As previously outlined in Section 4.1.1, the Project is located in what is known as Nova Scotia's Western Ecoregion and situated within the Rossignol Ecodistrict (Neily, 2003). The total area of the Rossignol Ecodistrict is 117900ha, or 7% of 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 750

Ecodistrict	Annual Precipitation (mm)	Mean Annual Temperature (°C)	Mean Summer Temperature (°C)	Mean Winter Temperature (°C)
Rossignol	1400-1500	7.0	17.5	-3.5.0

Moose and bat species are discussed in the Species at Risk or of Concern Section 4.1.7.

4.1.6. *Fish and Fish Habitat*

No direct alteration of watercourses is expected on the site; however, electrofishing and directed angling was conducted by East Coast Aquatics. The electroseining survey was conducted on Herring Cove Brook, from a small upstream pond to the Fishermen's Memorial Highway overpass (200m). The directed angling was conducted both above and below the Nickerson's Pond dam on Herring Cove Brook. Through the electroseining and the directed angling, two species were observed: American eel (*Anguilla rostrae*) and Smallmouth bass (*Micropterus dolomieu*).

The American eel (*Anguilla rostrae*) was listed as a "Threatened" by COSEWIC in 2012 (Government of Canada, 2015). This species is believed to be abundant in Nova Scotia, and is not protected by provincial laws.

The complete East Coast Aquatics report can be found in Appendix H.

4.1.7. *Species at Risk or of Concern*

Desktop data on species at risk, collected from ACCDC, in the vicinity of the LWF was compiled and reviewed. The ACCDC is part of the NatureServe network and maintain data for the Atlantic Canadian Provinces. Data reflects known occurrences of rare and endangered flora and fauna in the Project area. As per NSDNR requirements, data is presented within 5km radius. The 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.

ACCDC listed a total of 10 species at risk under Schedule 1 of SARA and / or the Nova Scotia Endangered Species Act (Government of NS, 2013) within five kilometers the Project area. These are outlined in Table 4.3 with the applicable Provincial and Federal designations. The ACCDC list is used to assist with predicting the likelihood of a species at risk being present at or near the Project works, and to aid in the development of the field programs used to assess potential environmental impacts. The risk will be defined as either insignificant, low, moderate, or high.

Table 4.3. Potential for Species at Risk

Scientific Name	Common Name	Taxonomy Group	Federal Status (COSEWIC)	SARA	Provincial Legal Protection	Number of Observations; and Distance (km)	Typical Species Habitat	Potential of Presence at or near Project works
<i>Thamnophis sauritus pop.3</i>	Eastern Ribbonsnake – Atlantic pop.	Animal	Threatened	Threatened	Threatened	2; 3.9+/- 0.1	Edges of shallow ponds, streams, marshes, swamps, or bogs with dense vegetation	Low
<i>Chaetura pelagica</i>	Chimney Swift	Animal	Threatened	Threatened	Threatened	1; 4.7+/-0.1	Hollow trees; occasionally cave walls or rocky crevices	Low
<i>Hirundo rustica</i>	Barn Swallow	Animal	Threatened		Endangered	2; 2.6+/-7.07	Mainly artificial structures (i.e. barns, bridges, etc.); sometimes caves, ledges, etc.	Low to Moderate
<i>Wilsonia Canadensis</i>	Canada Warbler	Animal	Threatened	Threatened	Endangered	2; 2.6+/-7.07	Wet, mixed deciduous-coniferous forest and in regenerating stands	Low
<i>Chordeiles minor</i>	Common Nighthawk	Animal	Threatened	Threatened	Threatened	5; 4.7+/-0.1	Open vegetation free habitats (i.e. grasslands, marshes, river banks, etc.)	Low
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Animal	Threatened	Threatened	Threatened	2; 2.6+/-7.07	Open areas with tall trees or snags	Low

<i>Riparia riparia</i>	Bank Swallow	Animal	Threatened		1; 2.6+/-7.07	Riverbanks, aggregate pits, road cuts, stock piles of soil, etc.	Low
<i>Dolichonyx oryzivorus</i>	Bobolink	Animal	Threatened	Vulnerable	2; 2.6+/-7.07	Grasslands, abandoned fields, no-till cropland, small-grain fields, etc.	Low
<i>Contopusvirens</i>	Eastern Wood-Pewee	Animal	Special Concern	Vulnerable	4; 2.6+/-7.07	Forest clearings and edges of deciduous and mixed forests	Low
<i>Danaus plexippus</i>	Monarch	Animal	Special Concern	Special Concern	1; 5.0+/-0.01	Primarily near milkweed and wildflowers (i.e., abandoned farmland)	Low

4.1.7.1. Flora

Two botanical studies were completed (July 9, 2014 and August 29, 2014) at the LWF study area by East Coast Aquatics Inc. (East Coast Aquatics). East Coast Aquatics reviewed the ACCDC listing (Appendix I) prior to commencing the field studies to ensure that they were aware of any target species, as well as to verify that the timing of field visits were appropriately scheduled to identify the rare flora.

As previously discussed, the field investigations conducted by ECA found a total of 90 species across the Project site. No rare, endangered, or species of conservation concern were observed during field investigations at the Project site. All of the 90 species encountered were either Secure/Not at Risk or Exotic.

4.1.7.2. Birds

Pre-existing information on the Maritime Breeding Bird Atlas lists five species at risk that may potentially breed within the 10km by 10km atlas square that encompasses the Project area. These include: Common Nighthawk (*Chordeiles minor*), Olive-sided Flycatcher (*Contopus cooperi*), Barn Swallow (*Hirundo rustica*), Canada Warbler (*Wilsonia Canadensis*), and Bobolink (*Dolichonyx oryzivorus*). No suitable breeding habitat for the Bobolink (*Dolichonyx oryzivorus*) was observed in the Project area, but adequate habitat for breeding for the others species was observed to be present. Also worth consideration was the Chimney Swift (*Chaetura pelagica*); while only previously observed in neighbouring atlas squares, suitable breeding habitat for the Chimney Swift (*Chaetura pelagica*) was present in the Project area.

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

- group of five Barn Swallows (*Hirundo rustica*) were sighted on August 30, 2014; and
- Bicknell's Thrush (*Catharus bicknellii*) flight call was heard on September 2, 2014.

In addition to the listed species, other species of concern (NSDNR Yellow ranking) were identified: Common Loon, Common Tern, Gray Jay, Boreal Chickadee, Golden-crowned Kinglet, Ruby-crowned Kinglet, and Red Crossbill. The Project site lacks a breeding site for the Common Loon and Common Tern, and these species were only encountered flying overhead.

Impact assessment, mitigation and follow up measures related to birds are discussed in Section 6.2.

4.1.7.3. Mammals

Moose

Mainland moose (*Alces Americana*) populations persist in the Tobeatic Region, Chebucto Peninsula, Cobequid Mountains, Pictou-Antigonish Highlands, and the interior of the eastern shore from Tangier Grand through to Guysborough (NSDNR, 2009b). A number of reasons are purported for the low number (1000 animals) of mainland moose populations, including disease (i.e., *P. tenuis* (brain worm)), illegal kill and poaching, calf predation by black bears, habitat alteration and increased access, disturbance and possibly climate change (NSDNR, 2009b). Three moose surveys were conducted, consisting of four transects during the visit on April 18, 2014, February 1, 2015 and March 9, 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 1000m in length, and a distance of one meter from either side of the transect was investigated. All habitat, including cutovers and lowland areas, were covered.

During field work completed for moose on April 18, 2014, February 1, 2015 and March 9, 2015, no evidence of moose was found (pellets, tracks, or evidence of browsing). Impact assessment and mitigative measures related to moose are discussed in Section 6.2.

Bats

The nearest known hibernaculum is Vault Cove which is in the Annapolis Valley over 100km away. Of the 40 AMO Database records within 25km of the Project site, none remained as potential bat hibernacula. Therefore, there are no known bat hibernaculum near the Project site (i.e., within 25km).

The average number of bat call sequences per night was 2.79 during the sampling period. This is quite low in context of other monitoring completed by Dr. Hugh Broders in past years in Nova Scotia - especially in forested landscapes near rivers which previously have been found to exceed 120 call sequences per night on average. However, these high numbers of sequences observed were prior to the emergence of white-nosed syndrome and likely not directly comparable.

Three species of bats documented during the bat inventory study are listed as Endangered by COSEWIC and by the Province of Nova Scotia. These are the *Myotis* spp., i.e., little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), and the tri-coloured bat (*Perimyotis subflavus*). The little brown bat and the long-eared bat were the only abundant and widely distributed bats in Nova Scotia. The third species, the tri-coloured bat, has a significant

population in southwest Nova Scotia. These three species over-winter in caves and abandoned mines.

Examination of data collected through desktop and field work at the Project site suggests that there is no significant movement of bats throughout the study area and there are no known hibernacula within 25km; however, the field work recorded the highest bat species richness observed by Dr. Hugh Broders in his work in Atlantic Canada. While six species of both resident and migratory bats were observed based on Burns & Broders data interpretation, it is important to note that none were recorded at exceptionally high activity levels.

Impact assessment and follow up measures related to bats are discussed in Section 6.3.5.

4.1.7.4. *Reptiles*

The ACCDC reports suggest that the Wood Turtle (*Glyptemys insculpta*) and the Blanding's Turtle (*Emydoidea blandingii*) are not known to occur within five kilometers of the Project site. No incidental observations of these turtles were recorded during any of the field surveys completed at the Project site.

4.2. **Socio-Economic**

4.2.1. *Community*

The communities of Liverpool, Brooklyn, and Milton, are part of the Region of Queens Municipality. The community of Liverpool is approximately six kilometers south of the Project site, with Brooklyn located approximately four kilometers southeast and Milton four kilometers southwest of the Project site.

There are approximately 11,000 residents in the Region of Queens Municipality, with the nearest residential dwelling being approximately 2300m away from the WTGs. The Municipal Planning Strategy considers the scale of this Project to be Large scale since the height of the turbines is greater than 200 feet. Currently, there are no setback requirements for Large scale projects in the Region of Queens Municipality.

Consultation with the community is further discussed in Section 5.1.

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

Strum Consulting (Strum) was retained to perform the Archaeological Screening and Reconnaissance for the LWF. Strum, in association with Boreas Heritage Consulting Inc. (BHCI), was issued a Heritage Research Permit A2014NS068 by the Special Places Program

(SPP). Field reconnaissance was conducted on the site on October 1, 2014. Results of the desktop and field work concluded that there is a low risk for the LWF and its Project components to impact archaeological resources.

If archaeological resources or human remains are encountered within the LWF study area, work will be halted and immediate contact with the Coordinator of Special Places, Communities Culture and Heritage, Sean Weseloh McKeane will be initiated.

Refer to Appendix G for the complete Strum report.

4.2.3. Aboriginal Uses and Resources

The Project site is approximately 15km from the nearest Mi'kmaq community, i.e., IR11 Medway River which is a satellite community of Acadia First Nation. Beyond this, the Project site is approximately 30km away from additional Acadia First Nation satellite communities, and over 100km away from the Bear River First Nation community. The Proponent has informed various First Nation groups of Project specifics, including: Kwilmu'kw Maw-klusuaqn (KMK), Acadia First Nation, and Bear River First Nation. The Proponent has also provided detailed information to the Office of Aboriginal Affairs (OAA). Section 5.2 outlines the correspondence with the various First Nations groups.

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 LWF site. Based on the various components of the background study including environmental setting, Native land use, property history and archaeological potential, the vicinity of the study area is considered to exhibit low potential for encountering Pre-contact and/or historic archaeological resources.

4.2.4. Sound

The Project site is located in a mainly rural area, with some residential development along Nickerson Road and Milford Street. The closest residential dwelling to the WTGs is approximately 2300m away, which is designed to mitigate environmental concerns such as sound. As previously discussed, the alteration to the number of WTGs at the wind farm increased the closet setback distance from 2000m to 2300m.

Nova Scotia has no specific sound regulations or guidelines for wind farms; however, 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 (Hau, 2006). 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 (Table 4.4).

Table 4.4. Noise Levels Measured at Receptor Locations.

Receptor ID	Predicted Noise Level (dBA)
R01	31.6
R02	31.7
R03	27.0
R04	27.1
R05	27.3
R06	27.2
R07	28.1
R08	27.1

Strum's complete report outlining the sound modelling results is in Appendix M.

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 Project. Approvals and communication with mandatory agencies can be found in Appendix B.

4.2.6. *Ambient Light*

Existing ambient light levels in the Project area have not been monitored by the Proponent; however, predicted impacts associated with rotating WTG blades have been analyzed by an independent consultant using industry standard modelling software. Strum studied the worst case scenario of potential impact of shadows cast by WTG blades at the identified receptors within a two kilometer radius of the WTGs. Please note that similar to the sound modelling, the light modelling was also based on the initial plan to construct three WTGs in the Project area. Modelling results indicated that all receptors are predicted to comply with NSE guidelines (Table 4.5). The complete Strum Consulting report can be found in Appendix M.

Table 4.5. Shadow Flicker Modelling Results at Receptor Locations.

Receptor ID	Predicted Shadow	
	(hours/year)	(hours/day)
R01	0:00	0.00
R02	0:00	0:00
R03	3:13	0.07
R04	1:59	0:07
R05	2:24	0:07
R06	2:12	0:07
R07	5:11	0:13
R08	2:25	0:07

Studies on aeronautical transportation and clearance have been completed prior to environmental assessment submission. As per Transport Canada Standard 621, the WTGs will be required to have aeronautical lighting.

4.2.7. Visual

Three separate vantage points were selected to develop representative images of the LWF site and results can be found in Sturm’s report in Appendix N. The vantage points were selected in an attempt to demonstrate the greatest visual impact the LWF WTGs will have to residents or community members living, or commuting in the area.

4.2.8. Recreation

Regional recreational activities exist in the area, such as fishing, hunting, and other outdoor pursuits. East Coast Aquatics Inc. observed evidence of recent recreational angling activity on Herring Cove Brook, and at the Nickerson’s Pond dam.

Furthermore, it was observed that bridge abutments had recently been constructed on Herring Cove Brook immediately below Nickerson’s Pond dam. The Department of Natural Resources Conservation informed ECA Inc. that the Queens County ATV Association has been active in establishing a multi-use trail through the former Bowater Mersey lands on the previous logging roads, and that a portion of the planned trail network will pass through the proposed Project area.

4.2.9. Economic Development

Based on the 2011 Census of Population, Queens County has a population of 10,960 which is 2.20% lower than in 2006. In comparison, Nova Scotia has a population of 921,727 which is

0.9% higher than in 2006 (Government of Nova Scotia, 2012). Agriculture and primary resource based jobs comprise 10% of the workforce in the municipality with manufacturing jobs totaling 19% of the workforce (Statistics Canada, 2010). According to Statistics Canada, the unemployment rate is 12.2%.

When commercially reasonable, the Proponent is committed to using local contractors. For example, Watt's construction of the single 1.5MW wind turbine in Sheet Harbour in 2011 involved half of the project costs being raised by Nova Scotian investors. In addition, the BOP design and construction contracts were issued to local firms, adding to the local economy and knowledge base.

5.0 CONSULTATION

5.1. Community

On February 24, 2015, the Proponent engaged the Liverpool, Milton, and Brooklyn communities, as well as surrounding areas. The meeting was facilitated by the Proponent in Liverpool at the Liverpool Fire Hall. The meeting was advertised by way of individual mailouts to landowners within two kilometers of the initially proposed three WTG Project. As previously mentioned, WTG 3 was removed from the Project resulting in an increase of the nearest setback distance to 2300m. A notice was also placed on the internet on the Queens Community Blog. The Proponent believes the community was well informed of the February 24, 2015 community meeting.

During the information session, the Proponent provided preliminary Project information explaining the proposed location of the LWF, 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 Queens County and the surrounding areas to share their thoughts and concerns with the Proponent.

Approximately 30 people were in attendance for the February 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, 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.

The Proponent addressed each concern brought forward during the meeting. Table 5.1 outlines the concerns raised during the February 24, 2015 information session, along with the how the proponent addressed each concern.

Table 5.1. Concerns Raised during the February 24, 2015 Information Session.

CEDIFs – Who are the investors? How can we invest? What happens to our investment at the end of the Project?

This concern was addressed by explaining how CEDIFs work by relating to Watt's experiences as a CEDIF for over four years.

How long will the turbines last?

It was explained that with regular service and maintenance, turbines can last up to 30 years.

How will this affect jobs in the region?

This was addressed by describing the contractors required throughout the construction process, and the operations of the wind and storage project. The spinoffs from the Project were also discussed.

Will the wind farm get bigger once these two turbines have been installed?

It was explained that the wind farm is limited in size due to distribution constraints, so the farm is not likely to get bigger.

Will the Project be 'tour friendly'?

It was explained that both the storage and wind facilities are demonstrations, and they are being designed to be safe and accessible for tours.

Community members also inquired about the proposed energy storage project to be associated with the LWF. It was explained that a team of experts are vigorously testing the storage technology before deploying it in Liverpool. It was also emphasized that part of the Project's mandate is field testing the storage unit.

The Proponent also discussed the fact that WTG technology has greatly improved in recent years and WTG suitability for the site will be determined following the completion of a wind resource assessment. Also, sound levels of WTGs were addressed by the Proponent by way of discussing past experiences in developing wind farms. Setbacks were noted by the Proponent, and that sound levels are expected to be well below NSE accepted guidelines.

An informative community mailout will be sent to the nearest residents in the near future to update on the progress of the Project, in specific the desktop studies and fieldwork associated with the completion of an EA. The mailout will also contain notification of the Liverpool registration as well as advanced notice for the upcoming community information session.

The Proponent is committed to continuing to engage the residents of the Queens County, and will do so through specified mailouts and via the Watts Wind webpage (<http://wattswind.com/portfolio/liverpool>), 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 LWF. The possibility of forming a community liaison committee (CLC) will be suggested by the Proponent at the community meeting. Residents will be 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, i.e., meetings, mailouts, and use of the community website, will continue as the Project proceeds, and the necessary requirements for the Development Agreement process with respect to community engagement will be satisfied. The Proponent will schedule another meeting in the fall following the collection of adequate wind data from the MET tower. Refer to Appendix K 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, Acadia First Nation, and Bear River First Nation. Table 5.2 outlines communications and meetings that were held between the Proponent and various First Nation representatives.

Table 5.2 Summary of Aboriginal Engagement Activities.

First Nation Entry	Date	Action	Attendees	Meeting Topic	Location
Kwilmu'kw Maw-klusuaqn (KMK)	June 4, 2014	Initial contact	Addressed to Twila Gaudet	Initial Project Information	N/A
Bear River First Nation	August 22, 2014	Informational letter and documentation	Addressed to Chief Carol Thompson	Initial Project information and request for meeting	N/A
Kwilmu'kw Maw-klusuaqn (KMK)	September 10, 2014	Follow-up Email	Addressed to Twila Gaudet	Providing further details regarding COMFIT projects	N/A
Acadia First Nation - Medway	March 6, 2015	Informational letter and documentation	Addressed to Chief Deborah Robinson	Initial Project information and request for meeting	N/A
Kwilmu'kw Maw-klusuaqn (KMK)	May 19, 2015	Follow-up Email	Addressed to Twila Gaudet	Request for a meeting to discuss the Project	N/A
Acadia First Nation	May 19, 2015	Follow-up Email	Addressed to Front Desk	Request for a meeting to discuss the Project	N/A
Kwilmu'kw Maw-klusuaqn (KMK)	May 31, 2015	Follow-up Email	Addressed to Twila Gaudet	Provided Updated Project Description	N/A

5.3. Regulatory

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

5.3.1. *Municipal Consultation*

The Proponent has conversed with a development officer in Municipality of Queens to discuss the LWF. The majority of previous discussions focused on the installation of a single meteorological tower; however, following the submission of the EA the Proponent will begin the process of applying for the Development Agreement for the two WTGs.

Following the submission of the application for a Development Agreement with a Development Officer, a draft Development Agreement will be prepared by the Development Officer. A Planning Advisory Committee will make recommendations to the Council who will then hold a required public hearing. A notice of the public hearing is required to be placed in two local newspapers, as well a notice of the Council's approval, if applicable, following the public hearing. A 14 day appeal period is required following the publication of the Council's approval in the local paper. 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 LWF project. The Proponent has either met or corresponded with NSDOE, NSE, OAA and NSDNR. These interactions have assisted the Proponent in scoping the EA, including defining the appropriate field work and consultation activities, and in Project planning and design.

A summary of significant contact with Provincial regulators can be found in Table 5.3 below.

Table 5.3 Significant Contact with Provincial Regulators

Date	Attendees	Method of Contact	Topic of Conversation
September 18, 2014	Beata Dera (OAA), David Mitchell (OAA), and Helen Yeh (NSE)	Meeting at OAA Office	COMFIT Projects, First Nation Engagement
May 28, 2015	Beata Dera (OAA)	Email	Project Description
June 3, 2015	Helen Yeh (NSE) and David Mitchell (OAA)	Meeting at NSE Office	Discussion on Project prior to EA registration
June 5, 2015	Helen Yeh (NSE)	Email	Clarification on scope of EA
June 11, 2015	Mark Elderkin (NSDNR)	Email	Bat species richness
June 11, 2015	Peter MacDonald	Email	Moose Protection Plan
June 15, 2015	Mark Elderkin	Email	Bat species richness

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

5.3.3. Federal Consultation

The Proponent has consulted with various Federal entities regarding the construction of the LWF. Canadian Coast Guard, NAV Canada, Transport Canada and DND were all contacted regarding the development of the LWF. Environment Canada, by way of CWS, will be contacted as appropriate throughout Project construction. Like their Provincial counterparts, these Federal entities 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 LWF as appropriate.

6.0 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.

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	•	•	•	•	•	•	•	•	•	•	•	•	•	•

6.1. Assessment of Physical VECs

6.1.1. 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. Accordingly, quality and quantity of both ground and surface water have been identified as a VEC.

A significant environmental effect would result if a substantive change attributable to the Project could be identified in water quality or quantity in tributaries that lead to nearby bodies of water, nearby wetlands, or in groundwater immediate to the site, including the closest residential wells.

The closest residential wells are greater than 2000m from the nearest proposed turbine and approximately 1000m from the proposed access road upgrade off of Highway 103 (Fishermen's Memorial Highway).

- *Boundaries* – Spatial bounds include the local area, small wetlands near and within the Project site and immediate down gradient area, as well as groundwater local to the site. The temporal boundary focuses on Project construction but includes all phases of the Project with respect to unplanned releases.
- *Potential Project Impacts* – Pathways that may adversely affect surface 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;
 - Prepare detailed plan for construction to maintain drainage as per existing conditions to ensure minimal effect on local hydrology, including appropriately sized culvert 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 is 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;
- 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 that sediment and erosion control mechanisms upstream are sufficient;
- 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, if applicable.

Related to accidental release, these mitigations include:

- All hazardous materials to be used at the site will be labeled and contained according to applicable regulations;
- No hazardous materials will be stored within 50m of a wetland or watercourse;
- Frequent inspection and maintenance of equipment will be undertaken to identify and repair any fuel leaks;

- Used oil, filters and other products associated with equipment maintenance shall be collected and disposed of in accordance with regulatory requirements; and
- Spills shall be immediately reported as per legislation and as identified in the EPP.
- *Cumulative Effects* – There is land development (rural residential) in the general watershed of the Project site. Given the 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. The likelihood of an accident or malfunction resulting in a release is quite low; should it occur, the volume is anticipated to be very small, i.e., below reportable levels. Should blasting occur, the point of blast is not expected to be within 800m of a residential well.

The Project is not anticipated to have a significant residual environmental effect on the local ground and surface water. While any effect will be negative, it will be small in magnitude, reversible, short duration, and local. 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. 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 (Appendix B).
- *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 effect on communications via interference with radar or radio signals.

6.2.1. *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 2000m of the proposed WTGs. Studies based on the previous three turbine farm found seven receptors within a 2000m radius (Refer to Section 4.2.1).

As shown in Appendix M, conservative modeling was completed for the previously proposed three operating WTGs using industry standards (i.e., ISO 9613-2). Model assumptions included previous turbine model (i.e., GE 2.3-107), wind speed where this WTG model emits the highest SPL output (i.e., 10.1 m/s), climatic conditions (10°C and 70% humidity), ground cover (using a conservative estimate of 0.7) and topography data. 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. The highest predicted SPL from the operation of LWF is 31.7 dBA at the closest receptor based on the initially planned three WTG wind farm model.

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 as a guideline 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 of the initially planned three WTG wind farm. 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, etc.). There is also a potential for blasting during WTG foundation construction.

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 Nickerson's Pond; vibrations from blasting may 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 M and summarized above for the initially proposed three 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 minimum separation distances, if any, 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. As described in Section 2.10, there is a two WTG 4MW wind farm located approximately 40km away from the Project location; however, these are too far to act cumulatively. Given relative scale of the Project and existing setbacks, it is very unlikely that these activities might act cumulatively to increase the likelihood of a significant adverse environmental effect on ambient noise levels in the local area, especially during nighttime hours.
- *Significance of Residual Effects* – Annoyance caused by noise during construction, if it occurs, will be temporary and short term. Concerns of residents over noise during Project operation is expected to be minor, if it occurs, based on predicted SPL levels well below 40dBA at residences and the Proponent’s early and ongoing Project consultation.

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

6.2.2. *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 M, 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 M, 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 of the previously planned three WTG farm, 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 M.

- *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, if applicable, 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; but, lighting is not currently present on extensive network of pre-existing logging roads surrounding the Project area. Within 5km of the site there is a biomass energy generation facility, and within 40km of the site there is a 4MW WTG farm (See Section 2.10). However, these projects are too far apart 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.

7.0 ASSESSMENT OF ECOLOGICAL VECS

7.1. Wetlands and Watercourses

Maintaining ground and surface water quality and quantity was analyzed in Section 6.2.1, and 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 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, or near, the Project area wetlands and watercourses have been identified during the desktop and / or 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 H.

Field surveys were completed in the Project area in spring and summer during the appropriate time periods. The field work provided a general characterization of the area, identification of wetlands in the study area and delineation of the wetlands which intersected with proposed Project footprint. Liaison between the wetland consultant and the Project developer occurred to optimize the locations of the WTGs and access roads was completed in an iterative process (as described in Section 2.4). Following the July 2014 field identification of several small wetlands, the location of the turbines was modified to avoid the intersection of laydown areas with wetlands. The objective was to minimize direct and indirect disturbance to wetlands and watercourses.

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

- 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 approximately 4.8km to the southeast (Mersey River estuary) and approximately 7.1km

to the northeast (Medway River estuary), with an additional WSS located 8.5km to the northwest of the site.

- One treed swamp needs to be crossed as part of the access road; the area of proposed disturbance is about 60m². 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).
 - Approval for alteration of this linear treed swamp is not required due the fact that the road construction (i.e., linear development) impacting the treed swamp will result in less than 10m wide disturbance; and furthermore, less than 100m² total disturbance of the wetland.
 - One appropriately sized culvert will be used where the access road will cross the treed swamp to ensure impacts to local wetland hydrology are minimized.
 - No species at risk or species of concern were identified in this wetland.
- 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. No floral species at risk or species of conservation concern were observed at the Project site. Both WTGs are beyond 50m from the edge of these wetlands.
- Industry standard erosion and sedimentation control measures will be implemented to avoid impacts to any adjacent wetlands.

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 Nickerson's Pond or Herring Cove Lake.

There is no direct alteration of watercourse. 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.

One small area of wetland alteration due to access road construction is unavoidable but has been minimized with access road routing (i.e., 60m² of treed swamp). 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, if required, 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 not anticipated that any approval will be required for the linear development wetland disturbance 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;
 - 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;
 - Design and install appropriately sized culvert to maintain hydrology under access road to greatest 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, if applicable; 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* – While there is limited rural residential land development, there is an extensive network of gravel roads and signs of historic access for commercial forestry operations. As part of the water supply for the former Bowater Mersey pulp and paper mill, dams are located at the outlets of Nickerson’s Pond and Herring Cove Lake. While there is one small alterations proposed to wetlands, no alteration is proposed to watercourses in at or near the Project site. 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 greatest extent practical. Wetland alteration has been minimized in the proposed Project footprint (i.e., 60 m² in total) and no watercourse alteration is anticipated.

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 minimal that it falls within the exemptions of the Wetland Conservation Policy. No effect is predicted to watercourses. The environmental effect on wetlands and watercourses as a VEC is predicted to be negligible.

7.1.1. Fish Habitat

The Project site is within the Herring Cove / Medway Primary Watershed. The WTGs will be present on a height of land between Herring Cove Brook and Beach Meadows Brook secondary watersheds, both of which discharge to the Atlantic Ocean (NSDNR, 2009). The Herring Cove Brook catchment has suffered from significant anthropogenic alteration, by way of the

construction of dams, with water abstraction taking place at the Nickerson's Pond dam as part of the water supply for the former Bowater Mersey pulp and paper mill. The dams present at the outlet of Nickerson's Pond and Herring Cove Lake create a complete barrier to upstream fish passage.

Dated surveys suggested the presence of White sucker (*Catostomus commersoni*), Yellow perch (*Perca flavescens*) and American eel (*Anquilla rostrate*) in Herring Cove Lake. Electrofishing and directed angling were performed over two kilometers away from the WTG locations, near the proposed route of the transmission lines on existing roadways. Only Small mouth bass (*Micropterus dolomieu*) and American eel (*Anquilla rostrate*) were observed (see Appendix H).

Fish habitat 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 downgradient to the Project site.

- *Boundaries* – Spatial bounds include the catchment area draining into Nickerson's Pond and Herring Cove Lake from the Project site. 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.

7.1.2. *Migratory and Breeding Birds*

The Project site is not near a ridge, cliff, shoreline, or other topographical feature that would concentrate migrating birds; however, there is habitat that could conceivably be suitable for species at risk. Desktop and field work was completed in 2014 in the spring, summer, and fall by Andrew Horn and Ron d'Entremont. 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 E).

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 the full reports in Appendix E):

- Migration surveys showed the sites unexceptional habitats and its setting well away from the coast suggest that the site does not concentrate migrants or serve as an important stop over site.
- Breeding bird surveys did not encounter any species at risk despite an intensive search. However, four provincially sensitive species breed or might breed in the coniferous forest on the site and may be displaced in the clearing of that forest type. Such effects can be minimized by retaining the extent of the mature coniferous forest in the area of the site, if practical. The total area of impact for this proposed Project is 3.5ha including turbine pads, new access roads, upgrades to pre-existing 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 3.5ha within an area with a pre-existing extensive network of logging roads and other development associated with historic commercial forestry operations;
 - Minimizing wetland impacts to small linear treed swamp (under 60m²);
 - 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 is an existing wind energy project some 40km away from the LWF as noted in Section 2.10. Given the relative distance of the Project and the small size of the Projects, 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 any, will be temporary and short term, with no disturbance of nests due to timing of clearing. Effects on birds during Project operation via mortality from collisions is expected to be low in number based on low sensitivity of the site. Post-construction 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.

7.1.3. *Flora and Fauna*

As discussed in Section 4.1.5, the Project site is located within a land that was previously used for commercial forestry operations. 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 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 3.5ha) due to the pre-existing network of roadways in the Project area.

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 is known disturbed land use near the Project site, such as highways, previous commercial forestry operations, and rural residential development. Given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on flora and fauna.
- *Significance of Residual Effects* – Annoyance of fauna caused during Project construction, if it occurs, will be temporary and short term. Effect on habitat due to the clearing required for this Project is extremely small relative to similar habitat on the Project site and in the local area in general.

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

7.1.4. *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 I) 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 E-G and Appendix J.

Outlined below are key summaries of the findings in context of the assessment.

7.1.4.1. *Plants*

- ACCDC data within five kilometers identified records for 11 floral species to be of conservation concern with none listed federally or provincially.
- No rare, endangered floral species or floral species of conservation concern were identified in the surveys.

7.1.4.2. *Birds*

- ACCDC data within five kilometers identified records for 29 bird species listed provincially or federally, the majority of which are presumably at or near the coastline.
- No federally listed species were found during the breeding bird survey. Red Crossbills were found to be possibly breeding onsite; however further investigation determined that they were not the federally endangered subspecies *percna*, but rather a subspecies widespread and common in the region.
- The Red Crossbill (*Loxia curvirostra*) observed does have a provincial status of Yellow (Sensitive) and is one of several species with that ranking encountered. Two of the Sensitive species encountered, Common Loon (*Gavia immer*) and Common Tern (*Sterna hirundo*), were only observed once each as single birds flying over or heard at a distance, as the Project site lacks a breeding site for these species. The remaining four species with a Sensitive ranking, Gray Jay (*Perisoreaus Canadensis*), Boreal Chickadee (*Poecile hudsonicus*), Golden-crowned Kinglet (*Regulus satrapa*), and Red Crossbill (*Loxia curvirostra*), all breed in the coniferous forest on or near the site.
- Two federally listed species were detected flying over the site: one group of Barn Swallows (*Hirundo rustica*) and a Bicknell's Thrush (*Catharus bicknellii*). Birders suggest that this finding is not exceptional given the search effort involved. Furthermore, the numbers of other migrants passing through the site were also not considered to be exceptionally high numbers for the province given the time of year the field investigations were completed.

7.1.4.3. 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 is beyond 25km, being Vault Cove over 100km away in the Annapolis Valley.
- The average number of bat call sequences per night observed during bat inventory studies were quite low in comparison to other monitoring completed by Dr. Hugh Broders in similar locations in past years. Three Endangered species, Little Brown Bat (*Myotis lucifugus*), Northern Long-eared Bat (*Myotis septentrionalis*), and Tri-coloured Bat (*Perimyotis subflavus*), were observed at the Project site. While the species richness in the area was believed to be exceptional by Dr. Hugh Broders, there was no significant movement of bats observed throughout the study area since none of the species were recorded at exceptionally high numbers.

7.1.4.4. Reptiles

- As per ACCDC records, the Wood Turtle (*Glyptemys insculpta*) and Blanding's Turtle (*Emydoidea blandingii*) are not known to be present within five kilometers of the Project area. Furthermore, no sightings were noted during field investigations.

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

- *Boundaries* – The spatial boundary includes the area where the WTGs are proposed to be located and the Project's ancillary features (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 rare, endangered, or species of conservation concern were observed at the Project site.

- *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 3.5 ha of which 0.006 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. While potential interaction is considered low, there is raised uncertainty and heightened concern due to white-nose syndrome.
- *Reptiles*: No rare, endangered, or species of conservation concern were observed or believed to be present at the Project site.
- *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 wetlands, birds, flora and fauna, including minimizing footprint of the Project and clearing outside of bird nesting, 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 swamp where the culvert will be installed; 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.

7.2. Assessment of Socio-Economic Aspects

7.2.1. Land Use

The proposed Project is set approximately four kilometers away from the communities of Brooklyn and Milton, with minor rural residential development nearby along Nickerson's Pond Road, as well as along and off of Highway 103 (Fishermen's Memorial Highway). The land is not currently used; however, an extensive network of existing roads are present in the Project area from historic use of the land for commercial forestry operations.

There are no residential properties within 2300m of the proposed WTGs, and a total of seven dwellings within 2km of the previously planned three WTG wind farm, 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.

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 previously outlined 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 required. 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 minimum distance from habitable dwellings as per any municipal 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 40km away from the proposed LWF location. Other projects near the area are outlined 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.

7.2.2. *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. 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. However, field studies suggest), the Project site is considered low potential for encountering Pre-Contact artefacts.
- *Proposed Mitigative Measures* – Related to effect on Mi'kmaq resources and traditional uses by the Mi'kmaq, the mitigations are those proposed for the ecological VECs and land use as explained above; they are not repeated here. Further, follow up consultation is planned with the nearby Acadia 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.

7.2.3. *Archaeological Resources*

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

- *Boundaries* – The area where the WTGs are proposed, and their ancillary features, could impact cultural resources; hence, this defines the spatial boundary. The temporal boundary is primarily the construction phase.
- *Potential Project Impacts* – A pathway that may adversely affect archaeological resources is direct impact to cultural resources during construction activities, such as earth works and excavation.
- *Proposed Mitigative Measures* – The EPP includes protocols should artefacts or human remains be discovered during construction, including contact information for the Province and the KMK in the unlikely event that a discovery is made.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site; however, given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on archaeological resources.
- *Significance of Residual Effects* – The potential to discover an artefact is very unlikely given the low potential identified in the archaeological assessment.

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

7.2.4. Recreation

The Project is proposed on Crown lands. Evidence of recreational angling activity was observed on Herring Cove Brook. Abundant evidence of recreational angling and camping was also observed at the Nickerson's Pond dam.

There are existing ATV multi-use trails through the former Bowater Mersey lands on former logging roads, with a portion of the trail network passing through the study site for the LWF. Recreational activities do also exist in the broader area, i.e., on a watershed scale as briefly described in Section 4.2.8. Accordingly, recreation has been identified as a VEC. A significant environmental effect would result if a substantive change in recreation occurred that was attributable to the Project.

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

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

7.2.5. Vehicular Traffic

The Project site is located east of Highway 103 (Fishermen's Memorial Highway), 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 30 flatbed truck loads are expected 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, the Municipality 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.

7.2.6. *Landscape Aesthetics*

The two proposed WTGs are set near the communities of Milton, Brooklyn, and Liverpool. The proposed location for the wind farm is located on a height of land between the Herring Cove Brook and Beach Meadow Book secondary watersheds, with an appropriately elevation of 60-95m ASL. There are rural residential neighbours are beyond 2300m.

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 N.

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 proposed 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, if applicable, 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, i.e., historic access for commercial forestry operations and extensive network of logging roads, have resulted in disturbance to the natural landscape. Given relative scale of the Project, 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, since the current network of logging roads will be used to minimize the extent of disturbance. 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.

7.2.7. Health and Safety

The health and safety of the public are of utmost concern in any project. Related to operation of the two 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 98m and a blade length of 46m, the maximum distance of ice throw is 285m. 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.

7.2.8. 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 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 Municipality 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, as it is a community-owned Project.
- *Cumulative Effects* – There are known other works taking place in the vicinity of the site that will act cumulatively to increase the likelihood of a positive effect on the local economy (i.e. Regenerative Air Energy Storage system and the Innovacorp Demonstration Centre); 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.

7.3. 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.

7.4. Summary of Residual Environmental Effects

The following table, Table 7.1 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 7.1 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.

8.0 MITIGATIVE MEASURES, FOLLOW-UP AND MONITORING

The Proponent is committed to planning and executing the LWF 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 C); this will be updated to address comments from regulators, other stakeholders and the public on this EA. The Proponent is committed to training contractors, employees and other site personnel on the requirements of the EPP in relation to their responsibilities. The main commitments for mitigative measures, follow up and monitoring include but are not limited to:

- Installation of sediment and erosion control measures prior to earth works and maintained during construction, and visual monitoring of receiving water as appropriate until site is stabilized;
- Preparation of a plan for bird monitoring and carcasses searches (bird and bat) and implementation of the plan once approved by EC and CWS;
- Use of an adaptive management framework that responds to data on bird and bat post-construction monitoring to develop practical solutions in consultation with DNR and other stakeholders should fatalities indicate a trend toward a significant environmental effect;
- Implement the mitigation sequence of avoidance, minimization and compensation as per the Nova Scotia Wetland Conservation Policy (2011) in interaction with the small treed/shrub bogs identified on this site; while proposed area of alteration has been minimized to approximately 60m², avoidance of these wetlands is not feasible – the Proponent will liaise with NSE regarding necessary compensation activities before any alteration of wetlands occurs;
- Install culvert at location of wetland disturbance as required for access road to facilitate local drainage in accordance with pertinent regulations, and standard environmental protection measures to prevent sedimentation, limit alteration to area necessary for access road and maintain surface water flow;

- Preparation of a plan for bird monitoring and carcasses searches (bird and bat) and implementation of the plan once approved by EC and CWS;
- Proper handling, storage and disposal of hazardous and non-hazardous wastes;
- Implementation of protocols should an unplanned event occur, such as discovery of suspected artifacts, structures of cultural significance or human remains, unplanned release of deleterious material as per the EPP presented in draft in Appendix C;
- Continued consultation with the community, the Mi'kmaq and regulators to maintain information flow and open dialogue to ensure that any additional questions or concerns with respect the Project construction and operation are understood and addressed;
- Update to regulators and other stakeholders should any changes be identified to the description of environment and project scope as outlined in this EA to ensure that the analysis presented in this EA report remains applicable;
- Maintenance of all other commitments as laid out in this EA report and compliance with the expected NSE Terms and Conditions of EA Approval; and
- If necessary, development of plans to monitor noise and / or shadow flicker to the satisfaction of NSE if requested by NSE should complaints occur and monitoring be an appropriate component of approach to complaint resolution.

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

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

9.0 CLOSURE

The Liverpool 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 Liverpool 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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