# Environmental Assessment of the 30MW East Point Wind Plant

East Point
King's County, Prince Edward Island

Prince Edward Island Energy Corporation

(Source: Vestas, 2005)

Kari MacDonald, EIT
On behalf of
Frontier Power Systems

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## 1. PROJECT SUMMARY

| | |
|---|---|
| **Proponent** | *Proponent:*<br>Prince Edward Island Energy Corporation<br>P.O. Box 2000<br>Charlottetown PE<br>C1A 7N8<br><br>*Design completed by:*<br>Frontier Power Systems Inc.<br>P.O. Box 72<br>Alberton PEI<br>C0B 1B0 |
| **Contact Persons** | Mr. Ron Estabrooks, P. Eng<br>Prince Edward Island Energy Corporation<br>Tel: (902) 368-5011<br>Fax: (902) 894-0290<br>Email: rgestabr@gov.pe.ca<br><br>Mr. Carl Brothers, P. Eng<br>President, Frontier Power Systems Inc.<br>Tel: (902) 853-2853<br>Fax: (902) 882-3823<br>Email: Carl.brothers@pei.sympatico.ca |
| **Project Title** | East Point Wind Plant |
| **Project Location** | The project will be located in a rural area in King's County on the northeastern tip of Prince Edward Island. The specific coordinates of each turbine site can be seen in Table 3.1 |
| **Estimated Capacity** | The wind farm will consist of ten Vestas V90-3.0MW wind turbines and will have a total generating capacity of 30MW. |
| **Construction Schedule** | • Land negotiations – September to December 2005<br>• Design work – December 2005 to May 2006<br>• Conduct Geotechnical work – February 2005<br>• Clear roads and commence road construction – June 2006<br>• Install foundations – August 2006<br>• Install electrical collector system – September 2006<br>• Receive turbines – October 2006<br>• Install and commission turbines – October/November 2006 |
| **Federal Involvement** | This project will receive financial support from Natural Resources Canada through the Wind Power Production Incentive (WPPI) program. WPPI provides funding based on a rate of $0.01/kWh of electricity produced per year over a period of 10 years. For the |

| | |
|---|---|
| | EPWP this amounts to approximately $750,000 – 800,000 per year. |
| **Involvement of Other Departments/Agencies** | Mr. Mark Victor, former Environmental Assessment Coordinator and Mr. Greg Wilson current Environmental Assessment Coordinator with the PEI Department of Environment, Energy and Forestry (PEIDEEF), were consulted as a part of the EA process. |
| **Required Permits & Authorizations** | Approval for development from the PEI Department of Community and Cultural Affairs.<br><br>Excavation Pit Permit from PEIDEEF.<br><br>Project approval under Section 9(1) of the Environmental Protection Act, PEIDEEF. |
| **Public Consultation** | This project was announced to the public by PEI Energy Minister Jamie Ballem on October 4, 2005. This meeting took place at the East Point Community Center.<br><br>A subsequent public meeting was held on March 30, 2006 in which the final wind plant layout and the details of the electrical interconnection were presented to the public. The result of this public meeting is presented in Appendix F.<br><br>Residents in the project area were also individually informed of this project through discussions by Adam Sandler, EIT, an employee of Frontier Power Systems. |
| **Author of EA** | Kari MacDonald, EIT<br>2120 Creighton St.<br>Halifax, NS B3K 3R4<br><br>Tel: (902) 420-9360<br>Email: kari_macdonald@ns.sympatico.ca |

## 2. PROJECT SCOPE

### 2.1 Scope of Project & Assessment

Phase I of the East Point Wind Plant involves the construction, operation and decommissioning activities listed in Section 3. This environmental assessment evaluates the potential interactions between the environmental components described in Section 4 and the activities described in this document. Any new developments or future project phases will require a separate environmental assessment.

### 2.2 Methodology

This environmental assessment was completed using Natural Resource Canada's *Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms under the Canadian Environmental Assessment Act.* The first step in the process involves gathering detailed information on each project phase and the environmental conditions at the project site. This information is used to determine the potential interactions between the project and the physical and socio-economic environment. Any environmental element that may be impacted by the project is termed a Valued Ecosystem Component (VEC). Mitigation measures are established to ensure that the project is completed in a sustainable and responsible manner, and any required permits are identified and obtained.

The PEI Energy Corporation has made significant changes to the siting of the wind plant in response to environmental concerns raised. The modified siting has moved wind turbines from areas which were identified in preliminary studies, as potentially disruptive to local bird populations and has avoided watershed areas which also may have been potentially disruptive. The PEI Energy Corporation has addressed all environmental concerns raised and has implemented measures to mitigate these concerns. The proponent does not believe that any significant environmental interactions will occur as a result of this project.

## 3. PROJECT DESCRIPTION

### 3.1 Background

Over the past number of years both Federal and Provincial governments have been working to enhance Green Power initiatives across Canada. This move stems from the increasing cost of petroleum resources and the damaging effects that their use has on our environment. Federally, Natural Resources Canada has developed a Wind Power Production Incentive Program (WPPI). WPPI encourages wind power development by providing funding to private projects. This project is eligible for funding under WPPI in the amount of $0.01 /kWh of generated electricity per year. On a provincial level, the PEI Energy Corporation and the PEI Department of Environment, Energy and Forestry (PEIDEEF) are involved in developing and promoting green power.

Prince Edward Island is the only Canadian province without substantial resources of hydroelectric power, fossil fuels or nuclear energy. Research conducted in 2004 indicates that approximately 80% of Prince Edward Island's Energy needs are supplied by fossil fuels. Thirteen percent of our energy demands are met using imported and oil-fired electricity, the majority of which is generated in NB and transmitted to the Island by underwater cabling. The remainder of the energy consumed in PEI is composed of 6.5% biomass (including wood, solid waste, and sawmill residue), and 0.5% provincially produced wind power (PEIDEEF, 2004). PEI's dependence on fossil fuels has many disadvantages. Burning this type of fuel has well-known environmental consequences, including the emission of harmful air pollutants and greenhouse gases. In addition, the price of petroleum products has been steadily rising while supplies are dwindling. It is a widely held view that Prince Edward Island needs more reliable, sustainable energy sources.

The need for alternative forms of energy is being addressed by the Provincial Government through various initiatives. In November 2003, PEI became the first province to sign a Climate Change Memorandum of Understanding, an agreement with the Federal Government to collaborate in an effort to increase compliance with the Kyoto protocol and achieve the following goals (PEIDEEF, 2004):

- Develop renewable energy technologies
- Promote and implement energy efficient practices

- Develop a climate change action plan
- Promote individual climate change actions
- Reduce greenhouse gases within the agriculture sector

Adopting these goals lead to the development of the PEI Energy Framework and Renewable Energy Strategy. This policy strives to provide sustainable, dependable, and affordable energy to Island residents and businesses. The strategy also serves to promote efficient energy use, support economic development and encourage diversity in the energy sector. The province has also established a long term goal to supply 100% of its electrical capacity through renewable energy sources by 2015 (PEIDEEF, 2004).

The PEI Energy Corporation (PEIEC), the proposed project proponent, was established in 1978. This Crown Corporation is involved in the generation, production, transmission and distribution of energy for the residents of Prince Edward Island. Since its creation, PEIEC has taken a leadership role in promoting renewable energy on the Island. They are involved in developments at the Wind Energy Institute of Canada (WEICan), formerly the Atlantic Wind Test Site, in North Cape, PEI. North Cape is also the location of the PEI Wind-Hydrogen Village. The PEIEC has also developed several other renewable energy projects that continue to serve Islanders, including the Charlottetown District Heating System and the Energy from Waste facility.

Wind power is the fastest growing energy source in the world. Research conducted for both the Canadian and PEI Wind Atlas shows that wind energy has great potential in Prince Edward Island. The Island's wind resources have been demonstrated at the Atlantic Wind Test Site in North Cape, which currently generates 10.56MW of electricity. The average wind speed in North Cape is in the range of 8-9m/s at 80m above ground level. Comparable wind speeds are also found at the northeastern tip of the Island near the proposed location for the East Point Wind Plant. Average wind speeds at this location are in the range of 7.5-8.5m/s at 80m AGL.

The design and construction phases of the proposed project are being completed by Frontier Power Systems Inc., a privately owned Atlantic Canadian firm with extensive experience in the renewable energy industry. The company is involved in projects such as the Atlantic Wind Test Site, the Ramea Wind-Diesel Project, and the Wind-Hydrogen Village. Mr. Carl Brothers, President of

Frontier Power Systems, has been active in the wind energy industry in Canada for nearly twenty five years, primarily in the management of the Atlantic Wind Test Site. FPS was also involved in the development of a number of projects such as the North Cape Wind Plant. Frontier Power Systems continues to promote and develop energy technologies throughout the Atlantic region**.**

### 3.2 Purpose

The purpose of this project is to utilize an indigenous form of sustainable energy and to help provide the project investors, the taxpayers of Prince Edward Island, with more long term stability in their electrical rates. This facility will have a generating capacity of 30MW, which will be fed into the Maritime Electric Grid system and distributed to the electrical consumers of the province.

### 3.3 Project Details

The proposed project involves the construction, operation, maintenance and decommissioning of a 30MW wind power plant in East Point, Prince Edward Island. This facility will consist of ten wind turbines, installed in a single array, access roads, a control station with a meteorological tower, a maintenance building, an electrical substation, and connections to power distribution lines.

To determine the wind resources in the project area, three 50m meteorological towers were installed at East Point, North Lake and South Lake. The data from these towers was processed and analyzed using WAsP, (Wind Atlas Analysis and Application Program), the world's premier wind modeling software. WAsP uses wind data to produce a wind resource grid which is uploaded to GH Wind Farmer, a wind plant design software package. Wind Farmer uses the wind resource grid to optimize a wind plant layout to maximize energy production, while considering factors such as noise, shadow flicker and other visual impacts. The turbine placement at the East Point Wind Plant was optimized using this process. The wind plant design is expected to generate electricity at a capacity factor of approximately 35-36%, for generating 87 Gigawatt-hours of electricity annually.

The turbine array will be placed on the East-Northeast to West-Southwest axis to minimize array or wake losses between the turbines. An aerial plan of the project site can be seen in Figure 3.1. Table 3.1 shows the PID# and the UTM coordinates (Zone20 NAD83) at each wind turbine site.

**Table 3.1. Turbine array details**

| Site ID | PID# | Turbine Coordinates (UTM20 NAD83) | |
|---|---|---|---|
| | | Easting | Northing |
| 1 | 856088 | 571837 | 5144852 |
| 2 | 110973 | 572128 | 5144832 |
| 3 | 110973 | 572399 | 5144842 |
| 4 | 110965 | 572680 | 5144884 |
| 5 | 110932 | 572937 | 5145034 |
| 6 | 110916 | 573284 | 5145147 |
| 7 | 110908 | 573579 | 5145179 |
| 8 | 110858 | 573923 | 5145360 |
| 9 | 110817 | 574235 | 5145488 |
| 10 | 766436 | 574627 | 5145476 |

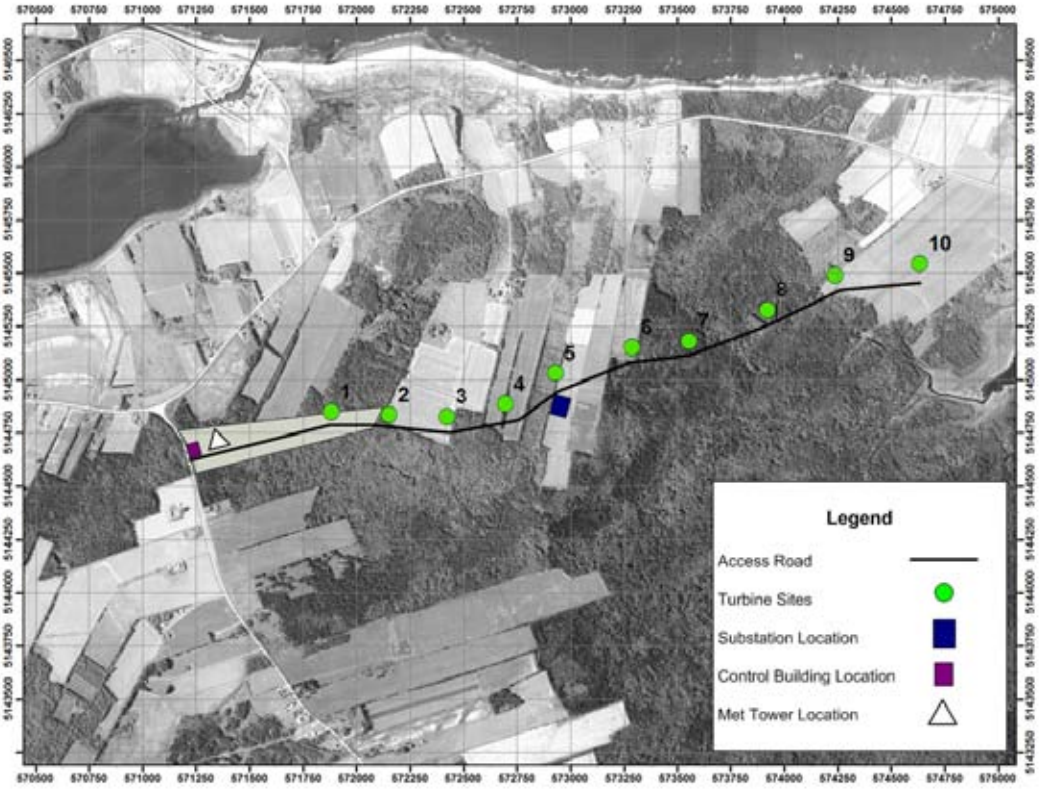


**Figure 3.1. Aerial photograph showing site layout**

### 3.3.1 Project Design

The project design phase consists, typically, of six tasks, as outlined in the following sections.

3.3.3.1 Wind Resource Assessment

The wind monitoring activities for this project have been underway for more than two years. Fifty (50) meter wind monitoring towers have been installed at East Point, North Lake and Souris for over two years and at South Lake for over a year. The wind data gathered from these towers forms the basis of the analysis for wind turbine selection, wind turbine location and overall project economics. In addition to the wind monitoring towers, which provide a relatively short term record of wind data, long term wind data is available from Environment Canada's weather station at East Point.

3.3.3.2 Turbine Selection

The selection of the most appropriate turbine for a project depends on a number of factors, including local wind resource, siting constraints, site access, noise limitations.

The turbines selected for this project are 10 Vestas V90 IEC IA wind turbines, one of the most advanced wind turbines in the world. The blade design uses carbon fiber composites and the shape has been improved to increase energy production and reduce sensitivity to small particles and other debris. The V90 has a larger rotor and generator than the Vestas V80-2MW turbine; however technological advances in blade, tower and nacelle design have created a lighter machine. The reduced weight allows for easier transportation and installation and results in lower associated costs (Vestas, 2005).

The V90 has three blades, each measuring 44m in length, providing a rotor span diameter of 90m and a swept area of 6362$m^2$. The turbine has a hub height of 80m and the tubular steel tower has a base diameter of 3.98m. Each turbine has a rated power output of 3.0MW, which can be achieved with a wind speed of 15m/s or greater. The cut in wind speed, 4m/s, provides sufficient torque to enable the rotor to turn at 9 rpm and start generating electricity. The turbine operates in wind speeds between 4 m/s and 25m/s with the rotor speed varying from 9-19rpm and the power increasing from 0 kW to 3,000 kW (Vestas, 2005). Figure 3.2 shows the components of the V90 nacelle, while the power curve for the V90 turbine can be seen in Figure 3.3.

3.3.3.3 Turbine Layout

Wind speed data, wind turbine selection, and the terrain input information in area of interest, complete the input information needed for the wind plant design. The wind plant layout can be optimized for energy generation and installation using one of several available wind flow modeling and wind plant design software packages. The turbine array resulting from this optimization process is shown in Figure 3.1.

3.3.3.4 Electrical Interconnection

The electrical output from the wind plant must be connected to the utility's electrical system. This design will require a combination of underground and overhead wiring. The wind turbine generator generates electricity at 1000 Volts, which is then increased to 34,500 Volts (34.5 kV) by a transformer in the nacelle of the turbine. The 34.5 kV is transmitted down the tower and through an underground cable, where it connects to an adjacent pole line that is part of the electrical collector system. These pole lines take the electricity back to the substation where it is further increased to 69 kV and connected to Maritime Electric's utility system.

3.3.3.5 Civil design

Civil design work is preceded by a series of geo-technical studies. The primary geo-technical work involves the drilling of boreholes at the location of each wind turbine in order to assess the bearing capacity of the soil for the wind turbine foundations. This information will be made available to the foundation design engineer to carry out the foundation design of the wind turbine.

Secondary geo-technical work is carried out using surface excavations, or 'test pits', to assess the soil conditions near the surface. The test pits are used to evaluate the soil conditions for the construction of roads and crane pads to install the turbines and for the substation.

Associated work, for both phases of the geo-technical work, will include clearing an access path, possibly on existing woods roads, to permit the excavating and borehole equipment to access the pre-determined locations. All excavated soil will be returned to its original location.

3.3.3.6 Environmental Assessment

The Environmental Assessment (EA) is a critical project activity to ensure that the construction and operation of the project does not cause any serous environmental impacts. This environmental assessment was conducted as per the requirements of CEAA and WPPI using the process outlined in Section 2.2. The EA document and the attached appendices form the primary record of the EA process.

### 3.3.2 Construction

Project construction can be divided into three phases: civil infrastructure, electrical infrastructure and turbine installation. The installation of civil infrastructure involves of the construction of access roads, crane pads, laydown areas, foundations, the service building and the meteorological tower. All aspects of the civil work will utilize similar equipment and site restoration protocols. The electrical infrastructure associated with the project consists of underground and overhead electrical collector systems, the sub-station and the transmission line (which is not a direct component of this project). The turbine installation will involve of the delivery, assembly, installation and commissioning of the wind turbines.

3.3.2.1 Civil Infrastructure

- Access Roads

  Access roads will be constructed to enable the delivery of equipment and turbines during the construction phase and to enable service vehicles to access turbine sites during plant operation. Some clearing of wooded areas will be required to construct these access roads. It is expected that up to 10 hectares of wooded land may need to be cleared to allow the access roads to be constructed. These roads will be approximately 6m wide to enable equipment and support vehicles to access the sites but wider shoulders, approximately 10 meters wide, will need to be cleared and compacted to enable the lift crane to move from site to site. Clearings will need to wider in areas where the transmission line runs beside the roadway. All access roads will be constructed according to the standards outlined in the PEI Department of Transportation and Public Works Environmental Protection Plan (T&PWEPP) and the site specific Environmental Protection Plan (EPP), seen in Appendix H and E respectively.

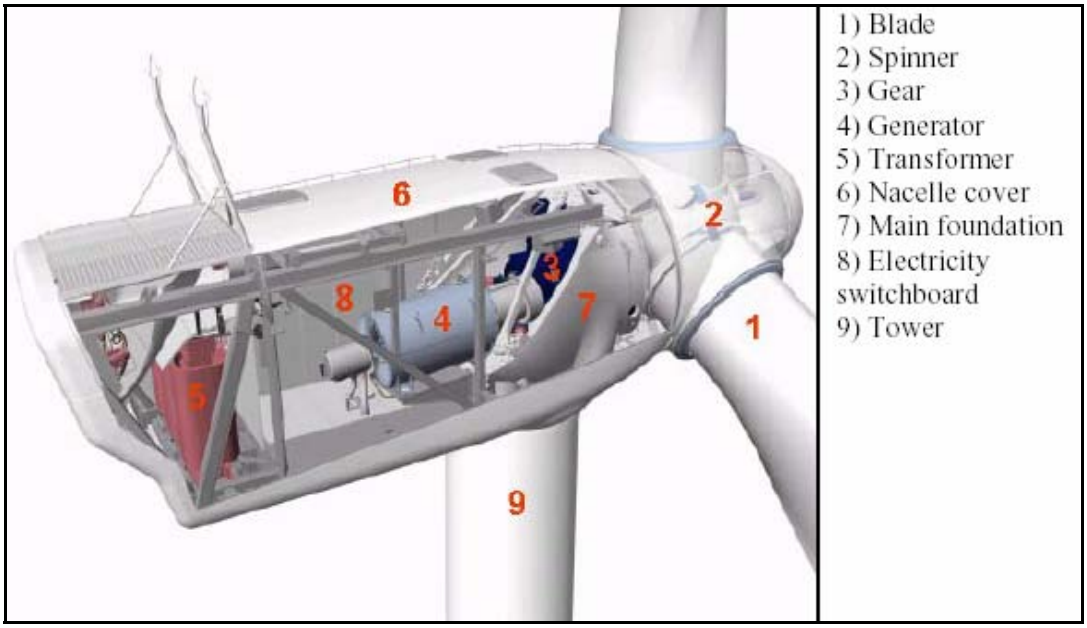


**Figure 3.2.Components of the V90 nacelle (Vestas, 2005)**

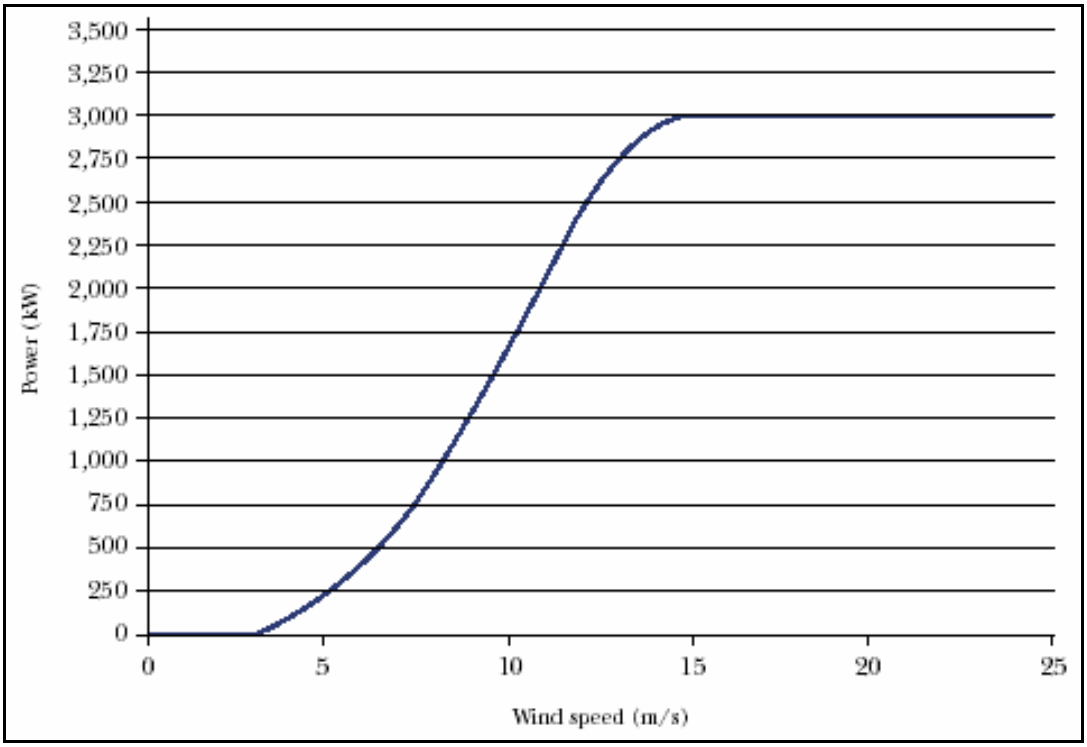


**Figure 3.3.V90 Power Curve (Vestas, 2005)**

The following activities are involved in the construction of access roads:

- Roads will be cleared by a qualified commercial forest operator.
- Land will be grubbed and cleared by a qualified civil contractor using an excavator, a bulldozer and bull rake.
- Up to 0.3m of top soil/overburden will be removed from the road surface and reused or disposed of as per T&PWEPP standards.
- Approximately 0.5m of Select Borrow will cover the road surface to ensure that the road has sufficient load bearing capacity for the transportation of turbines, cranes and other heavy equipment.
- The road surface will be compacted to provide a smooth, more erosion resistant surface.
- Left over grubbings will be removed from the site and disposed as per T&PWEPP standards.

- Crane Pads

An area adjacent to the wind turbine will be prepared to support the heavy lift crane. This crane pad, which will have similar construction requirements as the access roads, may be removed once the turbine is installed, in order to return the land to it original use. The crane pad has approximate dimensions of 20 meters x 25 meters

- Laydown Areas

There will be an area immediately adjacent to the foundation, which may be cleared to enable the turbine components to be unloaded and stored prior to installation. These laydown areas will be approximately 75 meters x 75 meters and must have specified capacity and grade to allow the components to be unloaded and stored.

- Foundations

The foundation, fabricated using steel reinforced concrete, will be either a proprietary annular type design or a conventional spread footing design. The following steps are involved in the construction of turbine foundations:

- Excavation of area for the proprietary tower foundation (8m deep x 6 meters diameter) will be completed using a specialized excavator. If a conventional, spread

footing type, foundation is used, the excavation will be 3 meters deep and 20 meters square.

- A portion of the excavated material will be returned to the foundation as backfill material if the soil is of acceptable quality. Surplus material will be removed and placed in an approved pit.
- Compacting perimeter of the hole using a compactor and/or excavator.
- Installing form work, rebar and pouring concrete for the tower base.
- Disposal of excavated material and other waste

- Service Building

A service building will be constructed near Highway 16A at the entry point to the wind plant access road. This building, which is expected to a single story, slab on grade design, will be approximately 275 square meters.

- Meteorological Tower

An 80 meter high meteorological tower will be procured and installed near the service building to provide continuous monitoring of wind speed and other meteorological parameters and data will be incorporated into the wind plant's SCADA system.

- Equipment Operation

This activity will involve heavy equipment including heavy trucks, excavators, bulldozers and cranes. The equipment will require fuelling and, potentially, servicing on site.

- Site Restoration

This activity includes:

- Backfilling and compacting excavated soil using an excavator and compactor.
- Final grading to recontour the site surface using a bulldozer and/or grader.
- Removal of site grubbings and other debris.
- Replacement of topsoil and re-vegetation of site by natural re-growth.

3.3.2.2 Electrical Infrastructure

- Underground Collector System

The 34.5kV underground collector cabling will terminate in the base of the wind turbine, run underground to an adjacent utility pole where it will connect to the overhead collector system on the adjacent roadway. The underground cable will be installed, along with fibre-optic communication cable in a trench between the turbine and the utility pole. A self-propelled trencher or backhoe will dig a trench measuring approximately 1m wide and 1.5m deep. The bottom of the trench will then be covered with a layer of sand before laying the distribution line. The cable is protected by covering it with planks prior to backfilling the trench. Magnetic warning tape is also placed just below the soil surface and allows the cable to be located easily.

- Overhead Collector System

An overhead collector system will transport the electricity from the point of interconnection for the underground cable to the substation. The 34.5kV overhead distribution lines will be carried on 15m wooden poles spaced approximately 20m - 30 m apart. A specially equipped utility truck will be used to drill holes in the ground and the wooden poles will be inserted and prepared for cable installation.

- Substation

In order to connect the wind power plant to Maritime Electric's grid, a substation is necessary to step up the 34.5kV, coming from the wind plant's collector system, to the grid voltage, 69kV. The activities involved in this project phase include:

  - Clearing of land and preparation of subgrade. The area required for the substation will be approximately 100 meters x 100 meters.
  - Installation of grounding network to protect equipment
  - Installation of vegetation control materials, surface fill and fencing.
  - Construction of the concrete bases for substation components.
  - Delivery and installation of substation units on site.
  - Equipment installation will require the use of cranes to receive the transformer and other large pieces of equipment needed to complete the civil installation work, including concrete trucks, excavators, bulldozers and graders,
  - Connection of substation to Maritime Electric's electrical transmission system.

3.3.2.3 Turbine Installation

The turbines will be transported by two special delivery ships from the manufacturing facility to the port of Souris in Prince Edward Island. The first ship will carry the 40 tower sections, which will be unloaded at and temporarily stored near the port. The second ship will carry the nacelles and blades and be unloaded one week later. All components will be delivered to the construction site on specially equipped trailers, as required for the construction sequence. The major construction tasks will include:

- Transportation of turbine to site using a series of flatbed trailers and truck. Site offloading will be carried out by two cranes.
- Assembling nacelle and blades in an area of approximately 100m x 100m.
- Erecting the turbine tower using a large crane.
- Installation of the tower, nacelle, hub and blades using a heavy lift crane and a smaller 'tailing' crane to stabilize the loads during erection.

Once the turbine components are assembled, work will continue over a period of 5-7 days to complete the necessary mechanical and electrical connections. Following the mechanical completion, the turbines will be commissioned individually and placed into service.

### 3.3.3 Operation

The wind plant is expected to be in operation for a period of twenty years and it is probable that life extension programs may extend the service life further.

The operation and maintenance of the proposed wind power plant is an integral part of the project. The following activities are involved in this project phase:

- Operation of V90 wind turbines to provide electricity to the utility grid.
- Regular inspection of facilities to ensure equipment integrity.
- Annual preventative maintenance program for the turbines.
- Monitoring wildlife activity and behaviour at the project site through general observation and field studies.

Most wind turbines are operationally available approximately 95% of the time and generating electricity 65%-75% of their operational time. A major advantage of the V90 model is the economy of scale on turbine maintenance. Repairs and maintenance are carried out by wind turbine technicians. Typical maintenance activities include the calibration of instruments, inspection and maintenance of hydraulic systems, and lubrication of all moving parts. Lubrication involves oil, grease and other petroleum products (Vestas, 2005). These and any other chemicals on site will be stored and disposed of as per T&PWEPP standards and the site specific EPP (Appendix H and E)..

A computer based SCADA (Supervisory Control and Data Acquisition) system will closely monitor the turbine operation, components and subsystems, at all times in all weather conditions. The system detects and responds to emergency situations, while providing important information to staff. Both the SCADA system and wind plant staff will be housed in an operations center within the wind plant. Full time staff will be available, but 24 hour supervision will not be required because automated paging systems will be used. The operations building will be the maintenance centre and will also be used to store parts and other equipment.

### 3.3.4 Decommissioning/Abandonment

The design lifespan of the wind plant is 20 years, so decommissioning is not expected until 2026. If it is economically viable, the turbines may be upgraded to continue operation or replaced with newer technology to allow the continued operation of the wind plant. If the proponent chooses to decommission the site, the following activities would be involved:

- Disconnection of wind turbines from grid.
- Disassembly and transportation of wind turbines using cranes and trucks.
- Possible excavation and removal of concrete pads using an excavator and trucks.
- Final grading to recontour the site surface.
- Revegetation of site by natural regrowth or seeding.
- Disposal, reuse or recycling of any associated waste material as per T&PWEPP standards.

### 3.3.5 Malfunctions and Accidents

It is important to consider any potential malfunctions and accidents that could occur during each of the project phases. The following events may result in unexpected negative impacts to the surrounding environment:

- During construction and decommissioning phases there is the potential for equipment upset and fuel spills.
- Maintenance activities may involve the use of petroleum products such as lubricants and there is the potential for the accidental release of these and other hazardous substances into the environment.
- Adverse weather conditions may cause operational problems. Precipitation in freezing conditions can lead to ice build up on turbine blades, possibly resulting in ice shedding and ice throw. These conditions may create a risk to human health or lead to damage of surrounding infrastructure.
- During connection to the MECL grid, power disruptions may occur. This may not be necessary, depending on exact connection locations. If power outages are required, they will be short-term and are not expected to impact a large number of users.

### 3.3.6 Project Schedule

Preliminary siting and soil testing is expected to begin in February 2006 and continue for approximately 2-3 weeks. The final project design, as well as the spring bird migration study and the rare plant study, will be complete by June 2006. Approval to commence construction will be sought at that time. While it is acknowledged that the formal completion of the bird and the rare plant studies may not be completed prior to the submission of the EA document, advance discussions with the principal investigators will ensure that the study results be considered in the report's conclusions and recommendations. The construction phase is expected to commence as soon as EA approval is obtained and is expected to last until November 2006, when the plant will become operational. The design life of the turbines is 20 years, so the project will operate until 2026. Wind energy is projected to become the most economical electricity source available; therefore it will likely be an even more economic source of energy in 2026. The site will likely be re-developed using newer equipment.

Details of the project schedule can be seen below:

- Conduct Geotechnical work – February 2006
- Design work – May 2006
- Clear roads and commence road construction – June 2006
- Install foundations – August 2006

- Install electrical collector system – September 2006
- Receive turbines – October 2006
- Install and commission turbines – October/November 2006
- Wind Plant operational – December 2006

### 3.3.7 Future Project Phases

There is the potential for further development in East Point; however the PEI Energy Corporation may not be the developer. Any developments not described in this report will require a separate environmental impact assessment.

## 4. DESCRIPTION OF SURROUNDING ENVIRONMENT

The project site is located near North Lake, a rural community in northeastern King's County, Prince Edward Island. A project site visit was conducted on September 2nd and November 13, 2005, and information regarding the environment surrounding the project site was obtained at this time. Photos from the site can be seen in Appendix I.

### 4.1 Ecoregion

This project site is located in the Atlantic Maritime Ecozone. The climate in this area is cool and moist with moderate temperatures. The mean annual precipitation varies from 90mm inland to 1500mm near the coast. Coastal lowland areas (such as PEI) have deeper, more fertile soils formed on surface materials derived from the underlying sedimentary bedrock (sandstone).

The forests in the Atlantic Maritime Ecozone are generally composed of mixed stands of conifers and deciduous species, characterized by red spruce, balsam fir, yellow birch, sugar maple, red and white pine, and eastern hemlock. Characteristic mammals include coyote, raccoon, striped skunk, and the eastern chipmunk. Northern Goshawk, Osprey, Common Grackle, Bobolink, Red-winged Blackbird, Sparrow, Rose-breasted Grosbeak, Northern Harrier, Sharp-shinned Hawk, Gray Partridge, Ruffed Grouse, Great and Double-crested Cormorant, Killdeer, Spotted Sandpiper, Herring Gull and Razorbill species are also known to have breeding colonies in this ecozone.

Forestry and agriculture are the major land-oriented activities in this region. The coastal communities traditionally support one of the country's most important fisheries. The more fertile, lowland soils support an agricultural industry that includes dairy beef, and poultry production and the production of vegetables and fruits (PWGSC-ES (b), 2002).

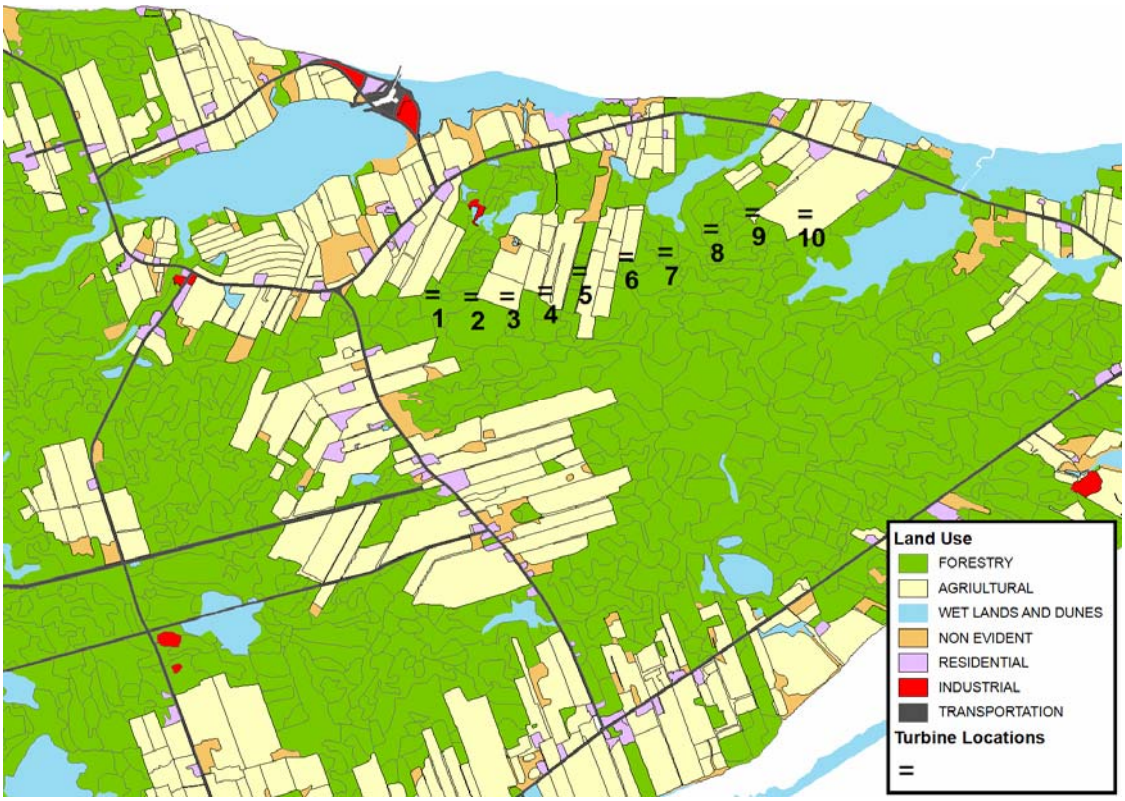


**Figure 4.1. Land use in the project area**

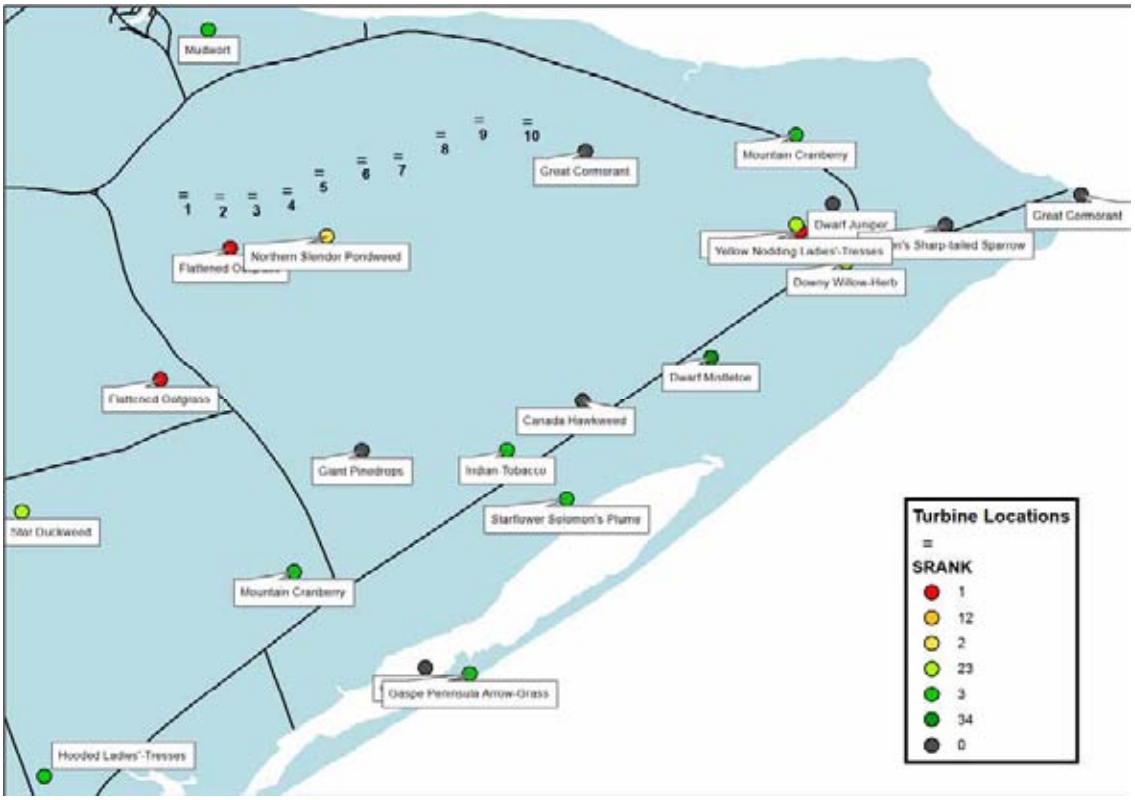


**Figure 4.2. Locations of species identified by ACCDC**

## 4.2 Climate

The climate in this region is generally cool and moist with moderate temperatures. The East Baltic weather station (46° 25'N 62°10'W) is located approximately 4km from the project site. Canadian Climate Normal (1971-2000) data from this station indicates that average air temperatures range from -10.9°C to 22.3°C, with extremes of -31°C and 33.5°C. The majority of the precipitation in East Point occurs between September and January. The average annual precipitation in this area amounts to 1226.3mm, of which 265.4mm is snow and the other 962.9mm, is rain. On average, there are 10 freezing rain events per year in this area.

Data from anemometer towers installed at the project site indicate that the prevailing winds are from the southwest during the summer months and from the northwest in the winter. The average wind speed in the East Point area ranges from 7.5m/s to 9.0m/s at 80m AGL. The maximum velocity for various heights and return periods was calculated using the observed wind data. At 80m, the maximum three second gust velocity was calculated to be approximately 60.9m/s.

## 4.3 Land Use/Ownership

The project site consists of a turbine array with 10 turbine sites and connecting access roads spread over three watersheds and 10 different properties. Table 4.1 describes the land use and ownership at the location of each turbine in this array and the properties in between that will be impacted by access roads. See Figure 4.1 for an aerial photo showing the location of the wind turbines.

Turbine 1 is located in the North Lake Creek watershed. Covering an area of 4770Ha, this watershed consists mainly of forest with some agricultural and wetland areas. Turbines 2 through 9 are located on the ridge that separates the East Lake Creek and Surveyor Point watersheds. Turbine 10 is located entirely in the East Lake Creek watershed, which has an area of 1660 Ha. The land cover in this watershed also consists primarily of forest with some agricultural and wetland areas. The Surveyor Point watershed has an area of 385 Ha and is also classified mainly as forest, agricultural and wetland (PEI GIS, 2005). There is a low density of residents near the project site, approximately 40 homes within a 1km range. All adjacent landowners have been consulted by the proponent and have no objections concerning the proposed project. Land negotiations were completed in January 2006 and any residents directly impacted by the project have signed lease

options with the Prince Edward Island Energy Corps. Figure 4.2 shows the environmental features in the project area.

## 4.4 Soils and Topography

The topography in the East Point area is classified as level to undulating, with slopes in the range of 0-5%. The elevation at the project site ranges from 10-40m above sea level, and the approximate elevations at each turbine site are shown in Table 4.2. The soils in the area are composed mainly of Charlottetown, Winsloe, and Malpeque types. Malpeque soils consist mainly of the Gleyed Eluviated Dystric Brunisol, whose family characteristics include coarse, loamy, deep, acid, cold and perquaic. This soil is usually imperfectly drained with a permeability of less than 0.5cm/h, therefore wetness is often a limiting factor in site usage. The dominant subgroup in Charlottetown soils is Orthic Humo-Ferric Podzol, material that has coarse-loamy, deep, neutral-acid and cool-cold characteristics. These soils have a deep layer of soft bedrock and are generally well drained with permeability less than 0.5cm/h; however they are also known to be an erosion hazard. The dominant subgroup in Winsloe soils is Orthic Gleysol, which is typically deep, sandy-loamy, acid, cold and peraquic. This soil is often imperfectly or poorly drained, and the permeability is consistent with Charlottetown and Malpeque soils (Agriculture Canada, 1988).

Geotechnical testing was conducted at each turbine site between January 30$^{th}$ and February 7$^{th}$, 2006. Drilling was conducted using a track-mounted auger drill rig. In order to determine the exact location of till and bedrock at each turbine location, 48mm diameter core samples were taken through rotary core drilling to depths of 15-16m. The bore hole results are shown in Table 4.3.

## 4.5 Hydrological Resources

As mentioned previously, the project spans the North Lake Creek, East Lake Creek and Surveyor Point watersheds. The drainage area of these watersheds are approximately is 4770Ha, 1660Ha, and 385Ha respectively. The groundwater table depth at each turbine site was also determined through geotechnical testing and the results are shown in Table 4.3. The water table depth was measured on February 10$^{th}$, 2006. In order to allow future groundwater level monitoring, perforated plastic standpipes were installed in each borehole. North Lake is located approximately 530m from

Turbine 10; however the boundary of the wetland surrounding the lake is located approximately 355m from Turbine 10. In addition, there is a small stream located to the south of the turbine array. This stream is located approximately 515m from Turbine 3, 565m from Turbine 4, and 615m from Turbine 5. A photo of the stream and North Lake can be seen in Appendix I. Concerns over environmental impact of stream crossings were one of the key factors in the decision to modify the turbine layout to eliminate significant water crossings.

**Table 4.1. Land use in each watershed**

| Watershed Name | Land Use Composition (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Forestry | Agriculture | Wetland | Transportation | Residential | Institutional | Non-Evident |
| East Lake Creek | 60.00 | 26.96 | 7.97 | 1.09 | 1.17 | 0.02 | 2.79 |
| North Lake Creek | 73.93 | 15.55 | 6.34 | 1.89 | 0.73 | 0.11 | 1.45 |
| Surveyor Point | 37.63 | 34.41 | 16.24 | 3.02 | 2.46 | 1.04 | 5.20 |

**Table 4.2. Current ownership and land use at each turbine site**

| Site ID | Elevation (m above sea level) | Turbine Coordinates (UTM20 NAD83) | | PID# | Current Land Use |
|---|---|---|---|---|---|
| | | Easting | Northing | | |
| 1 | 36 | 571837 | 5144852 | 856088 | Forestry |
| 2 | 40 | 572128 | 5144832 | 110973 | Agriculture |
| 3 | 37 | 572399 | 5144842 | 110973 | Agriculture |
| 4 | 31 | 572680 | 5144884 | 110965 | Agriculture |
| 5 | 25 | 572937 | 5145034 | 110932 | Forestry |
| 6 | 20 | 573284 | 5145147 | 110916 | Agriculture |
| 7 | 18 | 573579 | 5145179 | 110908 | Forestry |
| 8 | 15 | 573923 | 5145360 | 110858 | Forestry |
| 9 | 18 | 574235 | 5145488 | 110817 | Forestry |
| 10 | 13 | 574627 | 5145476 | 766436 | Agriculture |
| Access Rd | n/a | n/a | n/a | 111161 | Forestry |
| Access Rd | n/a | n/a | n/a | 110882 | Forestry |
| Access Rd | n/a | n/a | n/a | 110890 | Forestry |
| Access Rd | n/a | n/a | n/a | 110874 | Forestry |

**Table 4.3. Geotechnical testing results**

| Characteristic | Borehole ID | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| *Rootmass/Topsoil* | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 |
| *Till Thickness* | 1.68 | 4.43 | 6.10 | 8.69 | 2.14 | 5.65 | 8.69 | 4.73 | 7.17 | 8.08 |
| *Depth to Bedrock* | 2.13 | 4.88 | 6.55 | 9.14 | 2.59 | 6.10 | 9.14 | 5.18 | 7.62 | 8.53 |
| *Depth to Groundwater* | 6.60 | 14.9 | 13.9 | 12.6 | 10.3 | 5.19 | 2.43 | 4.70 | 11.1 | 7.71 |
| *Depth of Borehole* | 15.6 | 15.4 | 15.7 | 15.4 | 15.7 | 15.3 | 15.2 | 15.7 | 15.6 | 15.5 |

4.6 Vegetation

A data search was conducted through the Atlantic Canada Conservation Data Centre (ACCDC) to determine the presence of sensitive flora and fauna in the project area. These results indicated the potential presence of the following plant species: Canada Hawkweed (*Hieracium canadense*), Leathery Grape-Fern (*Botrychium multifidum*), Northern Slender Pondweed (*Stuckenia filiformis ssp alpina*), Yellow Nodding Ladies'-Tresses (*Spiranthes ochroleuca*), Downy Willow-Herb (*Epilobium strictum*), Mountain Cranberry (*Vaccinium vitis-idaea*), Pondshore Knotweed (*Polygonum raii*), Small Eyebright (*Euphrasia randii*), Dwarf Juniper (*Juniperus communis var. depressa*), Flattened Oatgrass (*Danthonia compressa*), and Bog Clubmoss (*Lycopodiella inundata*). The species in the immediate project area are not classified as being at risk, rare or endangered by either Federal or Provincial authorities; however the first five listed plant species are considered rare throughout their range in the province (ACCDC, 2005). Figure 4.2 shows the locations of the plant species identified by data from ACCDC.

This figure shows the presence of Northern Slender Pondweed, Pondshore Knotweed and Leathery Grape-Fern within 500m of the proposed site for Turbine #4. These plant species have been assigned provincial ranks of S0, S1 and S2 respectively. Northern Slender Pondweed is ranked S0 because the rarity of the species in the province is uncertain. According to the provincial ranking system (SRANKS), a species classified as S1 (Pondshore Knotweed) is considered to be “extremely rare throughout its range in the province (typically very few remaining individuals)”. A ranking of S2 (Leathery Grape-Fern) represents species considered “rare throughout its range in the province (6 to 20 occurrences or few remaining individuals)”. Flattened Oatgrass is also found within approximately 450m of turbines 1, 2, and 3 and is ranked S1. In order to obtain a more accurate depiction of the flora species present at each turbine site, a rare plant survey will be undertaken after the snowmelt in the Spring/Summer of 2006. The results of this survey will be evaluated prior to construction and considered when determining final turbine locations. All precautions will be taken to avoid disturbing any sensitive plant species in the project area.

The majority of the project site has been used as agricultural land for at least 50 years. Therefore the site is considered previously disturbed and the majority of the plant species at the sites are related to agricultural activities. The presence of native, rare or endangered plan species at the project site is unlikely. See Appendix I for photos of the environment surrounding the project area.

## 4.7 Wildlife

A data search was conducted through the Atlantic Canada Conservation Data Centre (ACCDC) to determine the presence of sensitive flora and fauna in the project area. These results indicated the potential presence of the following animal species in the immediate project area: Great Cormorant (*Phalacrocorax carbo*), Common Tern (*Sterna hirundo*), and Rusty Blackbird (*Euphagus carolinus*). The wildlife species in the immediate project area are not classified as being at risk, rare or endangered by either Federal or Provincial authorities (ACCDC, 2005).

At the project site, a bird population survey was completed by staff from Bird Studies Canada. The fall migration study took place between September 9th and November 2nd, 2005. The methodology used for this survey involved monitoring 8 point count sites, 6 test sites adjacent to the proposed turbine sites as well as 2 control sites along Lighthouse Road. Bird counts were also completed along the coast near the 50m meteorological test tower. Each site was strategically located along hedgerows and wooded areas or near the shore to provide a clear view of the sky and sample each type of habitat. In order to fully understand the fall migration patterns in East Point, all the test sites were monitored one morning per week and the control sites were monitored twice weekly. In addition to morning counts at the control sites, evening surveys were conducted weekly between September 28th and November 1st. Evening observations began 30 minutes before sunset and provide important information regarding migration patterns; many large flocks of migrating birds set flight around this time of day.

The results of the fall migration survey indicate the presence of various bird species at the project site. Table 4.7.1 shows the number of observations and total number of birds observed during the fall survey. These birds include gulls, crows and ravens as well as water birds including Harlequin Ducks, Eiders, surf, white-winged and black scoters were also observed along the coast. Further inland, staff found flocks of songbirds such as sparrows and kinglets, as well as a yellow-billed cuckoo, a blue-gray gnatcatcher, and a white-crowned sparrow in the project area. Observations also indicate that the flight path of these birds is typically around East Point, not directly over the project area. Details regarding specific bird species observed at each point count site and transect can be seen in the report in Appendix B.

Results of the fall survey show that more birds are located near the tip of East Point. The average bird count (birds/visit) at the two control site locations was used to establish typical bird counts across the project area. Results of point counts show that sites 9, 11, and 12 had more than the average (19 birds/count). Consultations with local birdwatchers also indicate that the best area for viewing birds during fall migration is the triangle extending from the east end of East Lake, south to South Lake and across to the tip of East Point. This area of proposed project site creates the greatest risk to birds. It is expected that results of winter, spring, and summer studies will also support this conclusion. Figure 4.3 shows the area of potential concern for turbine placement. It is the intent of the proponent to conduct future bird studies to evaluate their interaction with the wind plant.

The proponent believes that insufficient data have been acquired to conclude that the areas of exclusion identified in the initial bird studies warrant total exclusion of wind turbines. Nonetheless, the wind plant has been re-designed to remove all wind turbines from the area of concern. The proponent intends to undertake more detailed studies on the migration patterns and behaviour of the local bird populations once this phase of wind development is completed to provide a more accurate assessment of local bird behaviours and the impact of these wind turbines on local bird populations. If the results suggest that wind turbines may impact bird populations, it is unlikely that development will be proposed in the identified area. However, if studies show that wind turbines have limited impact on local bird populations, the location of wind turbines within the identified area of concern may be considered in future developments.

At the majority of the turbine array sites, the landscape is unsheltered and cleared for agricultural purposes and is therefore not suitable for permanent wildlife habitat. This area may serve as transient habitat for some small birds such as sparrows and robins as well as small mammals including skunks, rabbits and racoons.

## 4.8 Fish and Aquatic Life

The turbine sites and access roads are located on agricultural and forested land. The sites are not located at or near any streams, rivers, or other waterbodies, therefore there are no fish and aquatic life within the project boundaries. The proposed wind plant is not predicted to have any impact on this environmental component. Site visits conducted in September and November 2005 support this prediction.

## 4.9 Endangered Species

The only endangered animal species found within 5km of the project area is the Piping Plover (*Charadrius melodus*). Piping Plovers nest in coastal environments, particularly on sandy beaches. According to the 2004 PEI Piping Plover Atlas, these birds are found along the shore in Diligent Pond and South Lake, located approximately 3-5km from the project site (Waddell & MacDonald, 2005).

Plover monitoring is also conducted at East Point and East Lake. No Plovers have been observed in these areas since 1996 and 2003 respectively (Waddell & MacDonald, 2005). Due to the distance of established nesting site from the project site, the East Point Wind Plant is not likely to impact existing Piping Plover habitat. In addition, the project will be located away from the shoreline further reducing the likelihood that it might impact any potential Piping Plover habitat.

A data search through the Atlantic Canada Conservation Data Centre (ACCDC) does not indicate the presence of any other species that are classified as ‘at risk’ or ‘endangered’ within 5km of the project site. However, as mentioned above, there are five plant species in the project area that are considered rare throughout their range in the province. These plants include Canada Hawkweed (*Hieracium canadense*), Leathery Grape-Fern (*Botrychium multifidum*), Northern Slender Pondweed (*Stuckenia filiformis ssp alpina*), Yellow Nodding Ladies'-Tresses (*Spiranthes ochroleuca*), and Downy Willow-Herb (*Epilobium strictum*). The locations of the plant species identified by ACCDC can be seen in Figure 4.2.

A rare plant survey will be conducted in June 2006 and the results will be taken into consideration when determining final turbine placement. The study report can be seen in Appendix G.

**Table 4.4 Number of observations and total number of individuals observed from each bird category (Campbell & Whittam, 2005)**

| Bird Category | # of Observations | # of Birds |
|---|---|---|
| Landbirds | 684 | 2657 |
| Raptors | 24 | 26 |
| Shorebirds | 14 | 117 |
| Waterbirds | 198 | 2377 |
| Waterfowl | 65 | 3730 |
| Unknown | 13 | 585 |
| Total | 998 | 9492 |

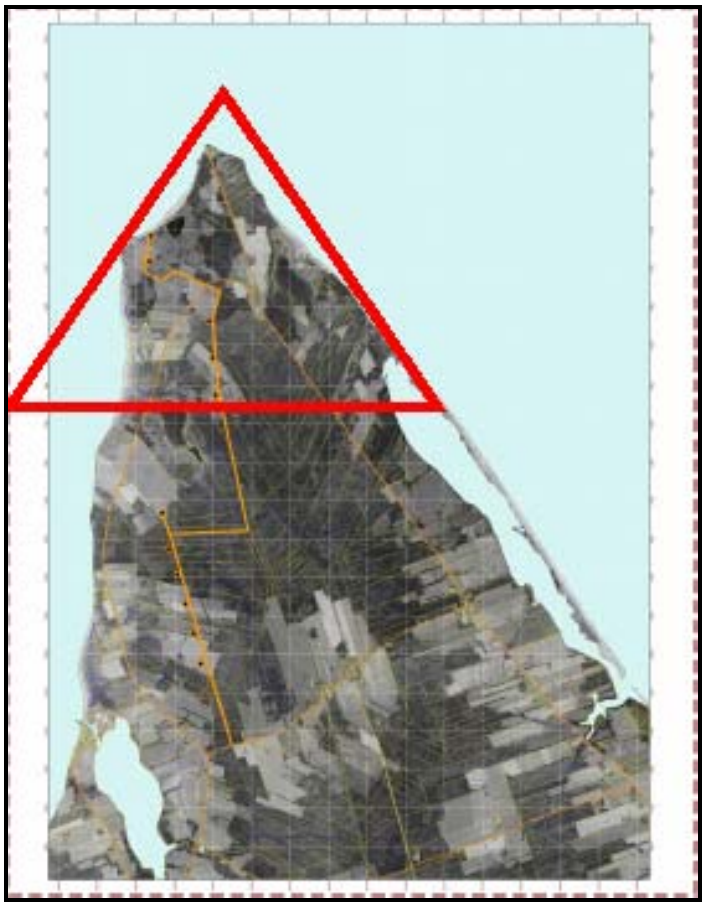

**Figure 4.3. Area of greatest risk to birds (Campbell & Whittam, 2005)**

4.10 Socio-Economic Conditions

### 4.10.1 Population

There approximately thirty five permanent residencies within one kilometer of the project site. The locations of nearby homes can be seen in Figure 3.1. Agriculture, fisheries, and tourism are the primary industries in the area and employ many of the people there. This project is expected to generate work opportunities for local contracting companies and nearby businesses.

### 4.10.2 Heritage & Archaeological Resources

The majority of the turbine sites are located on previously disturbed agricultural land that has been in production for greater than fifty years. It is therefore unlikely that there are important archaeological or historical resources at the specific sites.

Information received from the Prince Edward Island Department of Community and Cultural Affairs indicates that there are no known heritage sites within the project boundaries. The East Point Lighthouse, located approximately 2.5km from the project site, is listed on the PEI Register of Heritage Place. In addition, there were known to be Acadian Colonists located in the East Point area in the 1700's. According to an investigation conducted by Jacques Whitford Environment Ltd, there are potential archaeological sites associated with this colony near Diligent Pond and South Lake. The small pond 1.5km west of East Point may have previously drained to the Gulf of St Lawrence and there is therefore the potential for the presence of prehistoric sites in the immediate area. The project site is located at least 2km from this area; therefore the project is not likely to interact with any potential heritage or archaeological sites.

# 5. ENVIRONMENTAL ASSESSMENT OF PROJECT

Project site visits were conducted in September 2nd and November 13, 2005. Information regarding the surrounding environment and the potential environmental effects of the project were obtained at this time. Photos from the site can be seen in Appendix I.

## 5.1 Environmental Effects and Mitigation Measures

When predicting and evaluating the potential environmental effects of a project, details concerning project phases, project timing, project location and the surrounding environmental components must be considered. The following section presents a breakdown of the potential environmental impacts associated with each project phase. Mitigation measures are provided with the objective of avoiding, minimizing or compensating for potential environmental effects associated with the project. Following the written description, a breakdown of the potential project/environment interactions is outlined in tabular format as they apply to each environmental component. Table 5.4 shows the matrix used to determine the potential interactions between the project and various ecosystem components. This table outlines the project phases in the left-most column and the environmental components in the upper row. A 'P' indicates a potential effect of the project on the environmental component, an 'E' indicates a potential effect of the environmental component on the project, and a blank space indicates no potential interactions. The Valued Ecosystem Components (VEC's) are determined from the interactions in this table and are then carried forward for evaluation in Table 5.5. This table shows the potential interactions between the project and the VEC's, provides mitigation measures for each component and an evaluation of the level of residual impact. The mitigation measures provided here follow a hierarchical sequence of protection in order to eliminate, reduce or control the adverse environmental effects of the project. A summary of mitigation measures and contingency plans can be seen in the Appendix E – Site Specific Environmental Protection Plan.

### 5.1.1 Construction

The construction phase of the EPWP has the potential to impact various environmental components including: hydrological resources, soils, vegetation, wildlife and birds, health and safety, land use and noise levels.

During grubbing, excavation of the base area and drilling for anchor installation, there is the potential for the disturbance or destruction of native or rare plant species. A data search was conducted through ACCDC to determine the presence of any sensitive plant species in the project area. Figure 4.2 shows the locations of the plant species identified by data from ACCDC. This figure shows the presence of Northern Slender Pondweed (SO), Pondshore Knotweed (S1) and Leathery Grape-Fern (S2) within 500m of the proposed site for turbine #4. According to the provincial ranking system (SRANKS), the rarity of Northern Slender Pondweed throughout the province is uncertain. However, Pondshore Knotweed is considered to be extremely rare (S1), while the Leathery Grape-Fern is considered to be rare (S2) throughout the province. In addition, Flattened Oatgrass is also found within approximately 450m of turbines 1, 2, and 3 and is ranked S1 (ACCDC, 2005). In order to obtain a more accurate depiction of the flora species present at each turbine site, a rare plant survey will be undertaken after the snowmelt in June 2006. The results of this survey will be evaluated prior to construction and considered when determining final turbine locations. All precautions will be taken to avoid disturbing any sensitive plant species in the project area including: establishing a 100m buffer zone around any sensitive species or habitats, limiting vehicle traffic to access roads and turbines sites, and installing signage and/or fencing at nearby sensitive plant locations. As a result of these mitigation measures, the project is not expected to impact any plants species identified as rare or endangered under the Species at Risk Act or Provincial SRANKS.

Soils may also be impacted through compaction and erosion. Half of the turbine sites (No's 2, 3, 4, 7 &10) are located on previously disturbed agricultural land; therefore construction at these sites will not impact any native vegetation or undisturbed soils. In order to minimize disturbance at the forested sites, access roads will be constructed using geo-textile material if necessary and all vehicle traffic will be limited to these roadways and the specific turbine sites. In order to further minimize impacts on soils and vegetation, construction will not occur during periods of rain or wet soils. In addition, the project site will be re-vegetated or allowed to re-grow naturally after construction is complete.

During grubbing and excavation there is the potential for intersecting the groundwater table. Excavation to a depth of 8m will be required for the construction of each turbine base. During construction, excavation will be completed in a step-wise fashion ensure minimal risk of

groundwater contamination. There is also the potential for silt and other to debris to enter wetland area adjacent to the site of turbine no. 7. This issue will be mitigated by adhering to the provincial guideline and working at least 10m from the wetland boundary.

The operation of excavators, large trucks, cranes and other construction equipment at the project site has the potential to create dust and noise, which may disturb nearby humans and wildlife. In order to minimize disturbances due to noise, construction will be limited to regular working hours and vehicles will be properly maintained. The transportation of turbine components and the movement of cranes and other construction equipment to and from the project site may cause short delays in traffic. However, the site is in a rural area with minimal road traffic (approximately 12 cars per hour) and any delays in traffic will not likely exceed 5-10 minutes. If dust becomes an issue, access roads will be watered down. Table 5.1 shows typical noise levels from various types of construction equipment.

Wildlife may also be impacted through increased mortality due to heavy traffic and possible relocation if habitat is disturbed by project activities. The sites will be monitored for wildlife activity throughout the operation of the wind plant.

### 5.1.2 Operation & Maintenance

The operation of the East Point Wind Plant will have a positive impact on the local and global environment through the displacement of greenhouse gas emissions created by conventional petroleum fuelled power sources. Emissions associated with conventional electricity include $SO_x$, $NO_x$, $CO_2$ and many other harmful gases. These gases contribute to global warming and can also cause problems related to acid rain. Each megawatt-hour generated by the operation of the East Point Wind Plant will help reduce greenhouse gas emissions by as much as 0.8 to 0.9 tonnes per year (NRCan, 2002).

One of the major environmental concerns surrounding the operation of wind plants is avian mortality. When installed, wind turbines can attract birds if they create potential perching or nesting sites. This behavior increases the risk of tower and blade collisions that can result in death. A fall avian migration study was conducted at the project site to determine the types and numbers of birds present and any areas that would not be suitable for turbines. The results of this study indicate that the area east of East Lake extending to the tip of East Point is the most frequented by birds, and that turbines in this area may pose some risk to birds. The proponent has responded to these concerns and has relocated turbines west

of East Lake for this phase. The proponent will further investigate the interaction between birds and the turbines installed in this project to better assess the risks that turbines, installed in the East Lake area, might pose to birds. In addition, the risk to birds at the East Point Wind Plant is minimized through the use of tubular towers which prevent perching. Risks to birds and bats will also be minimized through the use of flashing white strobe lights which make the turbines more visible to flying birds. Strobe lights will be installed on sufficient turbines to comply with Transport Canada regulations.

In general, the operation of wind turbines has the potential to reduce the land acreage available for agricultural and forestry use. The area requirements for the project can be broken down as follows:

- Turbine sites (area required for turbine erection. Approximately 90% of this can be returned to original use once turbines are installed. ) ~10000$m^2$ each (10 sites) ~ 10Ha
- Access road ~ 25 meters width ~ 25000$m^2$/km (3.5km) ~ 10Ha
- Substation site ~ 2Ha
- Distribution Lines: Included in access road
- Underground Cables: Buried cables will have no impact on land usage.

The project footprint covers approximately 2.5 $km^2$ or 25 Ha, compared to the study area which encompasses three watersheds and a total area of approximately 6815Ha. Within the study area, there is approximately 70% (4770 Ha) forested land and 30% (2045 Ha) of agricultural land. Therefore, land use restrictions are not a concern due to the small project footprint relative to the extensive land area available for both agriculture and forestry.

Turbine operation also creates concerns with regard to the impact of noise on nearby residents. A noise analysis model was incorporated into the wind plant design to place the turbines far enough from nearby homes to ensure the noise levels are within acceptable levels. For siting purposes, the maximum noise level at a residence was considered to be 45 dB (A). In addition, the design is in compliance with set back distances in the Prince Edward Island Planning Act, which states that turbines cannot be located:

- Closer than the distance equal to three times the total height of the turbine tower from any existing habitable building
- Closer than the distance equal to the total height of the turbine tower from the nearest boundary of:

- A public road, private road or right-of-way, except for access roads being used as a part of the proposed project
- A lot line that is not owned by the proponent unless written permission is obtained from the landowner

Each turbine will be located at least 400m from the nearest home, therefore noise levels reaching residential areas are expected to be less than the commonly acceptable level of 45dB(A). The maximum expected noise will be approximately 43.9dB (A) at a distance of 488m from the project site. This is comparable to the noise level inside an average household. Figure 5.1 shows the noise emissions created by the V90 3.0MW turbine at various wind speeds. Table 5.2 shows the typical noise levels associated with various sources at specific distances.

There will also be visual impacts associated with the operation of wind turbines. The presence of wind turbines on the horizon will change the view in the direction of the wind turbines. However, experience has shown that these visual disruptions are temporary and people quickly adapt to the altered viewscape. Additionally, efforts to keep the wind turbines from blocking scenic coastal views by installing all turbines inland will mitigate most concerns over the visual impact of the turbines. It should also be noted that many, perhaps most, people find turbines to be visually attractive and most communities take great pride in their wind plants. Shadow flicker is another visual effect associated with the operation of wind turbines. This occurs when the sun shines through the rotor of a wind turbine and the moving shadow of the blades crosses a dwelling for an extended period of time. Efforts are required to ensure that individual dwellings are not exposed to excessive flicker. Shadow flicker analysis is being carried out for this project and all significantly affected residents will be consulted individually to discuss the extent of the impact. Generally accepted wind plant design practices indicate that dwellings exposed to less than 30 hours per year should not be affected by shadow flicker phenomenon.

A public meeting was held on March 30, 2006. A summary report of the public meeting can be seen in Appendix F.

The presence of wind turbines at the project site may also have a potential impact on aviation. In order to minimize the risk of interactions with avian traffic, a lighting plan has been developed according to the requirements set out by Transport Canada. Turbine lighting has also been designed to minimize the potential interactions with birds in the area by using the minimum number of flashes per minute and

flash duration. Please refer to the site specific EPP in Appendix E for further details on the lighting plan and Transport Canada regulations.

The operation of the East Point Wind Plant is likely to have a positive impact on nearby communities through the development of tourism and economic opportunities. The North Cape Wind Plant and the Atlantic Wind Test Site at North Cape have attracted many visitors to the site. It is expected that the East Point Wind Plant will also attract public attention and interested visitors. Increased human activity at the project site could result in more tourism and therefore greater business opportunities for nearby communities. In addition, the project will provide $25,000 annually in local initiatives and landowners will be splitting 2.5% of the gross revenue from the site.

**Table 5.1. Noise levels associated with construction equipment at various distances**

| Equipment | Noise Level (decibels) | | | |
|---|---|---|---|---|
| | 30m | 250m | 500m | 1000m |
| Dump Truck | 67.1 | 58.1 | 55.1 | 52.1 |
| Front End Loader | 80.2 | 71.2 | 68.2 | 65.2 |
| Bulldozer | 80.2 | 71.2 | 68.2 | 65.2 |
| Crane | 81.3 | 72.3 | 69.3 | 66.3 |
| Excavator | 81.3 | 72.3 | 69.3 | 66.3 |
| Cement Truck | 85.2 | 76.2 | 73.2 | 70.2 |

**Table 5.2. Noise levels of wind turbines compared to other common noise sources**

| Noise Sources | Noise Levels (dBA) @ Selected Distances |
|---|---|
| Vestas V90-3.0MW | <43.9Db @ 500m |
| Snowmobile | 95 @ 30m |
| Conversational Speech | 62 @ 0.9m |
| Highway Traffic | 80 @ 30m |
| Average Office Environment | 60 |
| Average Household Environment | 45 |

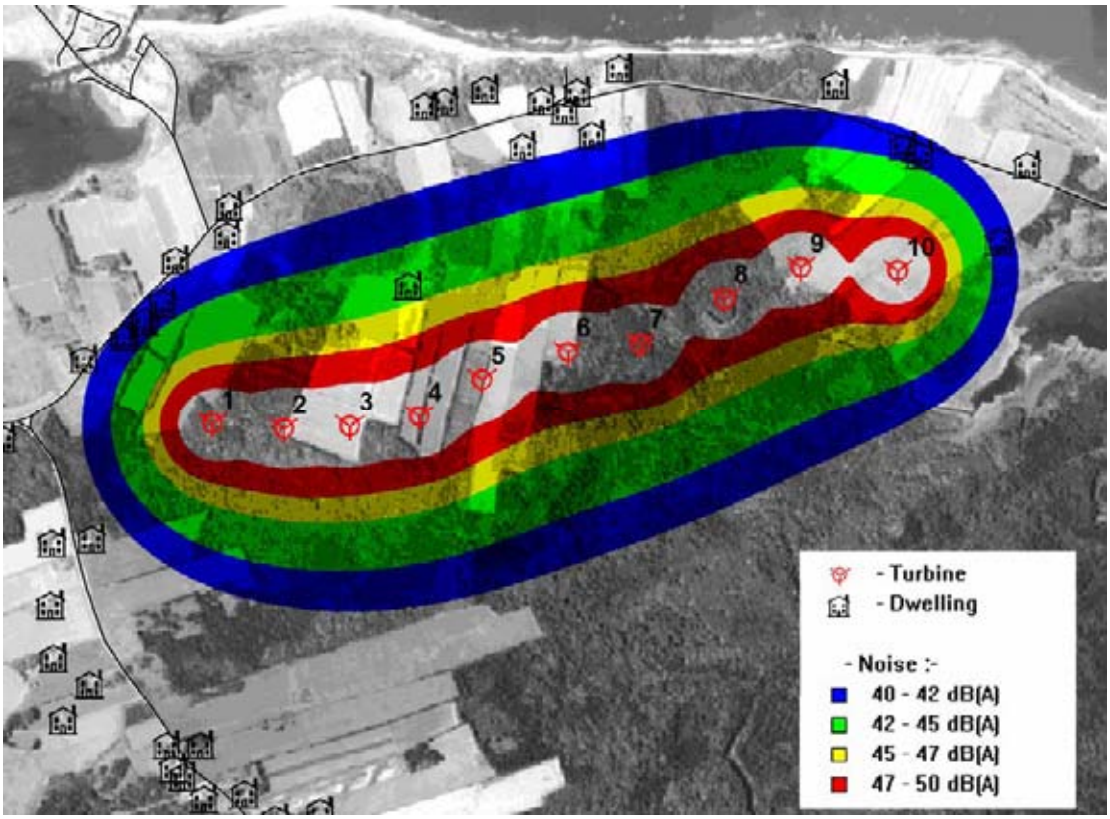


**Figure 5.1. Predicted noise level contours resulting from wind plant operation**

### 5.1.3 Decommissioning & Abandonment

As previously mentioned, site decommissioning is not likely to occur for at least 25 years. At this time is also possible that the turbines will be replaced with newer equipment in order to allow the site to continue generating electricity. During decommissioning or equipment replacement, there is the potential to impact the following environmental components: noise levels, soils and topography, vegetation, terrestrial and avian wildlife, and human health and safety.

The use of heavy machinery would result in elevated noise levels during site decommissioning, potentially disturbing nearby humans and wildlife. The nearest home is approximately 370m from the project site; therefore the slight increase in noise is not expected to cause a significant disturbance to nearby residents. In order to prevent unnecessary disruption, if decommissioning is required, this project phase will be completed during regular working hours. The movement of machinery and other vehicles to and from the project site may also increase local traffic and potentially cause short delays. The site is located in a rural setting with a low population density; therefore traffic on adjacent roads is very sparse (approximately 12 cars per hour). These impacts will be short term and any delays in traffic will not likely be longer than 5-10 minutes. In order to minimize disturbances to the surrounding environment decommissioning phase will be completed as quickly as possible.

Soils and vegetation at the project site may also be impacted by decommissioning. The use of heavy machinery and any excavation work may adversely affect soils by compaction, erosion or mixing. Decommissioning activities may also result in the disruption of surrounding agricultural lands, native vegetation or rare plant species. Most of the turbines (No's 2, 3, 4, 6, 9 &10) are located on previously disturbed agricultural land. There will be no risk to rare plants or native vegetation at these sites. As previously mentioned, a data search was conducted through ACCDC to determine the presence of any rare plant species in the project area. Data from ACCDC and COSEWIC does not show the presence of any rare of endangered plant species within 5km of the project site. However, in the project area there are some species that are considered rare throughout their range in the province (details in Section 5.1.1). To confirm these results, a rare plant survey will be conducted at the project site prior to construction.

In general, the impacts on agricultural lands and forested areas are not expected to be significant due to the relatively small project footprint, approximately 25 hectares. In order to further minimize impacts on soils and vegetation, decommissioning will not occur during periods of rain or wet soils. In addition, the laydown areas will be returned to their original land use and the project site will be re-vegetated or allowed to re-grow naturally after decommissioning is complete.

Decommissioning activities may also have an impact on human health and safety. The presence of and use of heavy equipment at the project site may result in injury or death if an accident were to occur. All employees will be equipped with appropriate personal protective equipment and all OH&S policies will be followed. First Aid kits will also be available on site.

### 5.1.4 Malfunctions & Accidents

The wind turbines used in this project have been designed to comply with rigorous standards and have been certified by Germanischer Lloyd, one of the world's largest and most reputable independent certification agencies. Turbines automatically remove themselves from service when wind speeds exceed 25m/s and remain out of service until the wind speeds drop to 20 m/s. During extreme winds the turbines remain out of service with their blades feathered into the wind. The turbines are designed to withstand the most extreme weather event encountered over a fifty year period. It is unlikely that highs winds will cause any problems with these turbines.

Icing events, particularly during the early spring, do have the potential to cause operational problems and create safety hazards at a wind plant. During an icing event, the V90 turbines will automatically shut down and the turbines will not be re-started until the blades are free of ice. Nonetheless, these are very large structures and enormous amounts of ice can accumulate on the blades and towers. Technicians will need to ensure public access is limited during icing events.

Observations of ice shedding events have shown that accumulated ice on the rotor typically falls downward and is not thrown any distance (Morgan *et al.*, 1998). Icing conditions can also cause problems for important weather sensors mounted on the nacelle. In addition, ice could be shed from moving turbine components which would create a safety risk for people using the wind turbine site.

The presence and use of heavy equipment, operational activities, accidental events/spills of hydrocarbon products, as well as load/equipment loss during the duration of the project could also create a risk to human health. Construction worker or wind plant technicians could be injured or killed if accidents occur. These risks will be mitigated by following all applicable safety guidelines, ensuring workers are properly trained and using appropriate personal protective equipment.

**Table 5.3. Potential Project /Environment Interactions Matrix**

| Project Phases & Related Activities | *Hydrological Resources* | *Soils and Topography* | *Vegetation* | *Wildlife & Birds* | *Fish and Aquatic Life* | *Endangered Species* | *Heritage and Archaeological Resources* | *Health / Safety* | *Climate* | *Land Use* | *Visual Impacts* | *Noise Levels* | *Socio-Economic Conditions* | *Cumulative Effects* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Construction*** | | | | | | | | | | | | | | |
| *Site Grubbing* | **P** | **P** | **P** | **P** | | | **P** | **P** | **E** | | | **P** | **P** | |
| *Excavation* | **P** | **P** | **P** | | | | **P** | **P** | **E** | | | **P** | **P** | |
| *Access road construction* | **P** | **P** | **P** | **P** | | | **P** | **P** | **E** | | | **P** | **P** | |
| *Turbine Installation* | | | | | | | | **P** | **E** | | | **P** | **P** | |
| *Site Restoration* | **P** | **P** | **P** | | | | | **P** | | | | **P** | **P** | |
| ***Operation and Maintenance*** | | | | | | | | | | | | | | |
| *Operation of V90 Wind Turbines* | | | | **P** | | | | **P** | **P/E** | **P** | **P** | **P** | **P** | |
| *Regular Turbine Maintenance* | | | | | | | | **P** | **E** | | | | **P** | |
| ***Decommissioning/Abandonment*** | **P** | **P** | **P** | **P** | | | | **P** | **E** | | | **P** | **P** | |
| ***Malfunctions/Accidents*** | **P** | **P** | **P** | **P** | | | | **P** | **E** | **P** | **P** | **P** | | |

P = Potential Effect of Project on the Environment; E = Potential Effect of Environment on Project

**Table 5.4. Expected level of residual effects (NRCan, 2003)**

| Level | Definition |
|---|---|
| **High** | Potential impact could threaten sustainability of the resource and should be considered a management concern. Research, monitoring and/or recovery initiatives should be considered. |
| **Medium** | Potential impact could result in a decline in resource to lower-than-baseline but stable levels in the study area after project closure and into the foreseeable future. Regional management actions such as research, monitoring and/or recovery initiatives may be required. |
| **Low** | Potential impact may result in a slight decline in resource in study area during the life of the project. Research, monitoring and/or recovery initiatives would not normally be required. |
| **Minimal** | Potential impact may result in a slight decline in resource in study area during construction phase, but the resource should return to baseline levels. |

**Table 5.5 Potential influence of project on valued ecosystem components and recommended mitigation measures**

| Valued Ecosystem Component (VEC) | Project Phase | Project Activities | Potential Interactions | Recommended Mitigation Measures | Residual Effects |
|---|---|---|---|---|---|
| **Hydrological Resources** | Site Preparation, Construction & Decommissioning | • Site grubbing<br>• Construction of access roads<br>• Excavation of soil and pouring concrete pads<br>• Removal of turbines and bases<br>• Re-contouring surface | • Site grubbing has the potential to disturb soil and cause erosion, potentially impact nearby water bodies<br>• Excavation activities could impact groundwater quality by exposing the water table at several of the turbine project sites.<br>• Construction of access roads and turbine sites had the potential to alter surface water flow and/or drainage patterns | • Short-term erosion and sediment control measures (silt fence or straw bales) will be used to prevent contaminated runoff from leaving the project site and entering nearby water bodies.<br>• If the groundwater table is exposed during excavation, the pit will be pumped dry prior to pouring concrete. Special precautions will be taken to prevent groundwater contamination.<br>• The project site is located at least 500m away from the nearest surface water body.<br>• This project has a limited spatial and temporal scope and is not expected to result in large amounts of contamination or suspended sediments.<br>• Natural drainage will not be impeded unless contaminated runoff is a concern. | Low |
| | Malfunctions and Accidental Events | • Accidental spills of hydrocarbon products or load/equipment loss during any project phase. | • Degradation of surface and ground water quality<br>• Release of hazardous materials | • Fuel and hazardous materials must be stored at least 500m away from the nearest watercourse.<br>• Contractor must have spill clean-up materials on site with a minimum of 25kg of suitable commercial sorbent, 30 cubic meters of 6 mil polyethylene, a shovel and an empty fuel barrel for spill collection and disposal.<br>• Construction equipment must be properly maintained to prevent leaks or spills of hazardous materials.<br>• Fuelling and servicing of equipment will be conducted off site. If on-site work is necessary, it will be conducted at least 100m from any water body.<br>• Any contaminated runoff will be contained for immediate collection and disposal.<br>• Any spills will be cleaned up immediately and reported to the Coast Guard (1-800-565-1633). | Low |

**Table 5.5 Potential influence of project on valued ecosystem components and recommended mitigation measures**

| Valued Ecosystem Component (VEC) | Project Phase | Project Activities | Potential Interactions | Recommended Mitigation Measures | Residual Effects |
|---|---|---|---|---|---|
| **Soils** | Site Preparation, Construction and Decommissioning | • Site grubbing<br>• Construction of access roads<br>• Excavation of soil<br>• Pouring concrete pads<br>• Underground cable installation<br>• Removal of turbines and bases<br>• Re-contouring surface<br>• Re-vegetation by natural growth or seeding. | • Potential to adversely impact the soil in the area by compaction and erosion.<br>• Potential loss of top soil and mixing with other soil layers. | • Construction/Decommissioning will not occur during periods of rain or wet soils.<br>• Traffic will be limited to access roads and specific turbine sites.<br>• In areas that excavation is to take place, topsoil is to be stripped and placed in a distinct pile above the high water mark in a manner that does not block drainage or runoff, construction activities, or replacement of grade material. Separation distances between stockpiled topsoil, subsoil and overburden shall be a minimum of 1 metre to prevent mixing.<br>• The underground cables will be ploughed in thereby minimizing impact to topsoil.<br>• Stockpiled topsoil, subsoil and overburden shall be replaced in a manner that minimizes mixing and in an order that ensures replacement with like materials. | Minimal |
| | Malfunctions and Accidental Events | • Accidental spills of hydrocarbon products or load/equipment loss during any project phase. | • Potential release of hazardous materials degradation of soil quality. | • Contractor must have spill clean-up materials on site with a minimum of 25kg of suitable commercial sorbent, 30 cubic meters of 6 mil polyethylene, a shovel and an empty fuel barrel for spill collection and disposal.<br>• Construction equipment must be properly maintained to prevent leaks or spills of hazardous materials. If maintenance is required on site, spill protection measures will be implemented.<br>• Any spills will be cleaned up immediately and reported to the Coast Guard (1-800-565-1633.)<br>• All construction wastes will be collected and disposed of as per Waste Watch regulations. | Minimal |

**Table 5.5 Potential influence of project on valued ecosystem components and recommended mitigation measures**

| Valued Ecosystem Component (VEC) | Project Phase | Project Activities | Potential Interactions | Recommended Mitigation Measures | Residual Effects |
|---|---|---|---|---|---|
| **Vegetation** | Site Preparation, Construction and Decommissioning | • Site grubbing<br>• Construction of access roads<br>• Excavation of soil<br>• Pouring concrete pads<br>• Underground cable installation<br>• Removal of turbines and bases<br>• Contouring surface | • Potential disturbance or destruction of native vegetation, productive agricultural lands, or rare/endangered plant species.<br>• Data from ACCDC and COSEWIC shows the presence of three plant species considered rare within their range in the province within 500m of turbine sites<br>• Potential use of vehicles with faulty exhaust systems or low catalytic converters. | • The majority of project site is considered previously disturbed because it has been in agricultural production for many years.<br>• A rare plant survey will be completed prior to construction.<br>• Project activities will be a minimum of 100m from identified rare plants and their habitat.<br>• Vehicle traffic will be limited to access roads and turbine sites, which will be located on cultivated land where possible.<br>• Underground cable routes will be located on cultivated lands where possible, avoiding any sensitive habitats and/or floral species at risk.<br>• The project site will be re-vegetated or allowed to re-grow naturally upon project completion.<br>• The project footprint is small relative to the surrounding agricultural area, therefore is not expected to cause significant disturbance to productive agricultural lands.<br>• Vehicles with faulty exhaust or low catalytic converters will not be permitted on site. | Minimal |
| | Malfunctions and Accidental Events | Accidental spills of hydrocarbon products or load/equipment loss during any project phase. | • Degradation of soil and water quality.<br>• Release of hazardous materials.<br>• Toxic effects to local vegetation. | • Contractor must have spill clean-up materials on site with a minimum of 25kg of suitable commercial sorbent, 30 cubic meters of 6 mil polyethylene, a shovel and an empty fuel barrel for spill collection and disposal.<br>• Construction equipment must be properly maintained to prevent leaks or spills of hazardous materials.<br>• All construction wastes will be collected and disposed of as per Waste Watch regulations. | Minimal |

**Table 5.5 Potential influence of project on valued ecosystem components and recommended mitigation measures**

| Valued Ecosystem Component (VEC) | Project Phase | Project Activities | Potential Interactions | Recommended Mitigation Measures | Residual Effects |
|---|---|---|---|---|---|
| **Wildlife** | Site Preparation, Construction & Decommissioning | • Tree removal & site grubbing<br>• Use of heavy machinery and other vehicles<br>• Increased human activity at the wind plant site<br>• Cable installation | • Tree removal and grubbing could potentially cause disturbance or destruction of existing or potential future wildlife habitat.<br>• Increased vehicle traffic will increase local noise levels and may result in more frequent vehicle-animal collisions.<br>• Injury or entrapment of animals in cable trenches.<br>• Potential interactions with rare or endangered species listed as rare or endangered under SARA.<br>• Potential interactions with species listed as rare throughout their range in the province | • A significant portion of the project site is located on cleared agricultural land; therefore significant impacts on existing wildlife habitat are not expected.<br>• A spring/early summer wildlife survey will be conducted at the project site prior to the commencement of construction activities.<br>• Vehicles and equipment will be properly maintained to minimize noise.<br>• Installation of underground cable by ploughing will eliminate the risk of wildlife from falling into cable trenches.<br>• A data search through ACCDC does not show the presence of any rare or endangered animal species within the project boundaries.<br>• Due to the distance of any rare, endangered or species at risk from the project site, the proposed project is not likely to affect a listed wildlife species or its critical habitat under SARA.<br>• Due to the limited spatial and temporal scope of the project, it is not expected to adversely impact wildlife at a population level. | Low |

**Table 5.5 Potential influence of project on valued ecosystem components and recommended mitigation measures**

| Valued Ecosystem Component (VEC) | Project Phase | Project Activities | Potential Interactions | Recommended Mitigation Measures | Residual Effects |
|---|---|---|---|---|---|
| **Wildlife (…continued)** | Operation and Maintenance | • Operation of the wind plant. | • The operation of wind turbines has the potential to cause avian (birds or bats) mortality by collisions with turbine towers or blades.<br>• Increased noise levels may disturb nearby wildlife. | • Fall migration surveys have been conducted at the project site and future studies will be completed in the Spring and Summer to determine the presence of any sensitive species, habitats and important migratory corridors.<br>• Results of the fall study indicate that the majority of coastal bird species fly around East Point, not directly over the proposed site.<br>• The area identified as posing the greatest threat to bird species in the area has been avoided during design of the wind plant layout.<br>• The project will be located away from known migratory bird pathways.<br>• No large bat populations have been observed in the project area.<br>• Flashing lights will be installed on each turbine to make the structures more visible to birds.<br>• The tubular tower design is not suitable for birds to use as perching or nesting sites.<br>• Noise levels are not expected to increase significantly due to turbine operation.<br>• Due to the limited spatial and temporal scope of the project, it is not expected to adversely impact wildlife at a population level. | Low |

**Table 5.5 Potential influence of project on valued ecosystem components and recommended mitigation measures**

| Valued Ecosystem Component (VEC) | Project Phase | Project Activities | Potential Interactions | Recommended Mitigation Measures | Residual Effects |
|---|---|---|---|---|---|
| **Wildlife (…continued)** | Malfunctions and Accidental Events | Accidental spills of hydrocarbon products or load/equipment loss during any project phase. | • Degradation of soil and water quality.<br>• Release of hazardous materials.<br>• Toxic effects to wildlife. | • Fuel and hazardous materials must be stored at least 500m away from the nearest watercourse.<br>• Contractor must have spill clean-up materials on site with a minimum of 25kg of suitable commercial sorbent, 30 cubic meters of 6 mil polyethylene, a shovel and an empty fuel barrel for spill collection and disposal.<br>• Construction equipment must be properly maintained to prevent leaks or spills of hazardous materials.<br>• Fuelling and servicing of equipment will be conducted off site. If on-site work is necessary, it will be conducted at least 100m from any water body.<br>• Any spills will be cleaned up immediately and reported to the Coast Guard (1-800-565-1633). | Low |
| **Health & Safety** | Construction, Operation, Decommissioning /Abandonment Malfunctions and Accidental Events | • Presence and use of heavy equipment<br>• Operation of wind plant for electricity generation.<br>• Regular and unplanned maintenance activities<br>• Accidental spills of hydrocarbon products or load/equipment loss during any project phase | • Maybe short exposure to potential hazardous materials and working conditions.<br>• Construction workers or wind plant technicians could be injured or killed if accidents occur.<br>• During freezing precipitation events, ice throw may create a safety hazard. | • Employees will be trained in health and safety protocols (e.g. safe work practices, emergency response).<br>• All turbine maintenance staff will be fully qualified and will wear appropriate personal safety equipment during all maintenance activities.<br>• Proper safety procedures must be followed during the duration of the project as per applicable municipal, provincial and federal regulations.<br>• The project will include the installation of fences and warning signs. Emergency procedures are posted around the project site.<br>• Specific warning signs will be put in place when weather conditions create the potential for ice throw and people public access to the project area will be limited. | Minimal |

**Table 5.5 Potential influence of project on valued ecosystem components and recommended mitigation measures**

| Valued Ecosystem Component (VEC) | Project Phase | Project Activities | Potential Interactions | Recommended Mitigation Measures | Residual Effects |
|---|---|---|---|---|---|
| **Climate** | Construction, Operation, Decommissioning /Abandonment | • Use of heavy equipment and personal vehicles | • Use of construction equipment and personal vehicles will result in increased emissions of greenhouse gases.<br>• Operation of wind plant for electricity production will reduce the amount of hydro-carbon fuelled electricity required, thereby decreasing greenhouse gas emissions over the projects lifetime. | • The use of construction equipment and higher personal vehicle use will be short-term and limited to the construction and decommissioning phases of the project.<br>• Carpooling will be used when feasible to reduce emissions from personal vehicles.<br>• The operation of the wind plant will ultimately reduce the provinces dependence on conventional sources of electricity and will result in a net reduction in greenhouse gas emissions. | Positive |
| **Land Use** | Operation | • Operation of the wind plant<br>• Use of access roads | • Potential loss of productive agricultural or forestry lands | • The project has a limited spatial scope (approximately 25Ha) relative to the available agricultural and forested lands in the area.<br>• The agricultural area surrounding turbine sites can be returned to its original use during wind plant operation. | Minimal |
| **Visual Impacts** | Construction, Operation, Decommissioning /Abandonment | • Presence of heavy machinery and cranes<br>• Operation of V90 wind turbines | • The presence of heavy machinery and cranes has the potential to create short-term visual disturbances for nearby residents.<br>• Wind turbine operation has the potential to alter the visual landscape on a long-term basis.<br>• Shadow flicker may impact nearby residents | • Due to the limited temporal scope of the project, the visual impacts associated with the presence of heavy machinery and cranes is expected to be short term and will cause minimal disturbance to nearby residents.<br>• All nearby residents have been consulted prior to the beginning of construction and have no objections concerning the project.<br>• The wind plant design has been optimized to minimize shadow flicker impacts on nearby residents. | Minimal |

**Table 5.5 Potential influence of project on valued ecosystem components and recommended mitigation measures**

| Valued Ecosystem Component (VEC) | Project Phase | Project Activities | Potential Interactions | Recommended Mitigation Measures | Residual Effects |
|---|---|---|---|---|---|
| **Noise Levels** | Construction, Operation, Decommissioning /Abandonment | • Presence of heavy trucks and cranes<br>• Operation of V90 wind turbines | • The presence of heavy machinery and cranes has the potential to create elevated noise levels and disturb nearby residents or animals<br>• Operation of wind turbines will create higher than background noise levels at the project site and may disturb nearby residents or animals | • Due to the limited temporal scope of the project, the noise impacts associated with the presence of heavy machinery and cranes is expected to be short term and will cause minimal disturbance to nearby residents.<br>• All equipment will be properly maintained to ensure minimal noise emissions from the project site.<br>• A sound impact study was completed during the design phase of the project and the layout has been optimized to minimize sound impacts on nearby residents.<br>• The operation of wind turbines is not expected to cause a significant increase in local noise levels.<br>• Appropriate setback distances will observed as per the requirements of the PEI Planning Act.<br>• The maximum expected noise will be approximately 43.9Db at a distance of 488m from the project site | Minimal |
| **Socio-Economic Conditions** | Construction, Operation and Maintenance, Decommissioning | • Increased human activity at the project site, either for work-related or tourism activities. | • Increased business opportunities in nearby communities<br>• Employment opportunities for local contracting companies and tradesmen.<br>• Green Power initiatives create a positive image for the community.<br>• Increased disturbance to nearby residents | • None required, increased business opportunities have a positive impact on nearby communities.<br>• None required, employment opportunities have a positive impact on local economic conditions.<br>• Non required, green power is a positive technology.<br>• Disturbances to residents will mainly be limited to the construction/decommissioning phases and are not expected to have long term impacts on the community. | Positive |

## 5.2 Cumulative Effects Assessment

Cumulative effects are the environmental impacts which may result from the combination of environmental effects resulting from the proposed project in combinations with other past, existing, and potential future activities in the project area. Watersheds are a useful boundary for determining the area in which potential cumulative effects may occur. The project site spans three watersheds including North Lake Creek, East Lake Creek and Surveyor's Point. The combined area of these three watersheds is approximately 6815Ha, while this phase of the project site covers approximately 25 Ha or 0.4% of the watershed area. The area requirements for the project can be seen in Section 5.1.2. Due to the relatively small footprint of the project site relative to the study area, significant cumulative effects are not expected to result from this project.

Other past, present and likely future projects and activities considered in cumulative effects assessment include agricultural activities, forest harvesting, and future wind developments. These activities also require land clearing and may therefore result in further disruption or destruction of established or potential wildlife habitat. In order to minimize potential interactions with wildlife, it would be beneficial to conduct a separate environmental impact assessment prior to any other land clearing activities. The operation of wind turbines also has the potential to impact wildlife over the long term through disruption and permanent displacement of terrestrial and avian wildlife as well as avian mortality. As discussed previously, an avian use survey was conducted at the project site and turbine locations were based on the recommendations laid out in the study report. In addition, avian mortality rates will be monitored at the project site to confirm the validity of the turbine locations. The impact on avian wildlife in the area is expected to be minimal and localized, no effect are predicted at the population level. The operation of wind turbines at the project site may also displace wildlife that had established habitat in the area. The majority of the project site is located on previously disturbed agricultural land which serves only as transient habitat for small birds and mammals such as skunks, coyotes, and racoons. Considering the limited project footprint and established mitigation measures, the project is not expected to impact wildlife at a population level over the long term.

Wind developments, agriculture and forestry may also disturb soil and may result in compaction or increase soil erosion rates and sedimentation/silting within the three watershed boundaries. Soil compaction will be minimized by limiting vehicle traffic to access roads and turbine sites. Increased sedimentation in nearby rivers and streams could degrade water quality and potentially impacts fish and other aquatic life present. In order to minimize these potential interactions, erosion control measures such as silt fences and straw bales will be used to manage soil loss from the wind plan site. With these mitigation measures in place, significant cumulative effects are not expected to impact water quality or terrestrial and aquatic wildlife within the three watersheds.

Land clearing activities may also make turbines visible from locations where they were not previously. In addition, future wind developments in the project area may create visual impacts for nearby residents. The residents in the project area have been consulted and are in favour of this development. In addition, neighbouring communities may experience long-term socio-economic benefits as a result of the wind plant through the development of employment and tourism opportunities.

The operation of wind turbines will also increase ambient noise levels in the project area. A sound impact study was completed and incorporated into the project design to minimize the sound impacts on nearby residents. Sound produced by wind turbines dissipates quickly. A sound impact study was conducted and the turbine layout has been optimized to reduce the impacts on nearby residents. Design calculations show the maximum noise level within 500m of the project site should not exceed 43.9dB (A) (45dB (A) is a commonly accepted limit). Impacts on air quality will not likely be obvious within the watershed boundaries; however this project will have a net positive effect on global air quality. The operation of wind turbines results in the emission of no greenhouse gas emissions, compared to conventional electricity generation which generates a significant number of air pollutants. A summary of the potential cumulative effects associated with each valued ecosystem component is seen in Table 5.6.

**Table 5.6 Potential cumulative effects associated with the project**

| Valued Ecosystem Component (VEC) | Project Activities | Other Activities | Potential Effects & Mitigation | Cumulative Effects |
|---|---|---|---|---|
| **Wildlife Habitat** | • Construction<br>• Operation of wind turbines<br>• Decommissioning | • Agricultural Activities<br>• Electrical Infrastructure upgrades<br>• Forest Harvesting<br>• Future wind developments | • Disturbances or relocation of terrestrial, or aquatic wildlife<br>• Increased suspended solids, turbidity, and sedimentation, resulting in adverse effects on fish and shellfish habitat and impacts on associated industries | Low |
| **Bird/Bat Population** | • Construction<br>• Operation of wind turbines<br>• Decommissioning | • Agricultural Activities<br>• Electrical Infrastructure upgrades<br>• Forest Harvesting<br>• Future wind developments | • Increased risk or disruption of bird populations and avian collisions with development of infrastructure such as silos, farm buildings, transmission lines, and wind turbines. | Low |
| **Aesthetics** | • Operation of wind turbines | Clearing activities associated with:<br>• Agricultural Activities<br>• Forest Harvesting<br>• Future wind developments | • Turbines may become visible where they were not previously.<br>• The presence of turbines or other tall structures may obstruct view of the ocean in some areas<br>• Nearby residents have been consulted and have no objections concerning the aesthetic impacts associated with the operation of the wind plant | Low |
| **Air Quality** | • Operation of wind turbines | • Future wind power developments | • Reduction in greenhouse gas emissions required for electricity generation on PEI | Positive |
| **Noise Level** | • Construction<br>• Operation of wind turbines<br>• Decommissioning | • Agricultural Activities<br>• Forest Harvesting<br>• Future wind developments | • Potential for increased ambient noise levels in the project area.<br>• Sound produced by wind turbines dissipates quickly. A sound impact study was conducted and the turbine layout has been optimized to reduce the impacts on nearby residents. Design calculations show the maximum noise level within 500m of the project site should not exceed 43.9Db. | Low |

## 5.3 Effects of the Environment on the Project

Throughout the project phases, environmental conditions may affect the working conditions, equipment, or structures associated with the project. Weather is the main factor to consider in this analysis, which is discussed below and summarized in Table 5.7.

Weather conditions, particularly wind speeds, play a major roll in the operation of a wind plant. The V90-3.0MW turbines are designed to begin generating electricity at a minimum wind speed of 4.0m/s and cut out when wind velocities exceed 25m/s. The average wind speed in East Point is in the range of 7.5m/s to 8.0m/s. Design engineers predict that the proposed wind plant will generate electricity at an availability rate of approximately 95% and a capacity factor of approximately 35-37%. This data confirms the validity of the proposed project at the chosen site in East Point, Prince Edward Island.

Ice build up on turbine components is a common weather related hazard that has the potential to cause operational problems and safety hazards at a wind plant. Rime icing is the most common type of ice accumulation to impact energy generation on wind turbines. This type of icing, which has the appearance of frosty snow, tends to occur at high altitudes, primarily in mountainous areas. In Atlantic Canada, glaze icing is predominant. This icing appears as frozen rain and is caused by precipitation in freezing conditions when the temperature of turbine components reaches sub-zero temperatures. Typically, the largest quantity of ice builds up on the large turbine components, such as the blades and the tower. Observations of ice shedding events have shown that accumulated ice on the rotor typically falls downward and is not thrown any distance (Morgan *et al.,* 1998). Icing conditions can also cause problems for important weather sensors mounted on the nacelle. In addition, ice shedding from moving turbine components can create a safety risk for people using the wind turbine site.

At the East Point Wind Plant, the V90 turbines will automatically shut down during severe icing events. Automatic shut down will allow plant technicians to ensure that the blades are free of ice before restarting the turbines. This may require waiting until the ice has melted naturally or the ice may require manual removal. If it is not possible to remove the ice, the shut down

mechanism will also allow technicians to ensure everyone has safely cleared the area prior to restarting the equipment when there is the potential for ice to be thrown from the blades.

Heavy rains and flooding have the potential to cause erosion problems at any construction site and may also impact soil properties over the long term. In the East Point area, coastal erosion rates are approximately 0.21-0.39 meters per year. The project site is located away from any coastal, freshwater or saltwater areas; therefore erosion is not likely to be a concern. In addition, geotechnical testing has been completed to ensure that the soil beneath each turbine site has appropriate geotechnical properties.

**Table 5.7. Potential effects of the environment on the project**

| Project Phase | Potential Interaction | Potential Effects | Mitigation | Residual Effects |
|---|---|---|---|---|
| **Construction, Operation & Maintenance, Decommissioning** | Adverse weather conditions including:<br>• Low wind speeds<br>• Excessive wind speeds<br>• Freezing precipitation<br>• Heavy rainfall<br>• Flooding conditions | • Wind speeds lower than 4m/s will not generate electricity.<br>• Wind speeds above 25m/s will cause the turbine to shut down.<br>• Rime icing and potential ice throw<br>• Equipment shutdown, malfunctions or damage to equipment<br>• Accelerated erosion at construction and disposal sites before they stabilize. | • Wind speeds at the East Point average approximately 7.5-8.5m/s, therefore the turbines are expected to generate electricity at an availability rate of approximately 95% and a capacity factor of approximately 35-35%.<br>• Wind turbines will automatically shut down when severe icing conditions are present. This will allow plant technicians to ensure that the blades are free of ice before restarting the turbines.<br>• Signs will be posted around the site warning of the safety hazards associated with ice throw when conditions are present.<br>• Geotechnical testing has been completed to ensure that the soil beneath each turbine site has appropriate geotechnical properties.<br>• Erosion rates near the coast in the East Point area are typically 0.21-0.39meters per year. The site is located away from any coastal, freshwater or saltwater areas; therefore erosion is not likely to be a concern.<br>• Weather conditions should be assessed on a daily basis to determine the potential risk of climate on the project.<br>• Contractors are encouraged to consult Environment Canada's local forecast at http://www.weatheroffice.ec.gc.ca/ so that the construction work can be scheduled appropriately. | Minimal |

## 6. FOLLOW-UP PROGRAM

A formal follow up program verifies the results of the CEAA screening and determines the effectiveness of the mitigation measures laid out for the project. Follow ups are usually conducted when the project involves a new or unproven technology, new or unproven mitigation measures, the project is located in an unfamiliar environment, conclusions are uncertain or when the timing of the project has been changed. None of these conditions apply at the East Point Wind Plant; therefore no formal follow-up program will be required under CEAA. However, due to the concern surrounding the interaction of the wind turbines and local bird species, avian mortality rates will be monitored according to the guidelines established in the Canadian Wildlife Service document, Wind Turbines and Birds: A Guidance Document for Environmental Assessment".

Prior to construction, avian use studies were conducted to determine bird utilization rates at the project site. The results of these surveys were used to determine final turbine placement. All potential turbine sites are located in inland areas with low sensitivity ratings; therefore bird utilization rates will not be studied following the construction phase of the project. However, bird mortality searches will be conducted every two weeks during peak migration periods in the spring and fall. These surveys will include at least half of the turbine sites and will focus on any sensitive groups identified during the site specific bird study. Surveys should be conducted in a well-defined zone, using turbines as reference points and searching the area within a 50m radius. If possible, bird mortality surveys will be conducted by the same observers to ensure an accurate comparison between current and past site conditions (CWS, 2003). For further details on avian mortality searches, see the above mentioned document published by the Canadian Wildlife Service.

## 7. PUBLIC CONSULTATION

A public meeting regarding the East Point Wind Plant was held on October 4th, 2005 at the East Point Community Center. At this time the project was announced to the public by PEI Energy Minister Jamie Ballem.

A public information session was also held at the East Point Community Center on March 20th, 2006. This session was lead by representatives from Frontier Power Systems and the Prince Edward Island Energy Corporation. Details regarding the results of the public consultation can be seen in Appendix F.

## 8. FIRST NATIONS CONSULTATION

There are no known First Nations communities in the project area; therefore no potential interactions are anticipated with this group. In addition, any concerns brought forward at the public meeting on March 30, 2006 regarding potential interactions with First Nations, will be addressed in the final EA document. Therefore, the construction, operation and decommissioning of the East Point Wind Plant is not expected to impact the current use of land and resources for traditional purposes.

## 9. SCREENING DECISION AND SIGNATURE

This document summarizes the results of an environmental assessment related to the proposed East Point Wind Plant in King's County, Prince Edward Island. This environmental assessment has been performed and completed on behalf of the proponent and the responsible authority in accordance with the Canadian Environmental Assessment Act. Based on the results of this assessment, the following conclusion has been established:

- ☐ The project is unlikely to cause significant adverse environmental effects, taking into account the implementation of appropriate mitigation measures. The requirements of CEAA have been met and the proponent and responsible authority may take action to allow the project to proceed.
- ☐ The project is likely to cause significant adverse environmental effects. The proponent and responsible authority may not take any action to allow the project to proceed.
- ☐ Uncertain whether project will cause significant adverse environmental effects. Refer to federal Ministry of the Environment for Panel Review or Mediation
- ☐ Uncertain whether the project may cause significant adverse environmental effects, project could be justified under the circumstances. Refer to the federal Ministry of the Environment for Panel Review or Mediation.
- ☐ Public concerns merit referral to federal ministry of the Environment for Panel Review or Mediation.

CEAA Screening Completed by: Kari MacDonald, EIT
Frontier Power Systems Inc

Name of Proponent: Prince Edward Island Energy Corporation

Signature of Proponent: _____
Mr. Wayne McQuarrie, P. Eng
CEO, Prince Edward Island Energy Corps

Name of Responsible Authority: Natural Resources Canada
Wind Power Production Incentive Program

Signature of Responsible Authority: _____

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