CLASS I - ENVIRONMENTAL ASSESSMENT

PROPOSED WIND ENERGY PROJECT - HIGGINS, NOVA SCOTIA

ea

Prepared For:

Nova Scotia Department of Environment & Labour

Report No: 061218

CBCL LIMITED
Consulting Engineers

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Chapter 1 Introduction

1.1 Project Overview

Springhill Riverhurst Wind Power Ltd. (SRWPL) is proposing to develop three wind turbines on Higgins Mountain Road, Cumberland County, Nova Scotia, located to the west of Wentworth Station as indicated in Figure 1.1. It is anticipated that the turbines will collectively generate approximately 3.5 MW of electricity. This will be sold to Nova Scotia Power (NSPI).

This environmental assessment has been prepared to meet the requirements of the *Nova Scotia Environment Act* and associated regulations. Based on the nature of the proposed works, it is a Class I assessment.

1.2 Proponent Information

The proponent, Springhill Riverhurst Wind Power Ltd., is a wholly owned subsidiary of Vector Wind Energy Inc., a company headquartered in Ottawa. The proponent contact locally is:

Paul Pynn, P.Eng.
Springhill Riverhurst Wind Power Ltd.
Suite 348, 14-3650 Hammonds Plains Road
Upper Tantallon, NS B3Z 4R3
Tel: (902) 820-2587
Fax: (902) 826-7633
Cell: (902) 430-0819
www.vectorwind.com Vector Wind Energy
TSX-Venture Exchange: "VWE"

The agent acting on behalf of the applicant is:

Ann Wilkie, VP Environment
CBCL Limited
1489 Hollis Street
Halifax, NS B3J 2R7
Tel: (902) 421-7241
Fax: (902) 423-3839

1.3 Regulatory Overview

1.3.1 Requirement for Provincial Environmental Assessment

Environmental impact assessment in Nova Scotia is the responsibility of the Department of Environment and Labour (NSDEL) under *Environmental Impact Assessment Regulation* made pursuant to the *Environment Act*. Schedule A of that regulation defines those “undertakings” that may result in a

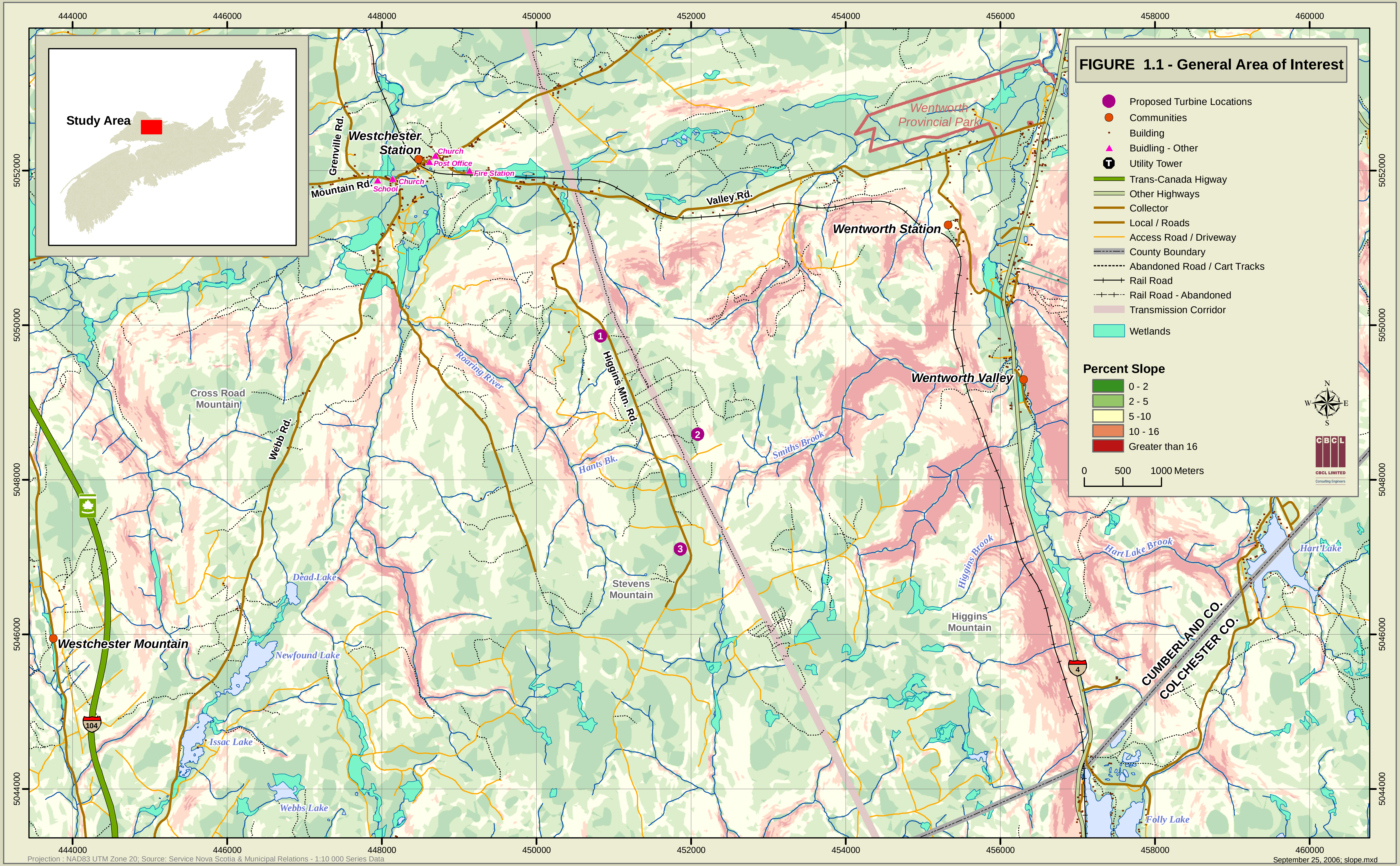


FIGURE 1.1 - General Area of Interest
Proposed Turbine Locations
Communities
Building
Buidling - Other
Utility Tower
Trans-Canada Higway
Other Highways
Collector
Local / Roads
Access Road / Driveway
County Boundary
Abandoned Road / Cart Tracks
Rail Road
Rail Road - Abandoned
Transmission Corridor
Wetlands
Percent Slope
0 - 2
2 - 5
5 -10
10 - 16
Greater than 16
0 500 1000 Meters
CBCL LIMITED
Study Area
Westchester Station
Church
Post Office
Fire Station
School
Church
Grenville Rd.
Mountain Rd.
Valley Rd.
Wentworth Provincial Park
Wentworth Station
Wentworth Valley
Cross Road Mountain
Webb Rd.
Roaring River
Higgins Mtn. Rd.
Hants Bk.
Smiths Brook
Stevens Mountain
Dead Lake
Newfound Lake
Issac Lake
Webbs Lake
Westchester Mountain
Higgins Brook
Higgins Mountain
Hart Lake Brook
Hart Lake
CUMBERLAND CO.
COLCHESTER CO.
Folly Lake
104
4
444000
446000
448000
450000
452000
454000
456000
458000
460000
5044000
5046000
5048000
5050000
5052000
Projection : NAD83 UTM Zone 20; Source: Service Nova Scotia & Municipal Relations - 1:10 000 Series Data
September 25, 2006; slope.mxd

significant environmental impact. Included is "all electric power generating facilities with a production rating of two megawatts or more". The proposed project therefore has to be registered with the Minister for the "purpose of his determining whether or not the completion of an environmental impact assessment (provincially) is required". This requirement was reinforced in October 2005, when the Department of Environment and Local Government issued additional information requirements for wind turbines pursuant to Section 5(2) of the *Environmental Impact Assessment Regulation* of the *Environment Act.* Once the Minister has received all the information that he considers necessary for his determination, he has 30 days within which to make his decision on whether further information is deemed necessary.

To ensure that the Minister has the requisite information to make an informed decision in accordance with Section 12 of the *Environment Act*, this document provides detail on the following:

a) the location of the proposed turbines off Higgins Mountain Road, Cumberland County;
b) the size and scope of the proposed undertaking;
c) reference to the meetings and consultations that have taken place;
d) steps that have been taken by the proponent to address environmental concerns;
e) potential environmental effects associated with the construction and operation of the proposed wind turbines;
f) detail of the proposed schedule; and
g) detail on existing land use in the area.

1.3.2 Federal Assessment Not Required

Since no federal financial assistance is being sought and no federal approvals will be required to enable the development of the three wind turbines at Higgins to be constructed, the *Canadian Environmental Assessment Act* is not triggered. No federal assessment is required.

1.3.3 Other Authorizations

In addition to meeting the requirements of the environmental assessment process, SRWPL will be required to attain other permits and authorizations and to take into account the requirements of pertinent legislation of general application including the *Species at Risk Act (SARA)* and the *Migratory Birds Convention Act (MBCA).* Other permits and authorizations will include, but are not necessarily limited to, the following:

- Authorization from Transport Canada to mark and/or light the proposed turbines to address the requirements of the Aviation Regulations pursuant to the *Aeronautics Act*;
- Provincial authorization(s) for license(s) and/or easement(s) to facilitate connections to the provincial grid;
- Municipal approval to construct; and
- Special Moves Permit from Service Nova Scotia.

1.4 Project Location, Land Ownership and Funding

Figure 1.1 illustrates the proposed locations of the three turbines in proximity to Higgins Mountain Road in Cumberland County, Nova Scotia. This area is located in the Cumberland Hills region of Nova Scotia (natural region #581) and is characterized by open fields interspersed with mixed wood stands. Higgins

Mountain Road is one of several largely unsurfaced roads that provide access to the heights of land of the Cumberland Hills plateau. The road largely parallels NSPI's transmission corridor.

There is no known federally owned land within the footprint of the proposed wind farm. As detailed on Figure 1.2, the land in the vicinity of where the turbines are to be constructed is held in a number of different ownership parcels. SRWPL, however, has met with and entered into contractual agreements with each of the landowners necessary to enable the turbines to the constructed and operated. More specifically, these are as follows:

- Turbine #1 – PID 25088295 – Philip Adams
- Turbine #2 – PID 25267626 – Rodney and Patricia Adams
- Turbine #3 – PID 25088733 – Mike Johnson and Wayne MacCallum

There are no public monies being accessed to facilitate the development of the proposed turbines.

1.5 Study Area Boundaries

The study area for this environmental assessment includes the footprint of all works associated with the construction and operation of the proposed wind turbines and those areas within which most project-environment interactions could reasonably be expected to occur. It is not possible to establish a single study area boundary that accurately reflects the spatial characteristics of the potential project-environmental interactions. For example, habitat types have been identified in a corridor that extends 900-1,600 m either side of the turbine locations along the Higgins Mountain Road (see Figure 1.3). This corridor is also the area that was the focus of the bat and bird field programs. In the consideration of other attributes of interest, e.g., the consequences of the project for local residents and communities, the study area was of necessity larger, extending to Westchester Station to the north and to Highway 104 to the west.

Temporal project boundaries include the timeline for the short term construction activities as well as the long term operation of the facility and its eventual decommissioning.

1.6 Project Justification

The federal and provincial governments have introduced strategies to facilitate the development of alternative energy sources in a bid to reduce the emission of "green house gases". The conversion of wind power into electricity is an acknowledged means of meeting this objective. Further, the Nova Scotia Power Inc. (NSPI) has established mechanisms by which they will buy from selected producers, including the proponent, "clean energy", i.e., wind power, in an effort to meet its emission targets.

The purpose of the proposed works, i.e., the construction of three wind turbines off the Higgins Mountain Road in Cumberland County, is to use natural wind energy to generate electricity for sale to NSPI. The proponent has been studying the wind regime in the Cobiquid Hills for some years and already has two turbines operating in the vicinity of Springhill. The proposed turbines off the Higgins Mountain Road will further add to the clean energy generated in this region, and its successful generation will contribute to NSPI's initiatives to reduce its greenhouse gas emission targets.

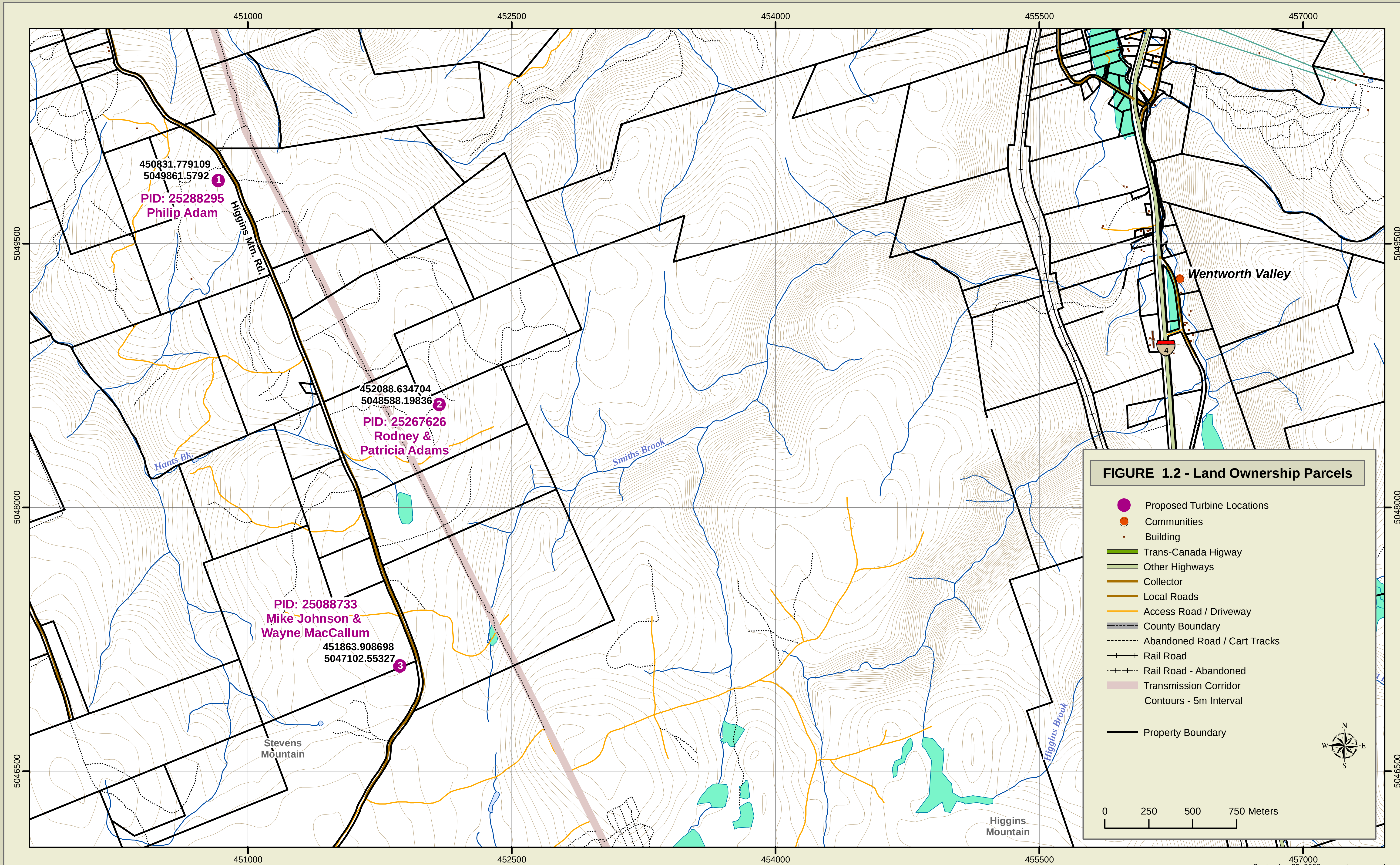


FIGURE 1.2 - Land Ownership Parcels

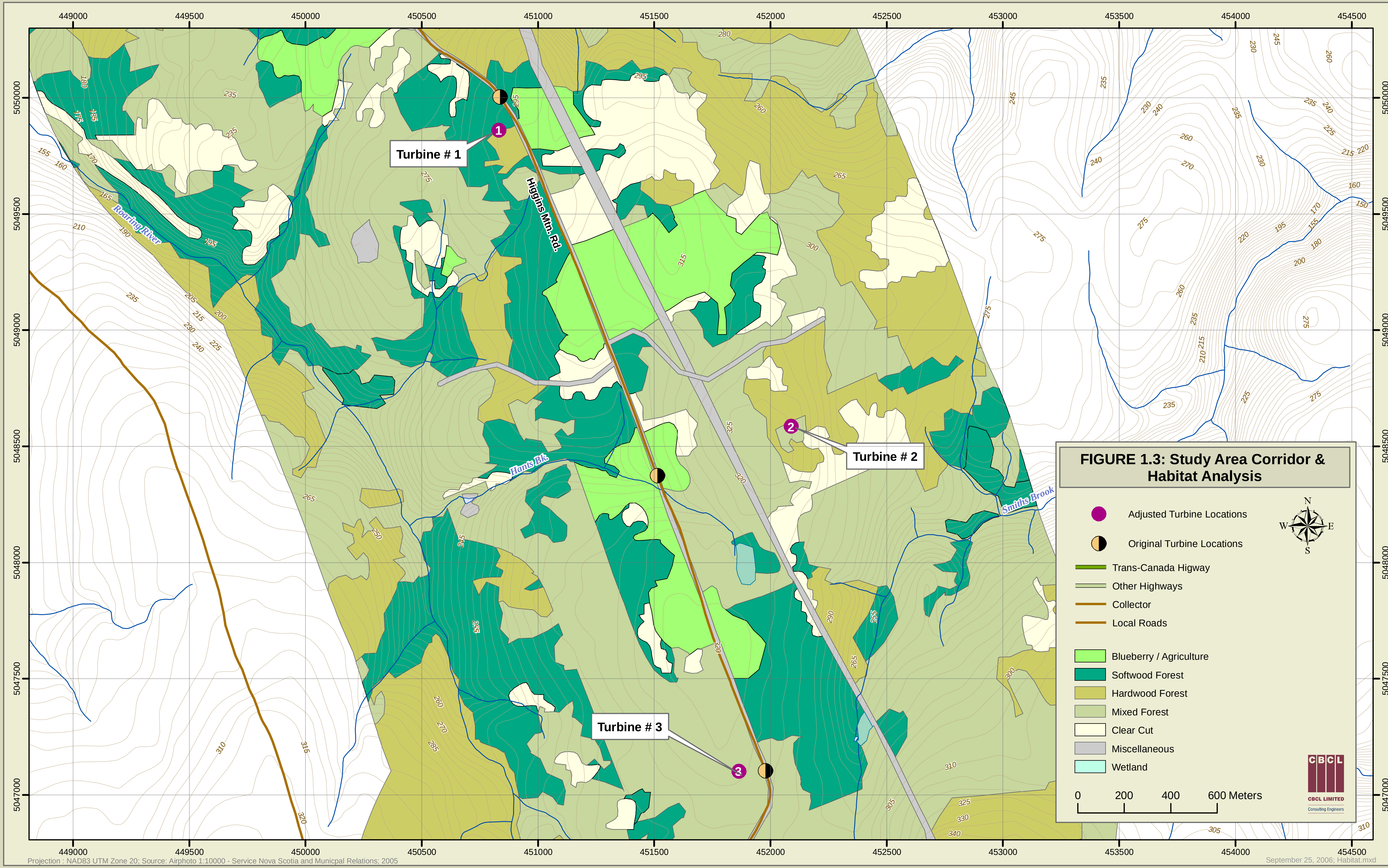


FIGURE 1.3: Study Area Corridor & Habitat Analysis
Adjusted Turbine Locations
Original Turbine Locations
Trans-Canada Higway
Other Highways
Collector
Local Roads
Blueberry / Agriculture
Softwood Forest
Hardwood Forest
Mixed Forest
Clear Cut
Miscellaneous
Wetland
0 200 400 600 Meters
N
S
E
W
CBCL
CBCL LIMITED
Consulting Engineers
Turbine # 1
Turbine # 2
Turbine # 3
1
2
3
Higgins Mtn. Rd.
Roaring River
Hants Bk.
Smiths Brook
449000
449500
450000
450500
451000
451500
452000
452500
453000
453500
454000
454500
5050000
5049500
5049000
5048500
5048000
5047500
5047000
Projection : NAD83 UTM Zone 20; Source: Airphoto 1:10000 - Service Nova Scotia and Municpal Relations; 2005
September 25, 2006; Habitat.mxd

1.7 Consultation

Consultation is an inherent facet of the environmental assessment process. It involves several dimensions including:

- consultation with those parties and agencies, including all levels of government, who can contribute ecological and related data to facilitate an understanding of the environment in the vicinity of the proposed works;
- consultation with local people, including property owners, who may in one way or another be affected by the construction and operation of the proposed works; and
- making contact with the representatives of the aboriginal communities that may have in the past, or who may currently, use the lands in the vicinity of the proposed works.

The environmental study team has also had contact with representatives from a number of regulatory agencies, with resource managers and with researchers with knowledge in key areas, to identify issues pertinent to the proposed project. These consultations are listed in Table 1.1.

Table 1-1: Consultation Record

Contact	***Means of Consultation***	***Issues or Concerns***
Robert Ogilvie, NS Museum	Telephone and e-mail	Archaeological field program
David Christianson, NS Museum	Telephone and e-mail	Archaeological field program
Stephen Powell, NS Museum	Telephone and e-mail	Archaeological field program
Bill Coulter, Canadian Environmental Assessment Agency	E-mail and telephone	Discussion of the need to undertake an environmental screening pursuant to *CEAA*.
Don Ruston, NSDNR	Telephone	Mammal species and recreational activities.
Vanessa Margueratt, NSDEL	In person	Provincial assessment process
Julia Towers, NSDEL	In person	Provincial assessment process
Kim George, NSDNR	E-mail	Mammal species, plus information on significant habitat in the area.
Diane Amirault, CWS	Telephone	Peregrine habitat
Hugh Broders and Colin Garroway, St. Mary's University	In person	Bat habitat
Mark Elderkin, NSDNR	Telephone	Migration pathways
Blake Maybank (birder)	E-mail	Bicknell's Thrush records
Ian McLaren, Dalhousie University	In person	Availability of bird records
Krista Patriquin, Dalhousie University	In person	Bat distribution
Mike Peckford, Atlantic Bird Observatory and Acadia University	Telephone	Availability of radar data
Francis Spalding (local birder)	Telephone	Availability of bird sightings and migration pathways

Contact	*Means of Consultation*	*Issues or Concerns*
Mr. Wilson (blueberry farmer)	In person	Historic use of site by raptors and swallows
Paul Merlin, Owner/Operator, Merlin Fish Farms	Telephone	Detail about the fish farm below Westchester Stations

In addition, the proponent and/or members of the study team have met with the involved land owners and with key individuals who have knowledge of the area. Letters have also been sent to the following representative aboriginal organizations:

- Confederacy of Mainland Mi'Kmaqs
- Union of Nova Scotia Indians
- Native Council of Nova Scotia

Given the remote nature of the location, there is no community in close proximity. There is one house within 1 km and a second some 1.5 km distant; both are located within a sound and visible light shadow caused by the mountain gradient. The community of Westchester Station is some 2-3 km distant from the proposed turbines. The land owners adjacent the Higgins Mountain Road use their lands for either forestry or blueberry cultivation, neither of which is affected in any way by the proposed works.

1.8 Approach and Methodologies

Environmental assessment is a process that is executed early in project planning to enable environmental factors to influence decisions and detailed engineering. It is in essence a planning tool, the underlying intent of which is to ensure that all works associated with the Project's construction, operation and termination are executed in a manner that causes minimal harm to the physical, ecological and socio-economic environments.

More specifically the process involves the following stages:

- describing the project and establishing the environmental baseline conditions;
- scoping the issues and establishing the boundaries of the assessment;
- assessing the potential environmental effects of the project, including residual and cumulative effects; and
- identifying potential mitigative measures to eliminate or minimize potential adverse effects.

The guidance provided in the work of Beanlands and Duinker (1983) and subsequent federal and provincial documents such as the DOE Guide to Addressing Wildlife Species and Habitat in an EA Registration Document and Environment Canada, Canada Wildlife Service documents on Wind Turbines and Birds, a Guidance Document for Environmental Assessments and Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (2006a and b) facilitated the approach and preparation of this environmental assessment. This approach emphasizes the identification of Valued Ecosystem Components (VECs) as the focal points of the analysis. VECs are generally defined as those valued aspects of the ecosystem and associated socio-economic systems that are susceptible to impact. The assessment focuses on the potential interaction between project components and activities on the one hand and VECs on the other.

By virtue of the legislation that has been referenced, it has been determined that a Class I assessment pursuant to the *Environment Act* is required for the proposed construction of three turbines at selected locations in proximity to the Higgins Mountain Road in Cumberland County. The assessment has drawn on:

- pertinent research work that has been executed with respect to comparable projects;
- the professional experience of members of the study team and their work at comparable sites;
- pertinent secondary ecological data with respect to the site and the surrounding area; and
- the execution of selected field programs.

Table 1.2 identifies the field programs undertaken, their timing and the names and credentials of those undertaking the work.

Table 1-2: Details of Field Programs

Field Program	***Timing***	***Personnel***	***Credentials***
Bird breeding and migratory programs	1st field visit 28 April 2nd field visit 25 May 3rd field visit 28 June	Andrew Horn	Ph.D., professor at Dalhousie University, Past President of the NS Bird Society, current member Maritimes Breeding Bird Atlas Steering Committee, author of federal status reports, recovery strategies and management plans for three bird species in NS, i.e., Least Bittern, Roseate Tern and the Ipswich Sparrow.
		Greg Breed	Ph.D. candidate at Dalhousie University and an experienced birder
		Ben Atkinson	B.Sc. candidate at Indiana University
Ecological and botanical field investigations	1st field visit 12 May 2nd field visit 26 July	Clinton Pinks	B.Sc., B.Design, M.L.Arch., landscape architect and field ecologist with 10 years of experience in habitat assessment, vegetation mapping, plant identification, landscape restoration and environmental design. CBCL Limited employee.
		Lori Williams	B.Sc., CEPIT, Environmental ecologist with five years of experience in the execution of various field programs and environmental assessments. CBCL Limited employee.
Bat monitoring program	8-23 Sept.	Hugh Broders	Ph.D., Associate Professor, St. Mary's University. Approximately 10 years of field experience and research.
		Lynne Henderson	M.Sc. candidate – research focus on northern long-eared bat.
		Lesley Farrow	M.Sc. candidate – research focus on eastern pipistrelles.

Field Program	Timing	Personnel	Credentials
Archaeological program	1st field visit May 2nd field visit July	Stephen Davis	Ph.D., Professor, St. Mary's University. Approximately 25 years of archaeological field experience and research.
		April MacIntyre	B.A. (Honors in Anthropology), M.A., field archaeologist with five years of field experience.

More specifically, the following field programs have been undertaken:

- ecological reconnaissance and field investigation for priority plant species;
- a survey of breeding birds and raptors in May and June and a raptor monitoring program in the fall;
- a fall bat monitoring program; and
- two archaeological field surveys.

The results of the fall raptor and bat monitoring program had not been received as of the date this environment assessment was submitted; the results will be provided as an addendum when available.

The VECs were identified through a scoping process that involved the secondary research, the field programs, the experience of the study team and reference to comparable assessments.

The bibliography identifies the documents and papers consulted.

The following paragraphs provide additional information on each of the above field programs.

1.8.1 Ecological Reconnaissance and Investigation for Priority Plant Species

In May 2006 two environmental scientists visited the study area to:

- detail the nature of the vegetation cover and land use at each of the turbine sites;
- identify the presence or absence of water courses;
- identify the proximity of any wetland and the nature of the wetland; and
- photograph the sites.

The methodology employed followed the DOE *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document* (November, 2005). The approach included the following steps:

- Development of Priority Species Lists for each taxonomic group based on the COSEWIC, NSESA, DNR General Status and ACCDC lists;
- Determination as to which of the priority species were known to be present in Cumberland, Colchester and/or Pictou counties in Nova Scotia;
- Determination of the types of habitat in which each species could be expected to be found;
- The Significant Species and Habitat (SigHab) data was accessed to establish if any significant habitat polygons existed within the general area of the proposed development project;
- Determination as to the optimal detection period for each species of wildlife, and, for plants, phenology windows were established for each species; and
- Field surveys were subsequently conducted for birds, plants and bats and are reported in the sections that follow.

1.8.1.1 Initial Site Visit

The initial ecological reconnaissance was undertaken in mid May, 2006. It consisted of ground-truthing the overall project area, including the lands on either side of Higgins Mountain Road, the proposed access roads to the turbine locations, the Roaring River and one of its tributary brooks (Harts Brook), a small wetland more than 300 m from Turbine Two and a small existing borrow pit on Higgins Road. The latter was observed to get a sense of the type of till material in the area.

The intent of the field investigation was to establish and/or verify the habitat types, vegetation cover and general land use and to identify any anticipated environmental issues that might arise from the development and operation of the turbines. This included the impact that the project might have on adjacent water courses, wetlands and other significant habitats in the area. A general habitat map was prepared based on field notes and area photography taken while at the site (see Figure 1.2). In addition, water samples were taken from two water courses as part of the baseline. The materials compiled provided a record for the definition of the ecological baseline and the subsequent environmental evaluations.

1.8.1.2 Priority Species List

An environmental screening of rare biota, either known, or which might have been located within the Higgins area, was undertaken. All applicable lists were reviewed; these lists include:

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

Species were screened based on their known geographic occurrence and the habitat type confirmed during the first field investigation. The results of the desktop review are provided in Appendix A.

1.8.1.3 Second Field Investigation for Priority Plant Species

The second field investigation involved a detailed field inspection of each turbine location including the access roads to these locations. The purpose was to verify the locations and habitat types for the turbines and to confirm the presence or absence of any priority plant species of special status. This exercise was conducted using the priority species list generated (see Appendix A). For each turbine site and access road, the vegetation was surveyed by walking in concentric rings from the proposed turbine centres to the edge of the proposed turbine pads, a distance of approximately 50 m. For priority plants, the area of concern is any area anticipated to be disturbed or lost as a result of the development of the project. The results of the field program are provided in Section 3.3.1.

1.8.2 Bird Survey

Wind turbines can harm bird populations in several ways:

i) through the destruction and disturbance of habitat at the construction footprint;
ii) through displacement, or blocking of natural flight paths; and
iii) through collision fatalities (Drewitt and Langston, 2006; and Madders and Whitfield, 2006).

The latter two pathways distinguish turbine projects from other construction. While details of turbine construction can lower collision risk, e.g., the avoidance of lattice supports and guy wires, turbine location is the most important factor mitigating displacement and collision risk. Current guidelines (USFWS, 2003; and CWS, 2005) recommend avoiding areas with listed species, migration pathways or other areas where birds congregate, e.g., colonies and roosts, and where raptors congregate, e.g., cliff edges, mountain passes, and areas of high prey abundance. The team ornithologist took these considerations into account in the design and execution of the field programs executed which are briefly outlined below. The results of the surveys, i.e., the breeding bird survey and raptor use survey, are provided in Section 3.2.2.

In accordance with Environment Canada's recommendation (2006a), the ornithologist undertook a desktop survey of relevant materials and consulted with other members of the project team with respect to the topography and habitats in and in proximity to Higgins Mountain Road. It was concluded:

i) that the site is not known to concentrate migrants, nor has the configuration one would expect to concentrate migrants;
ii) that the site is near a landform, i.e., the north slope of the Cobequid Hills, that may concentrate local movements or autumn migration of raptors; and
iii) that several provincially listed species might breed in the area.

The area does not show characteristics that would yield concentrations of wintering birds in Nova Scotia, i.e., field near grain or livestock operations for raptors, mudflats for shorebirds, or dense cone crops for finches. Its potential as a site for wintering birds therefore was not considered further.

The Environment Canada (2006a) further advises that:

i) a breeding bird survey be undertaken for all sites, with particular attention paid to the presence/absence of species at risk; and
ii) spring or autumn surveys be undertaken for sites in migration corridors.

Both of the above steps have either been undertaken, or are planned. Only an autumn migration survey is being undertaken since that was the only migration risk identified.

1.8.2.1 Breeding Bird Survey

From a literature search and interviews, it was determined that five uncommon species might occur in proximity to the proposed turbine location (provincial rank S1-2 except as noted): Purple Martin, Bicknell's Thrush, Wood Thrush (S2), Philadelphia Vireo (S2) and Eastern Meadowlark. This initial inventory was ground-truthed by a breeding bird survey conducted over three visits (April 28, May 25 and June 28). The survey followed standard protocols as detailed by Environment Canada (2006a). The temperature at 8:00 a.m. on each day was: on April 28 (4ºC), May 25 (11ºC) and June 28 (21ºC). Each day was partly cloudy with increasing cloud cover, but no precipitation occurred.

Each visit began with 10-minute, unlimited radius point counts completed by 8:00 a.m. at seven points. Winds were NE or NNE and light during all point counts, except on June 28 when they were moderate (26 km/h), but audibility seemed comparable to the other days. As is suggested by Environment Canada (2006a) for an area, which is a mosaic of small fields interspersed with patches of woodland, the count points were regularly spaced throughout the whole area; more specifically the points were spaced 0.5 km apart on the Higgins Mountain Road. These counts provided a list of likely breeding species and their relative abundance.

In May and June, the area within 0.5 km of the road (which includes the revised turbine locations) was searched for additional species and for breeding evidence of all species. This was accomplished by walking in an irregular path through each patch of habitat so that the searchers passed within 50 m of all wooded and within 200 m of all open habitat in the area; i.e., an unstandardized area search (Environment Canada, 2006a, Appendix 1). In June, the searches included playing back chickadee mobbing calls in at least one location in each forested or scrubby habitat, and playing back the song of Philadelphia Vireo and Bicknell's Thrush in appropriate habitat.

During the point counts, area searches and raptor watches (described below), and breeding status was determined for all birds sighted according to the breeding evidence codes of the Maritime Breeding Bird Atlas (MMBA) (available at http://www.mba-aom.ca). Atlas work amounted to 21 hours spread evenly over the three days, yielding 44 species, or 60% of the diurnal land birds encountered in the surrounding atlas square during the first MBBA. The time commitment is the minimum recommended for the MBBA, but all birds, including raptors, were watched closely for signs of breeding.

1.8.2.2 Raptor Surveys

On each of the three survey days in April, May and June, between 11:00 a.m. and 3:00 p.m., a search for raptors, either scanning from Cross Mountain Road, or from three evenly distributed vantage points along the Higgins Mountain Road, was undertaken, dividing time equally between the points. On April 28, the north slope of the Cobequid Hills from Sugarloaf Mountain to Wentworth Valley was specifically searched for exposed cliffs suitable for Peregrine Falcons; the area was also scanned for migrating raptors.

Watches for raptors are planned on at least three days during the peak of raptor migration, i.e., late September and early October (Tufts, 1986) between 9:00 and 16:00; the intent is to execute this work on days with favourable tailwinds that are perpendicular to the north slope, i.e., northeast, north or, preferably, northwest, as recommended in the Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (Environment Canada, et. al., 2006b). Vantage points that offer views that include all three turbine sites, as well as the north slope which might concentrate migrants, are found on Webb Road, about 2 km west of Higgins Mountain Road. Some time may also be spent watching from vantage points in fields between turbines 1 and 3 which offer more limited views, but may offer better information on altitudes and flight paths.

1.8.3 Archaeological Survey

Davis Archeological Consultants Limited conducted an archaeological resource impact assessment of the turbine locations in May 2006 to determine if heritage features were present (Category C Heritage Resource Permit A2006NS24). This followed an archaeological desktop study that had been conducted in March 2005 (Heritage Resource Permit A2005NS09). Copies of the permits are provided in Appendix B. This latter study had indicated that the area had been settled in the late 18th and early 19th centuries by

Loyalists, but had previously been occupied by First Nations peoples. To the Mi'Kmaq, Cumberland County was known as Kwesomalegek meaning "hardwood point".

In May 2006, each of the three turbine sites was surveyed on foot using GPS with sub-decametre accuracy. A minimum of a 100 m radius around each of the turbine sites was surveyed and all surface cultural activity noted and plotted by GPS. Since Turbine B was subsequently relocated, the new site was surveyed during the third week of July. No subsurface testing was conducted on either visit. The results of the work are presented in Sections 3.5.4.

1.8.4 Bat Surveys

The goal of the work undertaken was to document species composition and bat use of the project area by conducting an ultrasonic survey. The survey involved the use of two Anabat II detection systems to sample the echolocation calls of bats. Each system consisted of an ultrasonic Anabat II detector interfaced to a CF Storage ZCAIM (Titley Electronics Ltd., NSW Australia). The systems were calibrated to reduce variability in their sensitivity using the methods suggested by Larson & Hayes (2000). The seasonal timing of the sampling period likely corresponds to the end of fall migration activity by migratory species (mid-July to late-September) (Erickson et al., 2002) and movement by resident species to local hibernacula. Activity was monitored at two of the three proposed turbine locations (Location 1: 450892 E 5049851 N and Location 2: 452095 E 5048618 N; UTM Zone 20 NAD83 format). Systems were suspended from trees on pine constructed supports such that the microphone was unobstructed by surrounding vegetation, maximizing the quality of the recorded calls by reducing interference. Monitoring began on the evening of 8 September 2006 at 19:00 and will be completed on 23 September.

Identification of many bat species is possible because of the distinctive nature of their echolocation calls (Fenton & Bell, 1981; O'Farrell et al., 1999). Species will be qualitatively identified from echolocation sequences by comparison with known echolocation sequences recorded in this and other geographic regions. In the case of species in the genus Myotis (northern long-eared and little brown bat), it will not be possible to identify sequences to the species level as their calls are too similar to be separated. Identifications will be facilitated using frequency-time graphs in ANALOOK software (C. Corben, www.hoarybat.com). A bat pass, defined as a continuous series of greater than two calls (Johnson et al., 2004), will be used as the unit of activity.

Further information on bats is provided in Section 3.2. The results of the fall bat survey will be forwarded as an addendum when they have been compiled.

1.9 Structure of the Document

This report documents the environmental evaluation of the construction, operation and decommissioning of three wind turbines in proximity to Higgins Mountain road. The report consists of the following sections and appendices:

- Section 1.0 provides an introduction to the proponent and the proposed project, an overview of the approach and methodologies employed and reference to the pertinent regulatory regime;
- Section 2.0 identifies the principle project components, activities, scheduling, anticipated emissions and discharges, as well as outlining how malfunctions and accidents will be addressed;

- Section 3.0 describes the existing biophysical and socio-economic environment;
- Section 4.0 identifies the Valued Ecosystem Components (VECs), the pathways that may be associated with impacts and presents the environmental evaluation; and
- Section 5.0 summarizes the evaluation results and the commitments undertaken.

The text is supported by the following appendices:

A Results of ACCDC and Associated Screenings
B Heritage Resource Permits
C Vensys 62 Technical Description
D Results of Water Sampling
E Registration of Higgins Family Cemetery

2.1 The Wind Resource

The proponent has been compiling data on the wind resource at the site since December, 2004. More specifically Vector commissioned detailed monitoring to be conducted from December, 2004 to June, 2005. The 60 m guyed monopole was equipped with three levels of instrumentations, i.e., at 40 m, 50 m and 60 m. The tower was equipped with three calibrated NRG anemometers, two NRG wind direction vanes and one NRG thermometer. Two redundant anemometers were installed at the 60 m and 40 m levels. All the anemometers and wind vanes were non-heated instruments. An NRG Symphonie data acquisition system was used to collect the data. The data logger transferred the information and data files in the form of time-stamped data, averaged every 10 minutes, for wind speed, wind direction and temperature.

Table 2.1 presents the monthly averaged observation at the site.

Table 2-1: Monthly Average Wind Observations - Mount Higgins

Month-Year	Wind Speed at 60 m (m/s)	Wind Speed at 50 m (m/s)	Wind Speed at 40 m (m/s)	Temperature at 3 m (ºC)	Vertical Shear Coefficient 60 m – 40 m	Turbulence Intensity at 60 m	Turbulence Intensity at 50 m	Turbulence Intensity at 40 m
Dec-04	10.42	9.31	9.24	-4.67	0.35	0.13	0.14	0.16
Jan-05	7.58	7.24	6.70	-9.06	0.32	0.14	0.15	0.17
Feb-05	6.27	6.02	5.61	-4.19	0.33	0.14	0.15	0.17
Mar-05	7.50	7.14	6.73	-1.85	0.27	0.15	0.16	0.17
Apr-05	7.41	7.00	6.65	5.80	0.28	0.14	0.16	0.17
May-05	6.34	6.16	5.64	8.92	0.29	0.17	0.18	0.21
Jun-05	6.87	6.61	6.08	17.13	0.31	0.15	0.16	0.18
Average	7.11	6.80	6.34	2.43	0.30	0.15	0.16	0.18

Source: Helimax. 2005. Table 4.2.

Based on the analysis of these results, SRWPL believes the wind resource at the Higgins site to be commercially farmable.

2.2 Principal Project Components

2.2.1 The Wind Turbine Generators

The proposed turbines are Vensys 62; the specifications of this generator is presented in Appendix C. The Vensys 62 is a gearless wind energy converter and is equipped with a three blade rotor, pitch control with a rated output of 1,200 KW. This converter generates electric current that is fed directly into the public grid. Optimum aerodynamic rotor efficiency, at every wind speed, is achieved by using variable speed technology. The 62 m rotor diameter and 69 m hub height result in an overall height of approximately 100 m.

Although the detailed engineering has not yet been undertaken, a possible configuration of the proposed wind farm, based on preliminary site assessment involves the construction of three WTGs located on agricultural and/or forested lands in locations as illustrated in Figure 1.3. The proposed configuration would generate approximately 3.6 MW of electricity annually which would be fed to the NS Power grid.

The output of each WTG will be 600V, 3-phase, 60 Hz. Each unit will have its own 600V main breaker which will provide both protection and isolation to the unit. Connected to the main breaker of each unit will be 1000V cables installed underground in ducts which will run to a padmounted unit transformer located approximately 5 m from the base of each wind generator tower.

Also included in Appendix C are the technical details of the flashing strobe obstruction light that will be installed on the top of each turbine. No synchronization is required because Transport Canada does not, because of the distance between the turbines, consider the turbines to comprise a “wind farm”. There are no ground structures associated with these light units.

Connected to each of the unit transformers will a cable collection system. To ensure that the cable system will be consistent with typical distribution practices and to keep the cables to a reasonable and economical size, a 25 kV system has been chosen. The cables on site will be triplexed and either run on overhead lines or installed underground to tie into the grid.

2.2.2 Connection to the Grid

The connection to the grid will be undertaken by NSPI and will involve a 25 kV overhead line on wooden poles. Figure 2.1 provides the alignment. The routing and construction of this connection is the sole responsibility of NSPI and is a service being provided by NSPI to the proponent.

2.2.3 Ancillary Components

In addition to the components detailed above, some upgrading of the existing road to Turbine #2, may be required to enable construction and subsequent servicing and maintenance of the turbine. During the construction phase, facilities will be provided on site to provide for the needs of the construction crews, for laydown areas and for the storage of equipment. These facilities will be temporary. All access roads will be maintained as private roads following construction.

2.3 Project Activities

2.3.1 Construction Activities

In determining the scope of the Project for environmental assessment, SRWPL has given consideration to the following:

- What is involved in the construction of the principal structural elements necessary to the Project including the towers, the necessary cable linkages to the grid and the substation; and
- Other ancillary physical works that are necessary to accommodate the construction of the principal elements.

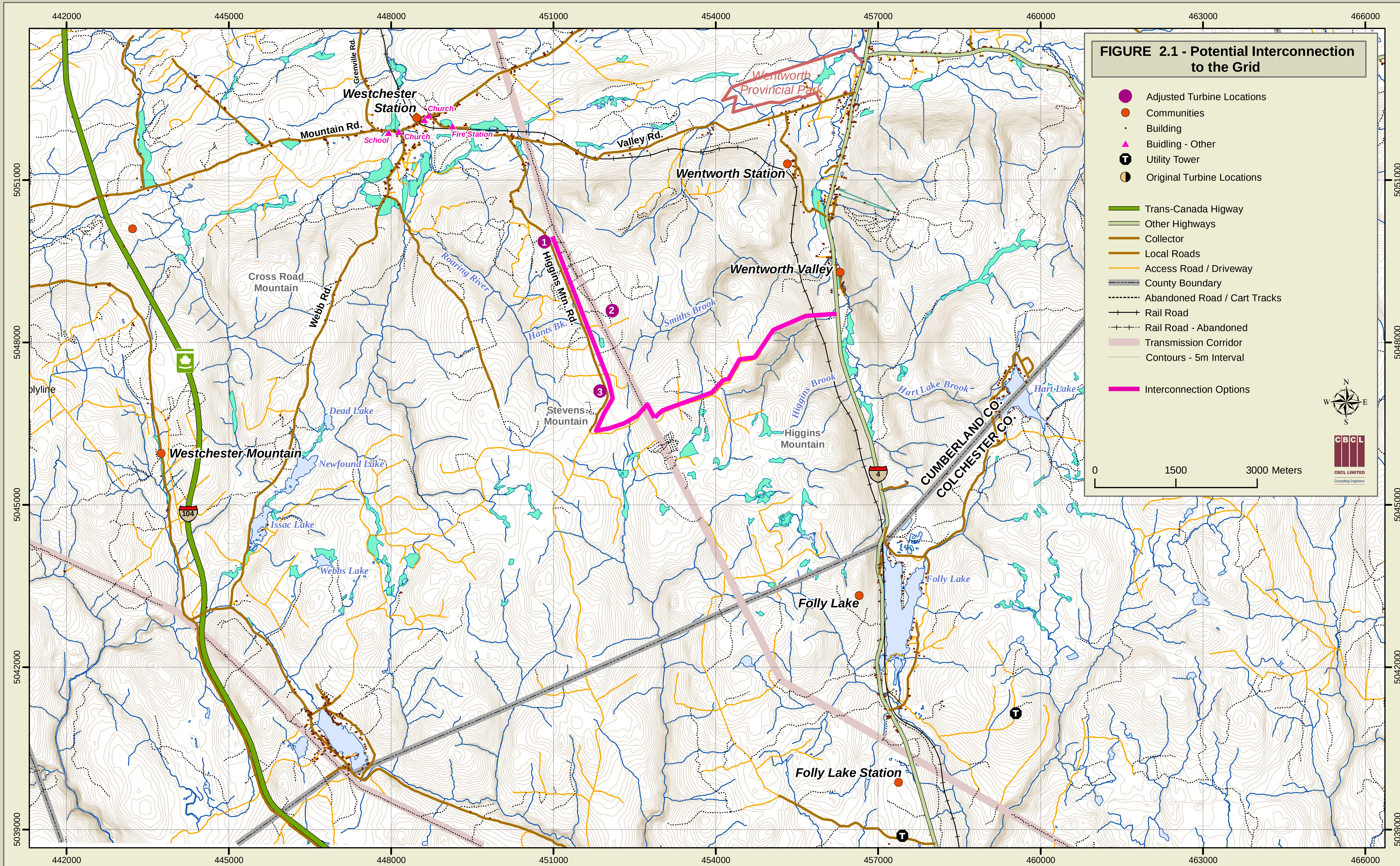


FIGURE 2.1 - Potential Interconnection to the Grid
Adjusted Turbine Locations
Communities
Building
Buidling - Other
Utility Tower
Original Turbine Locations
Trans-Canada Higway
Other Highways
Collector
Local Roads
Access Road / Driveway
County Boundary
Abandoned Road / Cart Tracks
Rail Road
Rail Road - Abandoned
Transmission Corridor
Contours - 5m Interval
Interconnection Options
0 1500 3000 Meters
CBCL LIMITED
Westchester Station
Wentworth Provincial Park
Mountain Rd.
Valley Rd.
Grenville Rd.
Wentworth Station
Wentworth Valley
Cross Road Mountain
Webb Rd.
Roaring River
Higgins Mtn. Rd.
Hants Bk.
Smiths Brook
Stevens Mountain
Higgins Brook
Higgins Mountain
Hart Lake Brook
Hart Lake
Dead Lake
Newfound Lake
Westchester Mountain
Issac Lake
Webbs Lake
CUMBERLAND CO.
COLCHESTER CO.
Folly Lake
Folly Lake Station
School
Church
Fire Station
104
4
Projection : NAD83 UTM Zone 20; Source: Service Nova Scotia & Municipal Relations - 1:10 000 Series Data
September 25, 2006; nspi_new_final.mxd

Construction will involve a number of actives including, but not necessarily limited to, the following:

- The undertaking of a number of surveys including a site survey, a geotechnical survey and a grid construction survey;
- The preparation of the site for construction activity including the upgrading of the access road to Turbine #2, preparation of the turbine pads[1] which will involve the clearing of wooded vegetation in the tower locations and the mobilization of construction equipment;
- The development and implementation of an erosion control plan to mitigate against sediment transfer during construction activities;
- Excavation to accommodate the concrete foundations of the tower bases and the disposal of the excavated materials in accordance with provincial regulatory requirements;
- The preparation of the building forms for the foundation, the pouring of the reinforced concrete foundation and the attachment of the mounting ring for the tower;
- The transportation of the wind turbine, including the tower, to the site by the supplier on flatbed trucks;
- The lifting by crane of the tower sections which will sequentially be bolted into place. The nacelle, which contains the generating and yawning mechanism, will then be placed onto the top of the tower;
- The rotor, i.e., the blades of the turbine, will be assembled, or partially assembled, on the ground and then lifted to the nacelle and bolted into place;
- The transformer, which will be approximately 1.5 cubic meters in size, will be sited within or in proximity to the tower base;
- The trenches for the power cables will be dug using heavy equipment and after the placement of the cables, the trenches will be backfilled; and
- Demobilization and site remediation which will include the restoration of vegetation around the towers, and the remediation of construction areas.

2.3.2 Operations and Maintenance

The wind turbines will be operational on a continual basis except under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities. Each turbine will be subject to periodic maintenance and inspection; regular maintenance will involve oil changes, and any waste products, e.g., waste oil, will be disposed of in accordance with provincial waste management regulations.

2.3.3 Decommissioning and Abandonment

The design life of a wind turbine is typically 20 – 30 years and capital improvement and replacement programs can extend safe and efficient operations well beyond 40 years. Decommissioning of both the turbines and the site, when it is necessary or desirable, will be undertaken in accordance with the regulatory regime in place at the time.

At the end of their useful life, the wind turbines will be decommissioned, and all equipment will be dismantled and disposed of in a manner that meets all regulatory requirements. Such activities would likely involve the preparation of the site, e.g., the establishment of access for construction equipment and the mobilization of that equipment including cranes. The sections of the towers would be taken apart and would be reused, recycled or disposed of in accordance with regulatory requirements. After the towers

[1] The turbine pads will be approximately 10 m x 10 m. No blasting will be necessary for their installation.

had been dismantled and removed from the site, the site itself would be restored to a state similar to what currently exists through regrading and revegetation.

It is noted that the transportation of equipment with dimensions similar to the tower sections and blades of a large turbine is a rare occurrence in Nova Scotia. Consideration is being given to their transportation by road. Discussions are ongoing, but their transportation will necessitate careful planning and discussion with all pertinent authorities including the Nova Scotia Department of Transportation and Public Works, Transport Canada and the RCMP. The intent is to select a cost effective and efficient means of transportation and to work with all authorities to ensure safety for all involved including road users.

2.4 Project Schedule

SRWPL plans to construct and install the wind turbines in 2006 as depicted on Figure 2.2. The phased development would involve the preparation of the turbine pads and associated laydown areas. Subsequently, work would involve the construction of the three towers, the installation of the necessary cabling to connect these towers, and the installation of the necessary connections to the grid including the substation.

Construction is dependent on the receipt of the requisite approvals and authorizations. It is estimated that road construction, site clearing, turbine construction and connection into the NS Power grid can be completed within approximately two months.

2.5 Anticipated Emissions and Waste Discharges

The proposed wind farm will not generate air emissions, and anticipated discharges are limited to the waste oils that will be handled during the course of regular maintenance. These wastes will be managed and disposed of in accordance with all applicable regulations.

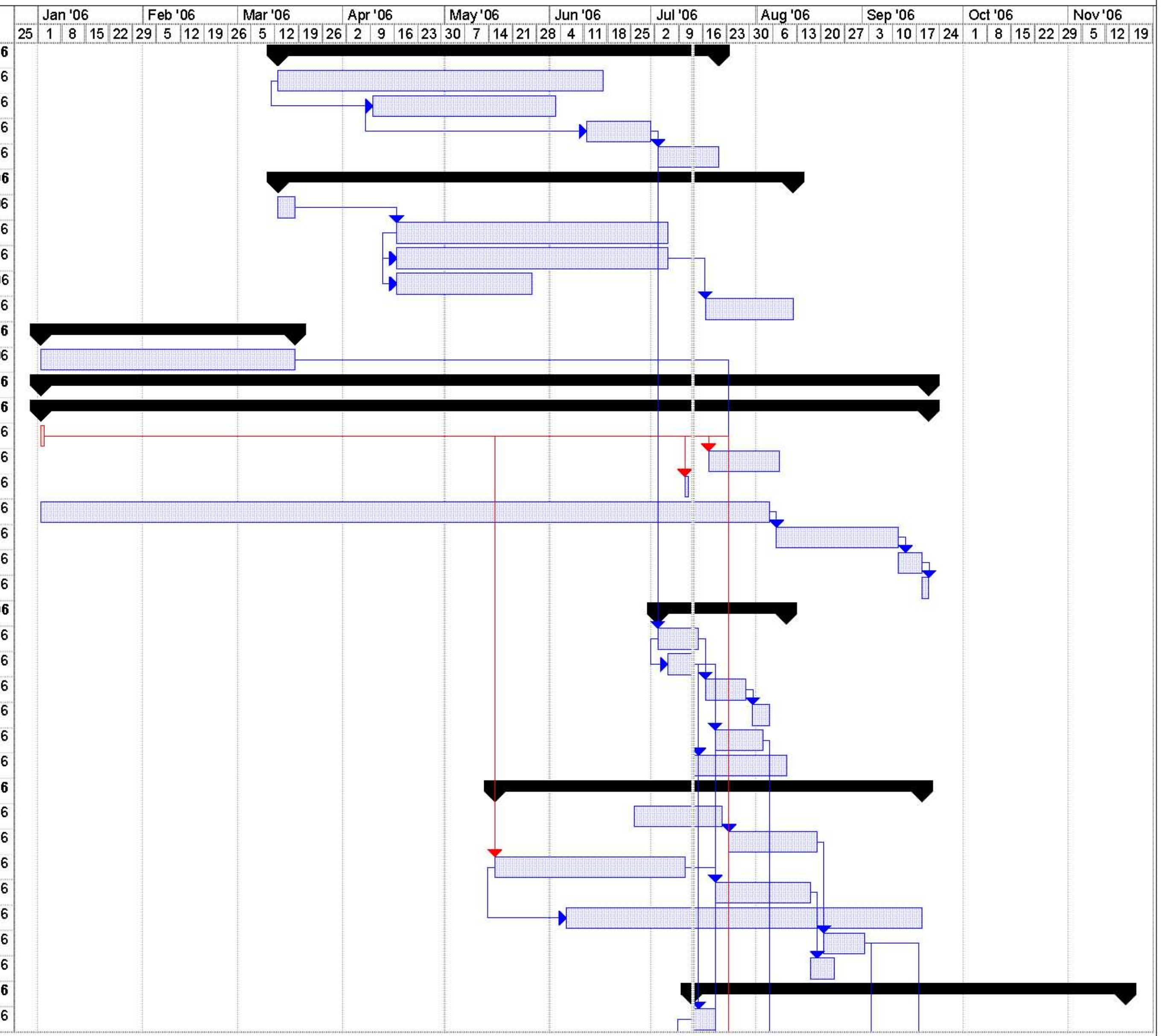
During the construction phase of the Project, control of silt-laden run-off may be an important issue. Erosion and sediment control measures will be stringently applied during the construction period and maintained until soils have been re-established through revegation, or other permanent means. Construction debris will be managed on site or at offsite disposal locations in an approved manner. Solid wastes will be recovered for reuse or recycling as required by provincial legislation.

A limited number of hazardous materials will be required for the construction and operation of the proposed turbines. Prior to commercial operation, an Environmental Management Plan will be developed and implemented to ensure that all staff working at the turbines are appropriately trained to handle, store and dispose of hazardous materials which may include one or more of the following:

- Corrosion and fouling inhibitors;
- Paints;
- Industrial cleaners; and
- Lubricating oils and fuels.

SRWPL HIGGINS MOUNTAIN
CONSTRUCITON SCHEDULE

ID		Task Name	Duration	Start	Finish
1		**Land Development**	**94 days**	**Mar 13 '06**	**Jul 20 '06**
2		Site Verification / Land owner consultation	70 days	Mar 13 '06	Jun 16 '06
3		Trigger options	40 days	Apr 10 '06	Jun 2 '06
4		Final Site Layout design	15 days	Jun 12 '06	Jun 30 '06
5		Finalize Leases	14 days	Jul 3 '06	Jul 20 '06
6		**Environmental Assessment and Permiting**	**110 days**	**Mar 13 '06**	**Aug 11 '06**
7		Define EA&P Scope of Work, Timetable	5 days	Mar 13 '06	Mar 17 '06
8		Desktop Studies / Field Investigations for SAR, MBA	58 days	Apr 17 '06	Jul 5 '06
9		Wetlands Research / Field Investigations	58 days	Apr 17 '06	Jul 5 '06
10		Historical and Archaeological DB Research	30 days	Apr 17 '06	May 26 '06
11		EIA Registration	20 days	Jul 17 '06	Aug 11 '06
12		**Grid Connection Studies and Technical Requirements**	**55 days**	**Jan 2 '06**	**Mar 17 '06**
13		Sytem Impact Study	55 days	Jan 2 '06	Mar 17 '06
14		**Engineering, Procurement, Management**	**188 days**	**Jan 2 '06**	**Sep 20 '06**
15		**Turbine and BOP Procurement**	**188 days**	**Jan 2 '06**	**Sep 20 '06**
16		Turbine Order	1 day	Jan 2 '06	Jan 2 '06
17		Anchor bolt fabrication	15 days	Jul 18 '06	Aug 7 '06
18		Order Metering and re-closers	1 day	Jul 11 '06	Jul 11 '06
19		Turbines Fabrication	155 days	Jan 2 '06	Aug 4 '06
20		Turbine Shipping	26 days	Aug 7 '06	Sep 11 '06
21		Customs Clearance	5 days	Sep 12 '06	Sep 18 '06
22		Turbines on site	2 days	Sep 19 '06	Sep 20 '06
23		**Civil Design**	**28 days**	**Jul 3 '06**	**Aug 9 '06**
24		Site Survey and Geotech investigation	10 days	Jul 3 '06	Jul 14 '06
25		Layout access roads/ crane pads	5 days	Jul 6 '06	Jul 12 '06
26		Foundation Design and Develop Tender Package	10 days	Jul 17 '06	Jul 28 '06
27		Foundaton Tender	5 days	Jul 31 '06	Aug 4 '06
28		Roads Tender	10 days	Jul 20 '06	Aug 2 '06
29		Provision of Cranage	20 days	Jul 13 '06	Aug 9 '06
30		**Electrical Design**	**90 days**	**May 16 '06**	**Sep 18 '06**
31		Define Requirements for SCADA and Communications	20 days	Jun 26 '06	Jul 21 '06
32		Detailed Design of Interconnection Facilities, Overhead lines	20 days	Jul 24 '06	Aug 18 '06
33		Prepare Equipment Specifications and Tender Packages	40 days	May 16 '06	Jul 10 '06
34		Tender Electrical Work	20 days	Jul 20 '06	Aug 16 '06
35		Delivery of Electrical Equipment	75 days	Jun 6 '06	Sep 18 '06
36		Survey for overhead lines	10 days	Aug 21 '06	Sep 1 '06
37		Evaluation and Award - Electrical	5 days	Aug 17 '06	Aug 23 '06
38		**Construction and Commissioning**	**92 days**	**Jul 13 '06**	**Nov 17 '06**
39		Road Build Permit (DOT)	5 days	Jul 13 '06	Jul 19 '06



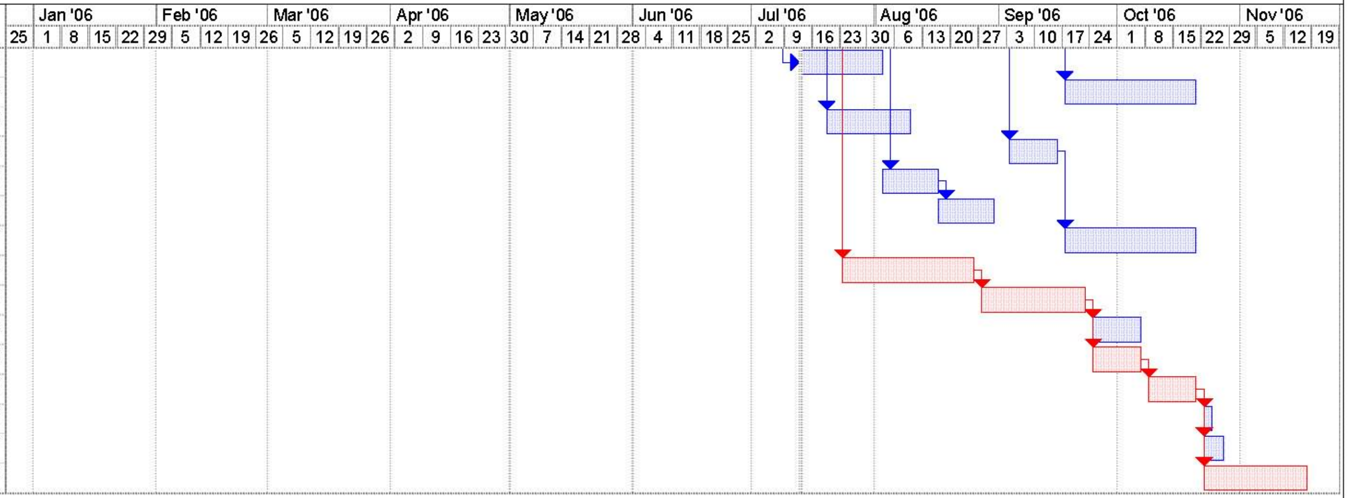
Date: Jul 13 '06

Task | Milestone | Rolled Up Critical Task | Split | Group By Summary
Critical Task | Summary | Rolled Up Milestone | External Tasks | Deadline
Progress | Rolled Up Task | Rolled Up Progress | Project Summary

Figure 2.2 Project Schedule

SRWPL HIGGINS MOUNTAIN
CONSTRUCITON SCHEDULE

ID	Task Name	Duration	Start	Finish
40	Construction Permit (Municipality)	15 days	Jul 13 '06	Aug 2 '06
41	Installation of Grid/Substation Upgrades	25 days	Sep 18 '06	Oct 20 '06
42	Clearing for Access Roads, WTGs	15 days	Jul 20 '06	Aug 9 '06
43	Clearing for overhead lines	10 days	Sep 4 '06	Sep 15 '06
44	Construction of Access Roads, Pads	10 days	Aug 3 '06	Aug 16 '06
45	Installation of Collector Lines	10 days	Aug 17 '06	Aug 30 '06
46	Installation of Overhead Lines	25 days	Sep 18 '06	Oct 20 '06
47	Delivery of Embeded Anchor rings	25 days	Jul 24 '06	Aug 25 '06
48	Turbine Foundations incl. transformer pads	20 days	Aug 28 '06	Sep 22 '06
49	Rotor Assembly	10 days	Sep 25 '06	Oct 6 '06
50	Foundation Curing	10 days	Sep 25 '06	Oct 6 '06
51	Turbine Erection	10 days	Oct 9 '06	Oct 20 '06
52	Installation of Aeronautical Obstruction Lighting	2 days	Oct 23 '06	Oct 24 '06
53	Installation of Control, Communication Systems	5 days	Oct 23 '06	Oct 27 '06
54	Commissioning	20 days	Oct 23 '06	Nov 17 '06



Date: Jul 13 '06

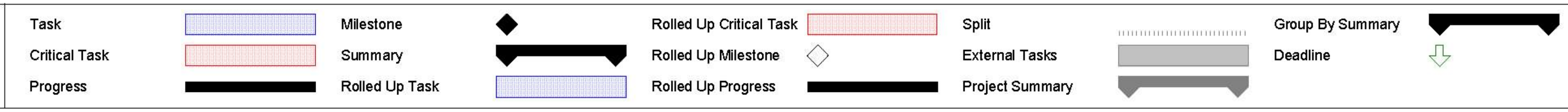


Figure 2.2 Project Schedule

All hazardous materials will be stored and handled according to all relevant federal and provincial regulations. Staff will receive the required training specified by law.

2.6 Malfunctions and Accidents

SRWPL is aware that malfunctions and accidents that pose a risk to human health and safety and to the environment can occur and are committed to ensuring that all requisite protocols are established to:

i) Minimize the risk to human health and safety during both construction and operation; and
ii) Minimize the risk to the environment during both construction and operation.

These protocols will include the formulation of a site specific Environmental Protection Plan to ensure the application of environmental protection measures and good engineering practices through construction; and the preparation of an emergency response plan to address responses in the unlikely event of an accident during either construction or operation.

The construction and operation of wind turbines, though the handling of these large structural elements, although relatively new to this region, employs techniques and technologies that are familiar to the construction industry. The likelihood of serious malfunctions or accidents associated with their development and operation that would pose a risk to human health and safety, or the environment, are substantially less than those associated with many alternative forms of power generation.

Chapter 3 Environmental Setting

3.1 Regional Environmental Context

The project site is located on the west side of Higgins Mountain some 2-3 km south of Westchester in Cumberland County. The site is at an elevation of approximately 300 ft, is a minimum of 1 km distant from any residence or settlement and is located in the Cobequid Hills (Theme Region 311) according to the *Natural History of Nova Scotia* (Davis, and Browne, 1996).

As depicted on Figure 3.1, the Cobequid Hills are characterized by deeply incised valleys and fast flowing streams. To the west of the turbine sites, for example, the Roaring River flows northwards into the Wallace River. To the east a number of smaller, even more deeply incised valleys fall towards the Wentworth Valley. Harts Brook is a tributary of the Roaring River and is the only water course in proximity to the turbines; it is discussed further in Section 3.4.2 below.

The geology of the area is dominated by metamorphosed sediments, granites and volcanic deposits. The soils are stony, usually shallow and are comprised of acidic, gravely sandy loams. These well drained loams are an excellent forest soil, providing a porous, but solid rooting medium. Significant areas of Wyvern soils in the area were used by the early settlers, who cleared the land, but many properties have been abandoned and significant areas are reverting to forest; much of the balance of the land in the vicinity of the turbine locations is being used for blueberry production.

The plateau of the Cobequids supports a forest of Sugar Maple, Yellow Birch and American Beech interlaced on the shallow soils with Balsam Fir and Red and Black Spruce. The poorly drained depressions support Balsam Fir and Black Spruce. Eastern Hemlock is common in the ravines. White Spruce, Red Spruce and Balsam Fir form mixed woods with Sugar Maple, Yellow Birch and Red Maple growing on the upper slopes. These associations shift toward softwood forests of Black Spruce, White Spruce and White Pine lower down in the valleys. Exposure to wind affects some portion of the forest; Red Spruce and Yellow Birch in particular are susceptible and may be stunted.

The Cobequid Hills provide habitat for a wide range of fauna, flora and avian species. Fauna include deer, black bear, moose, fox, bobcats and coyotes. Though the black bears in particular are attracted to the blueberry fields in the vicinity of the study sites (pers. comm.., Kim George, DNR), none of these mammals are restricted to lands in the immediate vicinity of the proposed turbine locations. In winter, for example, the accumulation of snow and the open nature of the deciduous forest, force the deer to migrate off the Cobequid Hills to the south-facing slopes; they return in May to the mature hardwood habitats to feed on spring flowers. The area also supports a moose population, which uses the softwood forest on the poorly drained soils for winter cover.

Animals and plants characteristic of fertile wetlands are not abundant in this Region due to the nature of the steep water courses and the small, relatively unproductive, headwater ponds and bogs. Low energy drainage systems on the crest are inhabited by beaver, but limited food and the harsh climate limit their populations. Bobcats and coyotes hunt the lowlands for snow shoe hare.

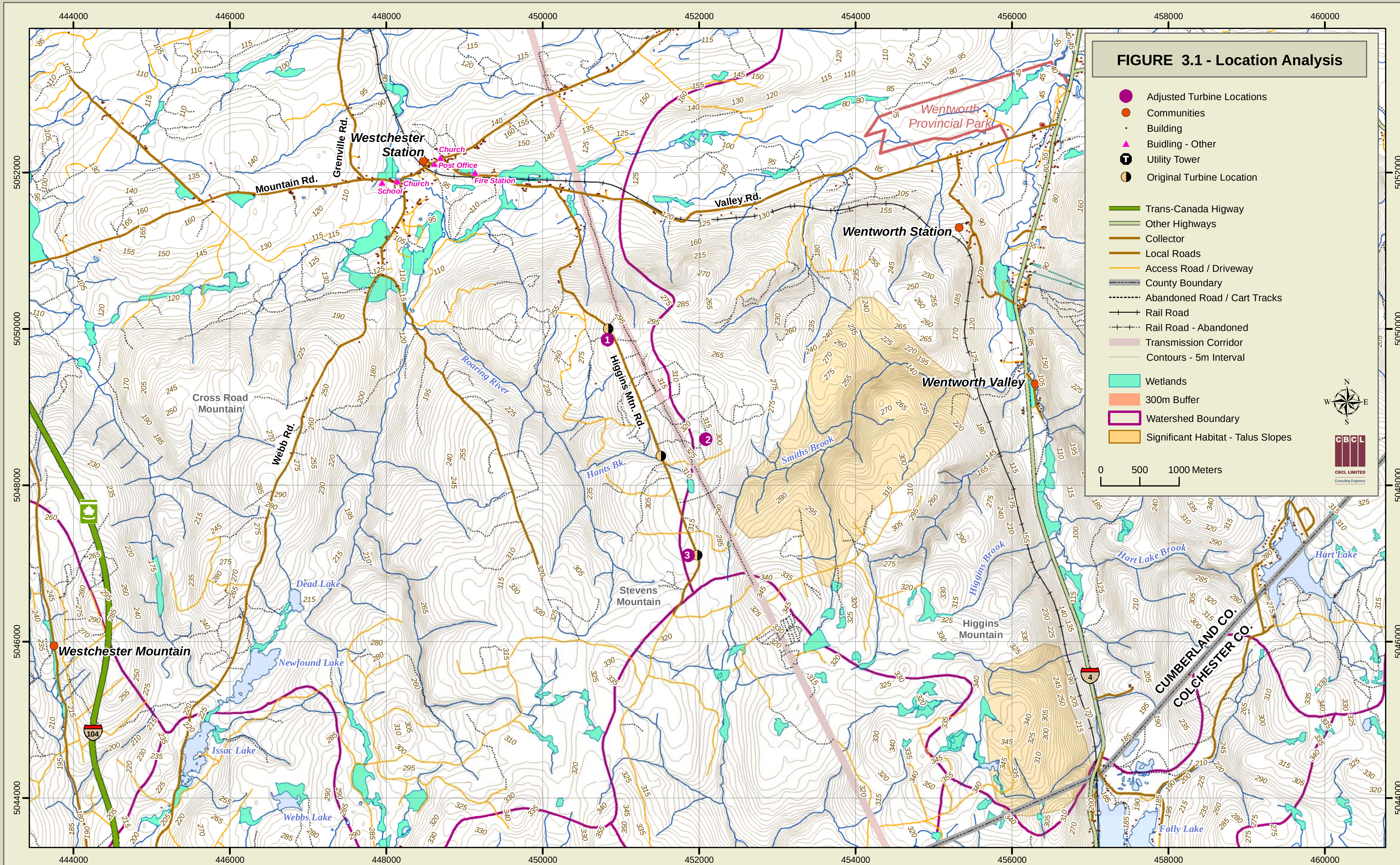


FIGURE 3.1 - Location Analysis
Adjusted Turbine Locations
Communities
Building
Buidling - Other
Utility Tower
Original Turbine Location
Trans-Canada Higway
Other Highways
Collector
Local Roads
Access Road / Driveway
County Boundary
Abandoned Road / Cart Tracks
Rail Road
Rail Road - Abandoned
Transmission Corridor
Contours - 5m Interval
Wetlands
300m Buffer
Watershed Boundary
Significant Habitat - Talus Slopes
0 500 1000 Meters
N
S
E
W
CBCL LIMITED
Consulting Engineers
Westchester Station
Church
Post Office
Fire Station
School
Grenville Rd.
Mountain Rd.
Valley Rd.
Wentworth Provincial Park
Wentworth Station
Wentworth Valley
Cross Road Mountain
Webb Rd.
Higgins Mtn. Rd.
Roaring River
Hants Bk.
Smiths Brook
Stevens Mountain
Higgins Mountain
Higgins Brook
Hart Lake Brook
Hart Lake
Dead Lake
Newfound Lake
Issac Lake
Webbs Lake
Folly Lake
Westchester Mountain
CUMBERLAND CO.
COLCHESTER CO.
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5044000
Projection : NAD83 UTM Zone 20; Source: Service Nova Scotia & Municipal Relations - 1:10 000 Series Data
September 25, 2006; Base_25k.mxd

The Maple and Yellow Birch forests that characterize the area provide excellent habitat for those animals dependant on tree cavities and fallen logs. The Eastern Redback Salamander, for example, is commonly found in these hardwood forests.

The lack of active farmland means that the area does not accommodate a large variety or numbers of open country birds, and the predominantly hardwood forest may restrict the number and variety of softwood forest bird species. The Great Horned Owl is known to nest in the soft and hard wood forests of the slopes below Higgins Mountain Road. Goshawks, Red-tailed Hawks and Barred Owl also nest in the region. In the hardwoods during winter, bird life is relatively sparse though there have been sightings of the Common Raven, the Pileated Woodpecker and Ruffed Grouse. Grey Jay and chickadees occur in the softwoods.

In the watercourses of the region, Brook Trout are the predominate fish species, but Brown Trout and Atlantic Salmon are also found in some of the small headwater streams (Davis and Browne, 1996. *Natural History of Nova Scotia*).

3.2 Species at Risk

In May 2006 an environmental screening of rare biota, either known, or which may be located within the Higgins area, was conducted. All applicable lists were reviewed; these lists include:

- the list compiled by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) under the *Species at Risk Act (SARA)*;
- the list compiled pursuant to the *Nova Scotia Endangered Species Act (NSESA)*;
- the Nova Scotia Department of Natural Resources General Status of Wild Species List (NSDNR General Status); and
- the Atlantic Canada Conservation Data Centre (ACCDC) guidance list.

Species were screened based on their geographic occurrence and their habitat type relative to the project site. The results of the desktop review are provided in Appendix A. The following paragraphs provide a brief overview of the results.

i) Mammals

Based on the desktop screening, four mammal species of concern were identified as either having been seen in the area, or because they frequent habitat similar to that found in the general study area. These mammal species are identified in Table 3.1.

Table 3-1: Mammal Species of Concern

• Fisher (DNR – yellow)	• Hoary Bat (DNR – yellow)
• Red Bat (DNR – yellow)	• Silver-haired Bat (DNR – yellow)

Fisher

In Nova Scotia fishers are known to inhabit territory in Cumberland, Colchester and Pictou Counties. Usually solitary, secretive mammals they spend most of their time on or near the ground, but prefer treed habitat with high canopy closure. It is likely that there are fishers in the hills and valleys around the proposed WTG sites, but they have not been seen in the execution of any of the field programs. They occupy a large home range, often about 16 km in diameter, and tend to avoid contact with humans.

Bats

Bats are of concern because they may be killed by the rotating turbine blades. The literature suggests that the bats most likely to succumb are solitary, tree-roosting species including the species identified in Table 3.1. As indicated by the review of the bat literature conducted by AMEC for the Canso Wind Farm (AMEC, 2006), the risk to migrating or dispersing (summer colonies) bats is greater than to resident, breeding, commuting or foraging bats. Bats generally forage from 1 m above ground level to tree top level, i.e., up to 10 m above ground level, and seldom above 25 m. Since this is below the height of the blades on the VENSYS 62, few moralities associated with feeding bats would be expected. In contrast migrating bats tend to fly at greater heights, i.e., between 46-100 m, and may fly into the turbine blades.

There are occurrence records for seven species of bats in Nova Scotia, i.e., the hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), eastern red bat (*Lasiurus borealis*), and big brown bat (*Eptesicus fuscus*), with smaller numbers of eastern pipistrelles (*Pipistrellus subflavus*), northern long-eared (*Myotis septentrionalis*) and little brown bat (*Myotis lucifugus*). Nova Scotia is at, or above, the northern extent of the current known range for each of these species, with the exceptions of the northern long-eared and the little brown bat (van Zyll de Jong, 1985). These two species, as well as the eastern pipistrelle are the only bat species with significant populations in Nova Scotia (Broders, et. al., 2003).

The eastern pipistrelle is a non-migratory bat species found throughout the eastern forests of North America (Fujita & Kunz, 1984; Veilleux, et. al., 2003). In 2001, Broders (2003) discovered a concentration of eastern pipistrelles at Kejimkujik National Park. Subsequent ultrasonic monitoring throughout mainland Nova Scotia confirmed the presence of a significant population of this species in the province, yet indicated restriction of the population to southwest Nova Scotia in the summer (Rockwell, 2005). This species occurs in very low numbers in southern coastal New Brunswick (Broders, et. al., 2001), suggesting that the Nova Scotia population of eastern pipistrelles may be a disjunct population. Given this restriction, it may only be locally abundant in southwest Nova Scotia (Broders, et. al., 2003).

Only the northern long-eared and little brown bat are common in southern New Brunswick (Broders, et. al., 2003) and they both have distributional ranges that extend beyond Nova Scotia (Grindal, 1999; van Zyll de Jong, 1985). They are therefore likely ubiquitous throughout the province (Broders, et. al., 2003). The northern long-eared bat is a forest interior species (Broders, et. al., 2003; Jung, et. al., 2004; LaVal, et. al., 1977), while the little brown bats is more of a generalist species, associated with forests, as well as human-dominated environments (Barclay, 1982; Jung, et. al., 1999). Both of these species have been documented at a number of hibernacula sites located throughout central Nova Scotia, including an abandoned mine shaft in close proximity to Londonderry, Nova Scotia (Tutty, 2006).

The hoary bat, silver-haired bat, eastern red bat, and big brown bat are all migratory species with extensive distributional ranges, found throughout North American (van Zyll de Jong, 1985). Historically, there have been few occurrence records for these species in Nova Scotia, though several reports of these species flying ashore in Massachusetts and aboard ships off the coast of Nova Scotia in the fall, suggest the possibility of a migratory movement across the Gulf of Maine (Broders, et. al., 2003). In 2001, Broders (2003) recorded greater than 30,000 echolocation sequences from May to September at Kejimkujik National Park and points further southwest, yet fewer than 15 of these, all in September, were attributed to any of the migratory species. Therefore, it was suggested that there are no significant migratory movements of these species through Nova Scotia.

Based on his experience and knowledge of bats, Broders anticipates the following results from his work on site:

- It is expected that the majority of bat passes recorded will be attributable to Myotis species;
- The majority of the myotis passes recorded will likely represent the little brown bat for at least two reasons:
  - i) The northern long-eared bat has low intensity calls and is thus not recorded as well as the little brown bat; and
  - ii) The northern long-eared bat is a recognized forest interior species and is less likely to use open areas for foraging and commuting;
- The eastern pipistrelle is likely only locally abundant in southwest Nova Scotia (Broders, et. al., 2003) and is therefore not expected to be well represented in the study area, unless they hibernate in the area and are detected en route; and
- Given that there are likely no significant movements of migratory bat species (hoary, red, silver-haired or big brown bats) through Nova Scotia (Broders, et. al., 2003), it is expected that few, if any, bat passes attributable to these migratory species will be recorded.

ii) **Birds**

As depicted in Table 3.2, 14 species of listed birds were identified as having been seen, or as having the potential because of their preferred habitat, to be seen in the study area. The species of greatest concern in the region is the Peregrine Falcon which is listed by COSEWIC and NS ESA as Threatened, i.e., facing imminent extirpation or extinction. The Peregrine Falcon is the only bird species listed under the NS DNR General Status list for this area as a RED species; ACCDC does not provide a listing for the falcon in this area.

Table 3-2: Bird Species of Concern

• Boreal Chickadee (ACCDC-S3S4) • Vesper Sparrow (ACCDC-S2S3B, DNR-yellow) • Brant (DNR-yellow) • Semipalmated Sandpiper (DNR-yellow) • Short-eared Owl (DNR-yellow) • Eastern Bluebird (DNR-yellow) • Bobolink (ACCDC S3B, DNR-yellow)	• Peregrine Falcon (COSEWIC and NSESA-Threatened, DNR-red) • Black-crowned Night Heron (DNR-yellow) • Northern Goshawk (DNR-yellow) • Long-eared Owl (DNR-yellow) • Purple Martin (DNR-yellow) • Ipswich Sparrow (DNR-yellow) • Common Tern (DNR-yellow)

iii) **Invertebrates, Amphibians, Reptiles and Fish**

Eight amphibians, five freshwater mussels, three fish and one reptile of concern were identified as being either known to the area or found in habitat similar to that in the project area. These species are presented in Appendix B; only the Monarch Butterfly and the Wood Turtle are listed under the federal COSEWIC list as being of Special Concern. Three of the five freshwater mussels, the Squawfoot, the Rusty Snaketail and the Brook Snaketail, are listed under the DNR General Status list as being RED species. Since the development and operation of the WTGs will not impact any bodies of freshwater, these species will not be impacted. ACCDC lists only the Wood Turtle as being of concern in the area.

The wood turtle lives along permanent streams during the greater part of the year, but in summer may roam and can be found in a variety of terrestrial habitats including deciduous woods, cultivated field and woodland bogs. Although not seen on or in the vicinity of the footprints for the WTGs, the wood turtle is likely present in the general area. Similarly, the four invertebrates that are to be found in habitat characteristic of the area, i.e., the Early Hairstreak, the Hoary Comma, the Greenstripped Darner and the Satyr Anglewing, are likely to be located in the area.

iv) **Plants**

Based on the desktop screening, 24 plant species of concern have been identified as being either known to occur in the area, or as having the potential to be found in habitat similar to that found in the general study area. These are identified in Table 3.3.

Table 3-3: Plant Species of Concern

• Northern Bedstraw (ACCDC-S2) • Stout Wood Reed Grass (DNR-red) • Northern White Cedar (DNR-red) • Northern Maidenhair Fern (DNR-red) • Lance-leaf Grape Fern (DNR-yellow) • Purple False Oats (DNR-yellow) • Halbred-leaf Tearthumb (DNR-yellow) • Small-flower Bitter Cress (DNR-yellow) • Pennsylvania Blackberry (DNR-yellow) • Short-awn Foxtail (DNR-yellow) • Northern Comandra (DNR-yellow) • Field Milkwort (DNR-yellow)	• Elk Sedge (DNR-red) • Blue Cohosh (DNR-red) • Nodding Fescue (DNR-red) • Proliferous Red Fescue (DNR-yellow) • River Anemone (DNR-yellow) • Yellow-seed False Pimpernel (DNR-yellow) • Acadian Quillwort (DNR-yellow) • Marsh Bellflower (DNR-yellow) • Wood Nettle (DNR-yellow) • Drummond Rockcress (DNR-yellow) • Yellow Canada Lily (DNR-yellow) • Ebony Sedge (DNR-yellow)

None of the plant species shown in Table 3.3 are identified on the COSEWIC or the DNR NS Wild Species lists. Of those species identified by ACCDC, only the Northern Bedstraw has been identified in the vicinity of Higgins. The following sections detail the field investigations undertaken.

3.3 Field Investigations

3.3.1 Ecological Reconnaissance and Investigation for Priority Species Plant

As detailed in Section 1.8.1, environmental personnel from CBCL Limited visited the study area and the proposed wind turbine locations off Higgins Mountain Road in May and July to conduct ecological reconnaissance and an investigation for priority species of plant. The landscape in the immediate area is gently rolling, with a vegetation cover of commercial blueberry fields and mixed forest. All sites were easily assessable from the Higgins Mountain Road. The three sites are all located in an upland forest habitat, with the main forest association being Sugar Maple, Beech, White Birch, Spruce and Balsam Fir. The lesser tree species include Mountain Ash, Yellow Birch and Red Maple.

In the third week of July a second visit was made to each of the turbine locations, including the relocated site for Turbine #2, with the express purpose of conducting a survey for priority plant species. Of the priority species of plants listed and suited to the habitat at Higgins, only the Northern Bedstraw is listed on the ACCDC list as being known to the area. The Northern Bedstraw (*Galium boreale*) is listed as S2 by the ACCDC, i.e., it is rare throughout its range within the province. DNR lists the plant as "Undetermined", meaning that there is little or insufficient data available to reliably evaluate its status. The plant is typical of semi-shaded woodlands, to rich deciduous forests, edges of fields, meadows, rocky slopes and streamsides, moraine, scree, shingle, and stable dunes. While the reference provided by the ACCDC for this bedstraw refers to a sighting found in a dry-unforested field, all three turbines lie within forest habitat. Although this habitat may also be suitable for this bedstraw, no specimens were found.

No plant species of concern were observed, but the plant species at each location were identified; these are listed in the following subsections for each turbine location. The roadside plant species are listed on Table 3.4.

Table 3-4: Roadside Plant Species

Pearly Everlasting	*Anaphalis margaritacea*
Rough-stemmed Goldenrod	*Solidago rugosa*
Narrow-leaved Goldenrod	*Solidago graminifolia*
Meadow sweet	*Spirea latifolia*
White Birch	*Betula papyrifera*
Grey Birch	*Betula populifolia*
Strawberry	*Fragaria virginiana*
Red Raspberry	*Rubus idaeus*
Yarrow	*Achillea millefolium*
Serviceberry	*Amelanchier laevis*
Spruce	*Picea spp*.

3.3.1.1 TURBINE #1 (GPS 20T 0450882, UTM 5050026)

The initial location for Turbine #1 was at the northwest corner of a blueberry field adjacent to and on the west side of Higgins Road (see Figure 1.3). The forest composition to the west of the field consists of maple, Yellow Birch, White Birch and spruce with an understorey of Balsam Fir. Where the canopy is open, the ground cover includes the upland species lycopodium, blueberry, Trout Lily, Twinflower and Cinnamon Fern. Mountain Ash was also present. The area was well drained, dry and not adjacent to any water course or wetland.

Since the initial field investigation, the location of Turbine #1 has been adjusted to a location less than 100 m to the south west of the original location; the adjusted turbine location is characterized by a mixed young maple forest. The plant species identified at the WTG site are listed in Table 3.5.

Table 3-5: Turbine #1 Site – Young Maple Forest - Mixed

Sugar Maple	*Acer saccharum*
White Birch	*Betula papyrifera*
American Beech	*Fagus grandifolia*
Balsam Fir	*Abies balsamea*
Mountain Maple	*Acer spicatum*
Mountain Ash	*Sorbus americana*
Spreading Dogbane	*Apocynum androsaemifolium*
Wild Sarsaparilla	*Aralia nudicaulis*
Bristly Club-moss	*Lycopodium annotinum*
Tree Club-moss	*Lycopodium obscurum*
Wild Lily of the Valley	*Maianthemum canadense*
Hay-scented Fern	*Dennstaedtia punctilobula*
White Twisted Stalk	*Streptopus amplexifolius*
Wood Aster	*Aster acuminatus*
Lion's-paw	*Prenanthes trifoliolata*
Common Speedwell	*Veronica officinalis*
Small White Violet	*Viola macloskeyi*
Smooth Blackberry	*Rubus Canadensis*

3.3.1.2 Turbine #2 (GPS 20T 0451405, UTM 5048462)

Turbine #2 was originally located in a blueberry field, close to Harts Brook, a tributary of the Roaring River. This site was dry, well drained and consisted entirely of commercial blueberry fields. The site had a greater gradient than that at the location of Turbine #1 and sloped toward the tributary. There was some concern that due to its proximity to Harts Brook, any runoff resulting from the construction process might adversely affect the watercourse, which has a narrow, remnant corridor of native trees including beech, maple and Balsam Fir. Higgins Road also crosses this tributary in proximity to this site and any upgrading that might have been required to the road to facilitate turbine construction could have required alterations to the stream, or to the existing culvert. As a result of these field investigations, Turbine #2 was relocated to a site approximately 500 m to the east of its original location; it is now set back from Higgins Road, further upgradient, within the forested area, and well removed from Harts Brook (see Figure 1.3). Habitat at the new location can be characterized as a mixed Balsam Fir Forest. The plant species identified at this WTG site are listed in Table 3.6.

Table 3-6: Turbine #2 Site - Balsam Fir Forest - Mixed

Balsam Fir	*Abies balsamea*
American Beech	*Fagus grandifolia*
White Birch	*Betula papyrifera*
Spruce	*Picea spp.*
Sugar Maple	*Acer saccharum*
Spreading Dogbane	*Apocynum androsaemifolium*
Wild Sarsaparilla	*Aralia nudicaulis*

Tree Club-moss	*Lycopodium obscurum*
Hay-scented Fern	*Dennstaedtia punctilobula*
Wood Aster	*Aster acuminatus*
Small White Violet	*Viola macloskeyi*
Smooth Blackberry	*Rubus Canadensis*
Red-berried Elder	*Sambucus racemosa*
Snakeberry	*Clintonia borealis*
Indian Pipe	*Monotropa uniflora*
Yellow Wood Sorrel	*Oxalis stricta*
Tall White Aster	*Aster umbellatus*
Rough-stemmed Goldenrod	*Solidago rugosa*
Yellow Birch	*Betula alleghaniensis*

3.3.1.3 Turbine #3 (GPS 20T 0451943, UTM 5047188)

Turbine #3 is in a wooded area on the east side of Higgins Road. An overgrown track or logging road provides access to the site. The vegetation in the area consists of a Balsam Fir forest with Black Spruce and White Birch. Sphagnum moss is dominant on the forest floor. The vegetation on the west side of Higgins Road similarly consists of young Balsam Fir and birch, suggesting it was cut within the last 10 to 15 years. Evidence of deer in the area was observed.

Since the field investigation, the location of Turbine Three has been adjusted approximately 50 m to the west of its original location; the habitat in the new location is similar to that of the original location and can be characterized as a balsam fir forest. The plant species identified at this location are listed in Table 3.7 (see Figure 1.3).

Table 3-7: Turbine #3 Site - Balsam Fir Forest

Balsam Fir	*Abies balsamea*
White Birch	*Betula papyrifera*
Red Maple	*Acer rubrum*
American Beech	*Fagus grandifolia*
Mountain Maple	*Acer spicatum*
Mountain Ash	*Sorbus americana*
Spreading Dogbane	*Apocynum androsaemifolium*
Wild Sarsaparilla	*Aralia nudicaulis*
Bristly Club-moss	*Lycopodium annotinum*
Tree Club-moss	*Lycopodium obscurum*
Wild Lily of the Valley	*Maianthemum canadense*
Hay-scented Fern	*Dennstaedtia punctilobula*
Yellow Wood Sorrel	*Oxalis stricta*
Wood Aster	*Aster acuminatus*
Smooth Blackberry	*Rubus Canadensis*
Blueflag Iris	*Iris versicolor*
Soft Rush	*Juncus effuses or J. pylaei*

Star Flower	*Trentalis borealis*
Lowbush Blueberry	*Vaccinium angustifolium*
Bunchberry	*Cornus Canadensis*
Indian Pipe	*Monotropa uniflora*

3.3.2 Bird Survey

3.3.2.1 Breeding Bird Survey

The species encountered during the field surveys are listed in Table 3.8. Except for Vesper Sparrow, all are species common to suitable habitat throughout the province. Although the Bicknell's Thrush (status: Special Concern) has been reported as possibly breeding in the area (Erskine, 1992), none were encountered, despite the use of playback in suitable habitat (patches of dense young conifers). Similarly, no Blackpoll Warblers, a species with similar habitat requirements, were found. Philadelphia Vireos were not found, despite song playback in suitable habitat. There is no suitable nesting habitat in this region for other uncommon songbird species such as the Purple Martin, Bobolink, Wood Thrush and Eastern Meadowlark.

Table 3.8 provides detail of main habitat, the breeding evidence code and the maximum number of singing males, i.e., pairs or territories detected on any of the survey dates; O indicates that the species was found during observations but outside of formal point counts.

Table 3-8: Bird Species Found During the Survey

Species	***Habitat***	***Breeding Evidence***	***Maximum***
Sharp-shinned Hawk	Field	H	0
Red-tailed Hawk	Field, forest edge	P	0
Spruce Grouse	Mixed forest	FY	0
Ruffed Grouse	“	T	0
Ruby-throated Hummingbird	“	H	0
Woodpecker sp. (heard drumming)	“	T	3
Northern Flicker	“	T	3
Pileated Woodpecker	Mature deciduous	H	0
Yellow-bellied Sapsucker	“	H	1
Swainson's Thrush	Mixed forest	T	1
Hermit Thrush	“	T	4
American Robin	“	CF	12
Blue-headed Vireo	“	T	2
Red-eyed Vireo	Young deciduous	T	1
Blue Jay	All habitats	T	0
American Crow	“	FY	1
Common Raven	“	FY	0
Black-capped Chickadee	Mixed forest	FY	2
Boreal Chickadee	Spruce forest	T	3
Red-breasted Nuthatch	Mixed forest	T	0

Species	*Habitat*	*Breeding Evidence*	*Maximum*
Brown Creeper	"	T	0
Winter Wren	"	T	3
Gray Catbird	Forest edge	H	1
Ruby-crowned Kinglet	Mixed forest	T	11
Nashville Warbler	Young deciduous	T	2
Magnolia Warbler	Mixed forest	CF	15
Yellow-rumped Warbler	"	T	1
Black-throated Green Warbler	"	CF	18
Palm Warbler	Mixed forest (wet)	T	1
Black and White Warbler	Mixed forest	CF	4
American Redstart	Young deciduous	T	4
Ovenbird	Mature deciduous	T	3
Common Yellowthroat	Forest edge	T	4
Vesper Sparrow	Field	NY	2
Savannah Sparrow	"	NY	3
Song Sparrow	Forest edge	NY	2
Lincoln's Sparrow	Mixed forest (wet)	T	0
Swamp Sparrow	Wet scrub	T	3
White-throated Sparrow	Mixed forest	CF	14
Dark-eyed Junco	"	CF	4
Evening Grosbeak	"	H	0
Purple Finch	"	T	4
American Goldfinch	Forest edge	T	1
Pine Siskin	Mixed forest	T	1

Notes: H Species observed in its breeding season in suitable nesting habitat
P Pair observed in their breeding season in suitable nesting habitat
T Permanent territory presumed through registration of territorial song on at least 2

3.3.2.2 Raptor Habitat Use

There are no open cliffs suitable for nesting Peregrine Falcons on the north face of the Cobequid Hills, between Sugarloaf Mountain and the Wentworth Valley. No raptor nests were found in the search area. It is acknowledged, however, that depending on breeding stage, these can be easy to miss.

Along the study corridor, the raptors that were seen included the Sharp-shinned Hawk, the American Kestrel and the Red-tailed Hawk. These sightings are mapped on Figure 3.2. During the April visit, raptors sightings were concentrated over the north slope; in the later visits, they were concentrated along the forest edges and over the blueberry fields.

3.4 Significant Habitat

3.4.1 Talus Slopes

According to the Nova Scotia Department of Natural Resources' Significant Habitat Database, there is significant "other habitat" within approximately 800 m of Turbines #2 and #3 and within approximately 2 km of Turbine #1. In conversation with the Provincial Regional Wildlife Biologist this habitat is described as "Talus Slopes". These slopes provide important habitat for several mammal and plant species of concern. There are, however, no talus slopes in proximity to the proposed turbine sites.

3.4.2 Harts Brook and the Roaring River

The characteristics of Harts Brook were documented while on site. The culvert at Higgins Road is 0.9 m in diameter, with an invert elevation of 0.7 m above the stream, impeding any potential for fish passage. The stream in this location is 2.4 m wide. The substrate consists of boulders, cobbles and sorted gravels with some fines. Stream biology included algae on the rocks, water striders, caddisfly and blackfly larva. The water was clear, and some shade was provided by overhanging branches. Plant species in the riparian corridor adjacent to the stream included goldenrod, spirea, sphagnum moss, and sedges. As mentioned above, there was some concern that construction of Turbine #2 in its original location could have adversely impacted Harts Brook. With the relocation of Turbine #2, any risk of adverse consequences to Harts Brook has been addressed.

In-situ sampling for pH, conductivity and temperature was conducted at Harts Brook (GPS Coordinates 20T 0451157, UTM 5049317) on May 12, 2006 to provide a preliminary baseline for the stream prior to any project related construction. A water sample was collected for general chemistry. The location of the sampling was at the downward end of the culvert where the stream passes under Higgins Mountain Road and was selected because of its proximity to the original location for Turbine No. 2. While the water was clear and there was some shade provided by overhanging branches, water temperature was recorded at 21 degrees Celsius conductivity was 6.54 microhms and pH was 7.1. The results are attached in Appendix D.

Roaring River

In-situ sampling for pH, conductivity, and temperature was conducted at Roaring River (GPS Coordinates 20T 0448461, UTM 5049946) on May 12, 2006 to provide a preliminary baseline for the river prior to any project related construction upstream. The location is immediately adjacent to the road. Field parameters were measured and recorded to have a temperature of 12 degrees celcius, conductivity of 31.5 microhms and a pH of 7.75. A water sample taken at this site for general chemistry analysis show the pH to be 6.27 and the conductivity to be 26, again questioning the field equipment.

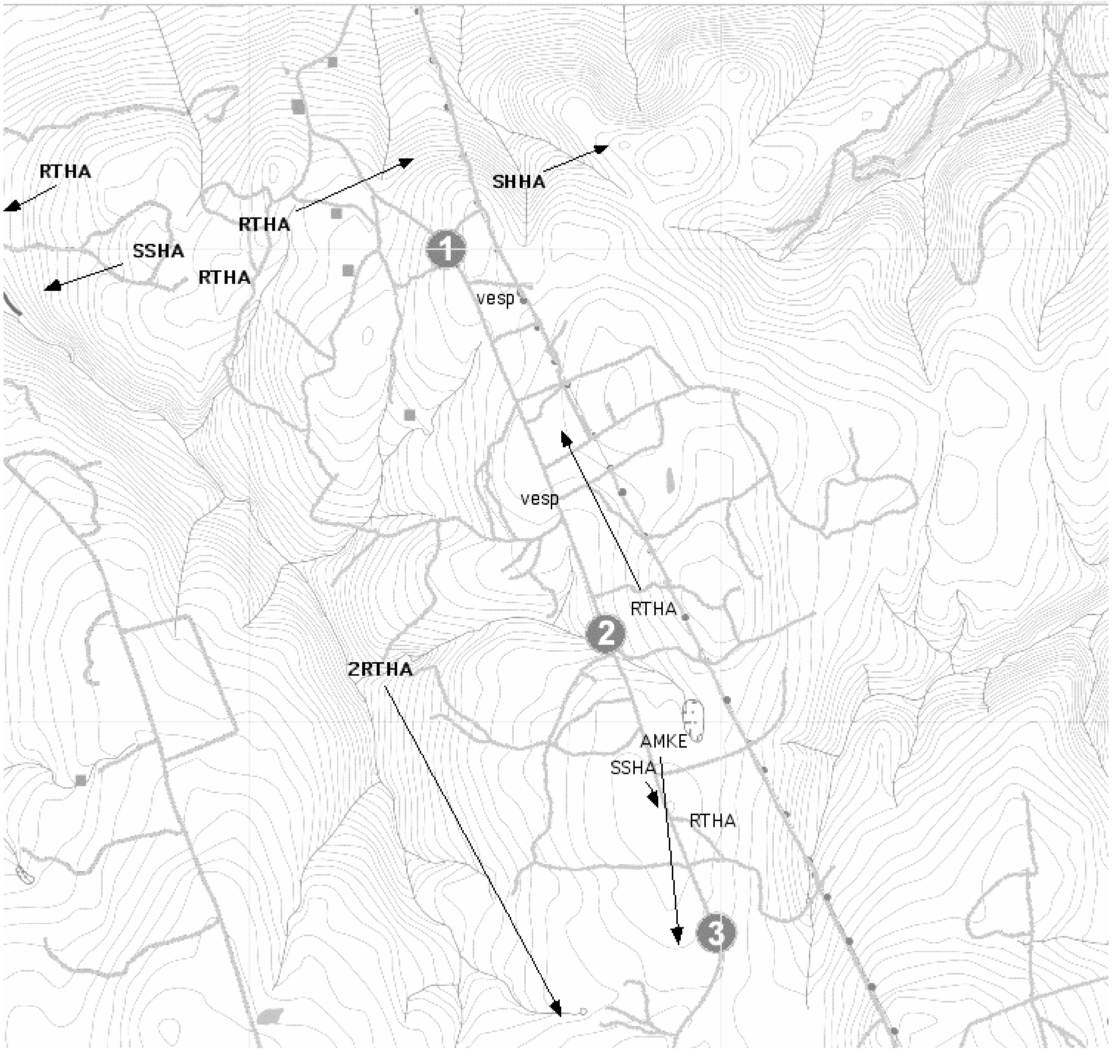

Figure 3.2 Locations of Vesper Sparrow Songposts (vesp) and Raptor Sightings

Notes:
Surveys undertaken in April are depicted in bold, May (plain SSHA) and June (others), with approximate path to point last seen. The numbers represent proposed turbine locations. All May raptor sightings and the northernmost June RTHA were soaring, gliding or in powered flight (eastmost SSHA only) >20 m above treetops. All later birds were foraging at or within 20 m of treetop height (although northmost RTHA increased altitude to > 100 m).
SSHA=Sharp-shinned Hawk;
RTHA=Red-tailed Hawk;
AMKE= American Kestrel.

The characteristics of the Roaring River were noted due to the possibility of potential impacts to its tributary, Harts Brook, as discussed above. A water sample was collected on May 12, 2006 at location GPS 20T 0448461, UTM 5049946; the sample results are presented in Appendix D. At this location, the Roaring River is approximately 10 m width and 0.6 m deep; the substrate is comprised of boulders, cobble and gravel bottom. At the sample site the canopy is open and not shaded. There is evidence of some invertebrate life, i.e., black fly larvae and caddis flies and algae growth in stream, although to a much lesser extent than in the tributary. The Roaring River is fast flowing. With the relocation of Turbine

#2, there is no risk of impact, direct or indirect, to the Roaring River. The analytical results are provided in Appendix D.

Analytical results show that both Harts Brook and Roaring River are clean, healthy systems with little to no contamination; this is demonstrated by the low readings for dissolved chloride (from road salt runoff) or, fertilizers (phosphates and nitrates very low). Neutral readings in pH, and low conductivity suggest the water is clean and healthy in both situations.

3.4.3 Wetland in Proximity to the Project Site

Due to its distance from the turbine locations and access roadways, the only and nearest wetland to the turbines will not be impacted. This wetland, depicted on Figure 1.1 and 3.1, is a classic Black Spruce Bog. In the general vicinity, the species observed were Sphagnum moss, Black Spruce, sedges, wild raisin, sheep laurel, Labrador tea, bog cranberry and other mosses. The hummocks are approximately 0.1 m in height. Given the location of the turbines in relation to the wetland, there is no risk of impact, direct or indirect, to this bog.

3.4.4 Site Geology

The proposed turbine locations are in an area of exposed bedrock, where the thickness of the surface soils is generally less than 1 m. The bedrock is primarily granite of the Wyvern Pluton (late Devonian) era and is composed of quartz, feldspar and mica. Although acidic soils are likely to be typical in the area, acidic rock drainage is not expected to be a concern for this geological setting. Acid generating waste rock is typically found at sites in Nova Scotia where Halifax Formation slates have been disturbed. Exposing sulphide minerals in the waste rock to the air triggers the oxidation of pyrrhotite which leads to production of acidic drainage. Although sulphide-bearing veins do occur in granite host rock, little to no sulphide minerals are expected to be encountered during the proposed construction. The bulk waste rock that will be generated during the construction of the foundations for the proposed turbines is unlikely to produce acid mine drainage. The bedrock in the extreme northern part of the study area is shallow marine siltstone, shale, or wacke of the Wilson Brook Formation, which is not associated with sulphide-bearing minerals, (Keppie, 2000) and (Stea et. al., 1992)

3.5 Socio-economic Setting

3.5.1 Key Settlements and Land Use

The study area is located in the regional municipality of Cumberland County, NS, off Highway 4, some 2-3 km distant from Westchester Station, the nearest community to the site. The population of the County in 2001 was a little over 32,605. The principle towns are Amherst (population 9,470), Springhill (population 4,091), Parrsboro (population 1,529) and Oxford (population 1,332).

The area in general is partially forested; there is pasture in the valleys, and a number of the cleared fields along the Higgins Mountain Road are used for the production of commercial blueberries. As none of the turbine sites impinge on blueberry fields, and construction will take place in late fall or early winter, there will be no impact on the production or harvesting of blueberries in the area.

The upland area that extends from Westchester Station to Higgins Hill including the area around the proposed WTG sites is very heavily hunted. Game includes deer, moose, bear, rabbits, beaver, muskrat, wild cats and coyotes (pers. comm. Don Ruston, NSDNR). The streams and rivers in this area are also a popular destination for recreational fishermen. The area is extensively used by ATVs, and, in winter, it is a popular area for snowmobiling. These activities bring people along the Higgins Mountain Road and into the woods and open spaces either side of the road. The development and operation of the wind turbines, however, will not in any way inhibit or interfere with these recreational activities and use patterns.

3.5.2 Local Economic Activity

As indicated above, the proposed site is located in a remote and decidedly rural area. Forestry, agriculture, some quarrying and the production of commercial blueberries are the principal economic activities in the immediate area. The production of blueberries is of increasing importance to the area. According to the Wild blueberry Producers Association of Nova Scotia, in 2003, the provincial production of wild blueberries was 57,300,000 pounds with a farm gate value of $28,650,000 and a total economic value to the provincial economy exceeding $71,625,000. The current average provincial production of blueberries in Nova Scotia is 41,000,000 pounds (www.nswildblueberries.com). Cumberland and Colchester counties produce the largest share of blueberries in Nova Scotia. Many of the producers, and spin off businesses such as jam companies, tractor sales, fertilizer sales, etc., are located in the Westchester Station area.

Some 5-6 km downstream on the Roaring River to the north of the proposed turbines and just below Westchester Station, there is a flow through aquaculture operation. This business, which sends Atlantic Salmon and Arctic Char to market, has been in operation for 32 years and creates five to 12 jobs depending on the time of year.

Other industries in the area include maple production and logging (pers. comm. Sankster, Dave, 2006). One company, i.e., Avert Bentley, in the Westchester Station area produces both blueberries and maple products; other producers in the area include Bragg Industry, Garnett Ruston and Gordon and Wendal Prudy (pers. comm. Hopper, Paul, 2006).

3.5.3 Infrastructure

The Higgins Mountain Road is only partially surfaced and carries very little traffic. The northerly portion, i.e., the access from Westchester Station, is the portion that is surfaced, and provides the access to the Valley Road and hence to Route 4.

3.5.4 Archaeological Interests

An archaeological survey of the project area was conducted in May 2006 by Davis Archaeological Consultants Limited. Three archaeological features and an abandoned, unrecorded cemetery dating to the mid to late 19^{th} century were revealed, none of which were found in proximity to the turbine sites. No evidence of First Nations presence was seen, and the area where the turbines will be located does not appear to be a suitable one for First Nations activity. The following paragraphs provide further detail for each of the turbine locations.

3.5.4.1 Wind Turbine Site #1

To the south side of the road-way into the blue berry field in proximity to Wind Turbine Site #1, a late 19th or early 20th century bucksaw blade was found on the surface.

On the west side of Higgins Mountain Road approximately 565 m to the south of this turbine site, there is a small open field. This appears to have been cultivated and several apple trees can be seen on both sides of the road. An old road way leads to the south west where there has been recent cutting. Five meters to the west of the road way is an anomalous depression which appears to have been recently dug, but does not appear to be an archaeological feature.

Some 765 m to the south there is an unrecorded cemetery on the east side of Higgins Mountain Road. The cemetery is marked by a single grave marker with three inscriptions: Elizabeth Higgins (d. Sept. 19, 1875), Joshua Higgins (d. Oct 13, 1878) and Joshua Higgins (d. Jan. 18, 1882) are buried here. Four associated graves are visible on the east side of the monument and at least three more unmarked graves are visible beyond this. The cemetery is situated at the west side of a blue berry field adjacent to the road: it has been recorded in the Archaeological Resource Inventory Appendix E).

On the opposite west side of Higgins Mountain Road is a depression from a foundation that has been pushed in and filled with field stone. The bounds of the feature are difficult to determine, but slight mounding around the perimeter measures approximately 8 m by 8 m. Black bottle glass, blue-green container glass, window glass, metal strapping, cut nails, ironstone, porcelain and stoneware ceramics are visible on the surface of the feature, all dating from the last half of the 19th century. Another feature, possibly an outbuilding, is visible to the southwest. This is likely the remnants of a Higgins family homestead, given its proximity to the Higgins family cemetery opposite it.

In summary, no archaeological features of interest were found in the areas that will be disturbed by Turbine #1.

3.5.4.2 Wind Turbine Site #2

The new Wind Turbine Site #2 is located approximately 650 m east of Higgins Mountain Road northwest of the main course of Smith’s Brook just east of the transmission line (Figure 1.3). The site can be accessed by an old roadway that leads eastward from a large elevated blueberry field. During DAC’s initial survey of the turbine sites in May, 2006, several field clearing stone piles and two stone foundations were recorded in the blueberry field adjacent to Higgins Mountain Road. The foundations had been pushed inward and no definitive structure could be discerned. Along the roadway to the east of these features, the land is rugged and covered in secondary growth associated with earlier clear cutting of the area. Bedrock is exposed is several areas along the road itself and within the turbine development area. The development area had been cleared of secondary growth prior to the archaeological survey and geotechnical testing had been conducted. The natural till is shown to be at or near the surface indicating that this area had not been farmed, which can be confirmed by the rugged terrain and shallow bedrock throughout. The study area is of low archaeological potential for First Nations resources as no nearby source of freshwater or suitable food resources exist. The nearest suitable water course is at least 0.5 km away and was shown during the initial survey to be narrow and slow moving, suggesting low productivity. The terrace was surveyed for evidence of First Nations activity during the May 2006 survey, but was found to be negative.

3.5.4.3 Wind Turbine Site #3

This site is located on high ground on the east side of Higgins Mountain Road. The road is intersected on both sides by skidder trails, and there are several bulldozed push-ups on both sides of the road way. The immediate development area is characterized by clear cutting for pine tree plantation. This area shows no evidence of historic or First Nations cultural activity.

3.5.4.4 Concluding Observations

All three foundations discovered along Higgins Mountain Road have been previously impacted by agricultural activity. There are no sensitive archaeological features. As no significant archaeological features were encountered within the areas that will be impacted by the proposed works, no recommendations for archaeological mitigation are required. Should, however, any in situ archaeological resources be encountered during construction, it is recommended that activity cease and that the Nova Scotia Museum, Heritage Division, be contacted regarding mitigation of the found resources. In the unlikely event that human remains are discovered during ground disturbance, it is required under provincial law that all activity cease and that the proper authorities including the police or RCMP and the Provincial Museum be contacted immediately.

3.5.5 Aboriginal Use

The lands are in an area that was used traditionally by First Nations peoples, and the Higgins Mountain Road may still be used as access to the Cobiquid Hills for hunting. There is, however, no physical or archaeological evidence of aboriginal use in the vicinity of the turbine locations, and the development of the turbines will not inhibit their access to the area.

3.5.6 Visibility Analysis

The turbines will be visible from many points along the Higgins Mountain Road, but this is not a highly trafficked road. Of more relevance perhaps is whether the turbines are visible from Westchester Station, from Highway 104 and from the Wentworth Valley. As depicted in Figure 3.3, observation sections were defined in each of these locations and, based on an analysis of the ground contours and the heights of the proposed turbines, i.e., a height to the top of the rotor blade in a vertical position of 100 m, the following determinations were made:

- Only Turbine #1 will be seen from the highest point to the west of Highway 104;
- Turbines 2 and 3 will be seen from an observation point above the ski runs to the east of Wentworth Valley. It is noted that the turbines could not be seen from the floor of the valley; and
- No turbine will be seen from Observation Point #3 at Westchester Station.

It must be remembered that Observation Points 1, 2 and 3 are approximately 7.7 km, 7.3 km and 3.3 km distant respectively from the turbines. Visibility at any time will be dependent on weather conditions. In many instances all that will be seen is the distant white rotation of the blades against the sky.

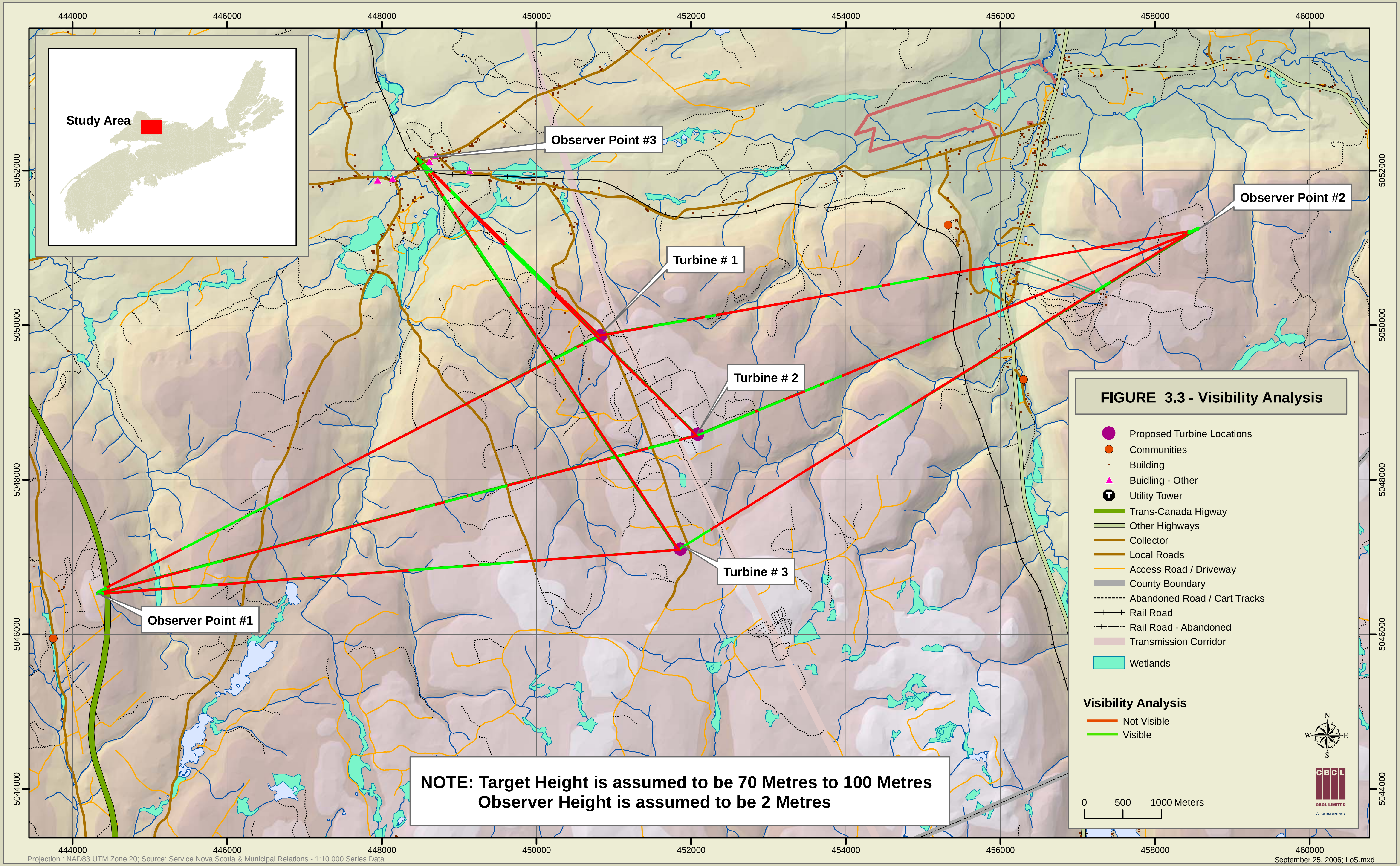
FIGURE 3.3 - Visibility Analysis
Study Area
Observer Point #1
Observer Point #2
Observer Point #3
Turbine # 1
Turbine # 2
Turbine # 3
Proposed Turbine Locations
Communities
Building
Buidling - Other
Utility Tower
Trans-Canada Higway
Other Highways
Collector
Local Roads
Access Road / Driveway
County Boundary
Abandoned Road / Cart Tracks
Rail Road
Rail Road - Abandoned
Transmission Corridor
Wetlands
Visibility Analysis
Not Visible
Visible
0 500 1000 Meters
NOTE: Target Height is assumed to be 70 Metres to 100 Metres
Observer Height is assumed to be 2 Metres
444000 446000 448000 450000 452000 454000 456000 458000 460000
5044000 5046000 5048000 5050000 5052000
CBCL LIMITED
Consulting Engineers
Projection : NAD83 UTM Zone 20; Source: Service Nova Scotia & Municipal Relations - 1:10 000 Series Data
September 25, 2006; LoS.mxd

3.6 Issues Scoping and Identification of VECs

The scoping process serves to identify those issues or VECs that are valued and that may be subject to impact given the nature of the works proposed. As a result of this process, the actual evaluation will focus only on those issues/VECs that may be impacted by the construction, operation or decommissioning of the project. The following are protected by statute:

- Fish and fish habitat (*Fisheries Act*);
- Migratory birds (*Migratory Birds Convention Act*);
- Species at Risk (*Canadian Species at Risk Act (SARA), NS Endangered Species Act, NS Wildlife Act*);
- Structures or historic sites of national interest (*Historic Sites and Monuments Act*); and
- Wetlands pursuant to the Federal Policy on Wetland Conservation.

Given the field programs that have been executed and the care that has been taken with respect to turbine siting, there is no linkage, or pathway, between the project and fish and fish habitat, structures or historic sites of national interest or wetlands. Of the above, only migratory birds and Species at Risk are VECs.

Based on the works that are proposed, the data that has been compiled, the fieldwork that has been executed, the experience of the study team and the consultations that have been undertaken, the following VECs and socio-economic issues have been identified and will provide the focus for the evaluation in Section 4:

- surface and groundwater quality;
- Species at Risk;
- avian species, including migratory birds;
- land use;
- air quality;
- noise;
- safety; and
- landscape aesthetics.

Chapter 4 Environmental and Socio-economic Evaluation

4.1 Approach to Evaluation

The approach to this evaluation has been to address the regulatory requirements of the environmental assessment regulations of the Nova Scotia *Environment Act* and to produce an assessment document that:

- Is focussed on the issues of greatest concern;
- Clearly addresses the regulatory requirements;
- Integrates engineering design and mitigative measures into a comprehensive environmental management planning process; and
- Integrates cumulative effects assessment into the overall assessment of environmental effects.

The environmental assessment evaluates the potential effects, including cumulative effects, of each Project phase, i.e., construction, operation and decommissioning, as well as malfunctions and accidents, with regard to each identified VEC.

4.1.1 Boundaries

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

4.1.2 Evaluation Criteria

To facilitate the evaluation it is necessary to establish a reference framework. The accepted norm, established by the *Canadian Environmental Assessment Act*, is to determine whether:

- The environmental effect is adverse;
- The adverse environmental effect is significant; and
- The significant environmental effect is likely.

The significance of an effect can be determined in two ways: by reference to environmental standards, guidelines and objectives where such have been defined or regulated, and by drawing on the experience and professional judgment of the study team. Table 4.1 identifies criteria that will be referenced in the evaluation.

Table 4-1: Criteria to Facilitate Assessment of Impacts

Key Terms	***Criteria***
Adverse	• Threat to, or loss of, rare or endangered species; • Reductions in species diversity; • Loss of critical/productive habitat; • Transformation of natural landscapes; • Negative effects on human health or quality of life; • Reductions in the capacity of renewable resources to meet the needs of present and future generations;

Key Terms	*Criteria*
	• Loss of current use of lands and resources for traditional purposes by aboriginal persons; and • Foreclosure of future resource use or production.
Significant	• Magnitude; • Geographic extent; • Duration and frequency; • Irreversibility; and • Ecological context.
Likely	• Probability of occurrence; and • Scientific uncertainty.

Source: CEAA (1994)

4.1.3 Mitgation

Mitigation is defined as the "elimination, reduction or control of adverse environmental effects, including restitution through replacement, restoration, compensation, or any other means for any damage to the environment caused by such effects" (Natural Resources Canada, 2003). Mitigation, where necessary, will be identified as part of the evaluation, but it is believed that many, if not all adverse effects, can be avoided through the application of good engineering and construction practices, the careful timing of activities and the adherence to good environmental management techniques.

4.1.4 Residual Effects

Residual effects have been defined by Natural Resources Canada as effects that remain after mitigation measures have been applied. The significance of the residual effects will be evaluated in terms of :

- Magnitude;
- Geographical extent;
- Timing, duration and frequency;
- Degree to which effects are reversible, or can be mitigated;
- Probability of occurrence;
- Standards, guidelines or other objectives; and
- The capacity of renewable and non-renewable resources to meet the needs of the present and future.

The evaluation includes clear statements of whether the residual environmental effects are significant or not.

To determine and appreciate the relevance of residual effects following mitigation, Natural Resources Canada suggests the application of the definitions of impact detailed in Table 4.2.

Table 4-2: Level of Impact After Mitigation Measures

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

Level	Definition
	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 life of the project. Research, monitoring and/or recovery initiatives would not normally be required.
Minimal	Potential impact may result in slight decline in resource in study area during construction phase, but should return to baseline levels.

Source: NRCan, Environmental Impact Statement, Guidelines for Screenings of Inland Wind Farms under the Canadian Environmental Assessment Act. Wind Power Production Incentive (WPPI) Program.

As not all consequences of Project development and operation on the identified VECs are adverse, the above table has been supplemented by the following two definitions:

- No impact, i.e., where the consequences of that phase of the Project have no effects on the specific VEC or socio-economic issue; and
- Beneficial impact, i.e., where the consequences of that phase of the Project enhance the specific VEC or socio-economic issue.

4.2 Evaluation

This section presents the environmental evaluation of the residual effects of the proposed Project on eight VECs. Recommendations for mitigation are identified where applicable. The analysis also takes into account the consequences of the proposed Project interacting cumulatively with other activities, but particularly the operation of the blueberry fields in proximity to the turbine sites.

4.2.1 Surface and Groundwater Quality

Pathways: the pathways that may adversely affect surface or groundwater quality include:

- The disturbance of sediments during the construction of the WTGs and the necessary access roads; and
- The accidental release of hazardous materials such as fuels, oils and lubricants.

Boundaries: the spatial boundary encompasses those areas which will be subject to construction including trenching or blasting of the bedrock for the siting of the foundations for the WTGs. The temporal boundaries are primarily those associated with Project construction, but the effects, if mitigative measures are not applied, could extend into the period of Project operation.

Project Construction: It is noted that there are no domestic wells, streams or watercourses in the vicinity of the proposed turbines. Related construction work including clearing and grubbing has the potential to cause erosion and the transportation of sediment to adjacent areas, including existing ditches. The severity of erosion and sediment transport depends on several factors including precipitation, soil type, slope, vegetation cover and distance. Given the topography and the fact that the vegetation surrounding the concrete pads will remain untouched, sedimentation is not anticipated to be an issue. This will be reinforced through the use of proven methods to control run-off and erosion including:

- Defined procedures for the storage and handling of excavated materials;

- Timely revegetation of disturbed areas after construction; and
- The installation of temporary erosion control measures, e.g., drainage barriers, sediment fences, plastic sheeting, straw or hay crimping, mulches etc.

Erosion and sedimentation, if they occur, will be temporary, since all areas to be disturbed by construction will be stabilized both during and after construction.

Accidental releases of hazardous materials could occur during any phase of the Project and might include petroleum products and possibly solvents and paints. Accidental releases of chemicals could occur from storage facilities or vehicles. The severity of an accidental event would depend on the chemical characteristics and volume of the release and its proximity to a watercourse. Relatively small amounts of fuel and hydraulic fluid spilled during the operation of construction equipment or the servicing of the turbines are the most likely types of accidental releases. Standard practices for the handling, storage and use of potentially hazardous materials will be enforced throughout all phases of the Project. The following mitigative measures shall also be applied:

- All hazardous materials to be used at the site will be labeled according to WHMIS regulations;
- Frequent inspection and maintenance of equipment will be undertaken to identify and repair fuel leaks;
- Used oil, filters and other products associated with equipment maintenance shall be collected and disposed of in accordance with regulatory requirements; and
- All spills shall be immediately reported to the Environmental Emergency # (1-800-565-1633).

Given the use of proven sedimentation control measures, including the "Erosion and Sedimentation Control Handbook for Construction Sites", and the distance from the turbine sites to any watercourse, it is highly unlikely that sedimentation will pose a hazard to ground or surface waters, or to uses that depend on such waters including the flow through aquaculture operation on the Roaring River.

In summary, through the use of standard and accepted industry procedures and mitigative measures, adherence to applicable regulations and guidelines, and waste management planning, the construction phase of the Project will be undertaken in an environmentally responsible manner and is unlikely to result in a significant adverse effect on surface and ground water quality.

Project Operation: project interactions with surface and ground water during Project operation are anticipated to be minimal. The most likely interface is an accidental release of a hazardous material during turbine maintenance, or when machinery is necessary to facilitate repairs. In summary, by adhering to applicable regulations and guidelines, implementing mitigation measures and applying good management practices as referenced above, the operation of the proposed project will not result in a significant adverse effect on surface and groundwater quality.

Project Decommissioning: the decommissioning of the Project would involve the dismantling and removal of the WTGs and the reasonable rehabilitation of the Project site. There would be no excavation of bedrock involved, and the underground cables and concrete pads would remain in place. In summary, the decommissioning of the site would be undertaken in an environmentally responsible manner and would not result in a significant adverse impact on surface and groundwater quality.

Malfunctions and Accidents: beyond the accidental release of a hazardous material identified above, malfunctions are most likely to involve the stoppage of one or more WTGs, or a break in a cable. The measures advocated to minimize erosion or sedimentation during construction would be adopted to address the consequences of any ground works necessary to address a malfunction in equipment.

Cumulative Assessment: there are no proposed new works that will take place in or in the vicinity of the sites and that might act cumulatively with the construction and operation of the proposed turbines to cause a significant effect on surface and groundwater.

Sustainable Use of Renewable Resources: N/A

Residual Environmental Effects Assessment: **The project is not anticipated to have a significant residual environmental effect on the surface and groundwater, i.e., the impact is predicted to be minimal.**

4.2.2 Species At Risk (Except Avian Species)

In recognition of the *SARA*, the *Migratory Birds Convention Act and* the *Nova Scotia Endangered Species Act*, consideration has to be given to those plants, birds, mammals, amphibians, reptiles and invertebrates that are listed as species of concern. Based on the field programs undertaken, there are no listed plant species located in or immediately adjacent the three turbine sites or the access roads to them. Access to each of the sites already exists. Consideration of avian species of concern, including migratory species, is addressed separately in Section 4.2.3.

The mammal species of concern identified in Table 3.1 include the fisher and the following three species of bat: red, hoary and silver haired bat. As indicated in Section 3.2, the fisher is found in Cumberland, Colchester and Pictou counties. Although the field teams did not see this species, it is likely present in the general area.

With respect to the listed invertebrates, amphibians, reptiles and fish, the species that might inhabit or frequent the lands in the vicinity of the proposed turbines include the Monarch Butterfly, the Wood Turtle and four of the eight species of listed invertebrates, i.e., the Early Hairstreak, the Hoary Comma, the Greenstripped Darner and the Satyr Anglewing.

Pathways: there are two principle pathways associated with the construction and operation of the Project that could have an adverse impact on the Species of Concern identified above. These include:

- The disturbance of the ground and the construction of the towers; and
- The WTGs as free standing structures with rotating blades.

Boundaries: With respect to the species identified above the spatial boundaries relate both to the footprint that will be disturbed and a greater area that may provide habitat for bats that could forage in the vicinity of the WTGs or migrate through the area in which the WTGs are located. The temporal boundaries encompass all phases of the Project, i.e., construction, operation and decommissioning.

Project Construction: the following sections address separately the likely impacts of construction on each of the species groupings identified above:

i) Fisher

If the fisher is present in the vicinity of the WTGs, they could during construction be affected both directly and indirectly. Directly individual could be killed during land clearing operations; indirectly they could be affected by a reduction in the quality and quantity of their habitat. Although known to breed in the county, they also seek to avoid contact with humans. Since the turbine footprints are limited in extent, the loss of productive habitat is considered minimal.

ii) Bats

If bats are present in the vicinity of the WTGs, and, if present, their numbers are likely to be low, they could during construction be affected both directly and indirectly. Directly individuals could be killed during land clearing operations; indirectly they could be affected by a reduction in the quality and quantity of their habitat. Foraging would not be impacted, as the construction would only be carried out during the day.

Impacts on bats during construction only appear possible as a result of habitat destruction. Habitat may be used for foraging, breeding, roosting and wintering. Since there are no caves within the project footprint, or in the vicinity of the sites wintering habitat is not impacted. The amount of woodland that will be cut to accommodate the WTGs is very small compared to the large spreads of forest cover in the surrounding hills. Impacts on bats from the destruction, alteration or fragmentation of habitat are not likely as a result of construction activities. Broders et al. state that Nova Scotia is at or beyond the northern limit of the range of the hoary, red and silver haired bat and these are generally rare in the province (Broders, H.G., G.M. Quinn and G.J. Forbes, 2003).

As indicated in Section 1.8.4, Broders has conducted a fall survey designed to determine the presence of bats at the turbine locations. The results of this work will be forwarded when it becomes available.

iii) Monarch Butterfly

As indicated in Section 3.3, no milkweed was found on, or in the vicinity of the WTG sites; the removal of the vegetation in these areas can therefore have no impact on the habitat preferred by the monarch butterfly.

iv) Wood Turtle

If wood turtles are present on, or in the vicinity of the WTG sites, they could during construction be affected both directly and indirectly. Directly individuals could be killed during land clearing operations; indirectly they could be affected by a reduction in the quality and quantity of suitable habitat.

v) Invertebrates

If the identified invertebrates are present in the vicinity of, the WTGs, they could during construction be affected both directly and indirectly. Directly individuals could be killed during land clearing operations; indirectly they could be affected by a reduction in the quality and quantity of suitable habitat.

In summary, the species identified above, though not specifically seen during the field work undertaken, are likely to be found inhabiting the lands in the general vicinity of the WTGs. Most, if disturbed, by the presence of human activity will relocate. Some habitat would be lost as a consequence of the proposed works, but would represent a very small percentage of their total habitat in the area of the hills.

Project Operation: the following sections address separately the likely impacts of construction on each of the species groups identified above:

i) Fisher

Once the construction has been completed and the turbines are operational, there would be no further impact on the fisher or its habitat.

ii) Bats

As indicated in Section 3.2, bats typically forage at a level below that of the rotating turbine blades. They do, however, migrate at greater heights, and this would be when they would be most susceptible to impact from the turbines. Detailed data on bat migration paths is not available, and the numbers of bats that might be involved are not known. A fall bat migration survey has been undertaken and the results will be forwarded when they become available. Since there is little knowledge about the factors that influence the risk of collision for bats, it is difficult to estimate the significance of any impact for the population. Based on research that has been done (Keeley, et. al., 2001), mortality can on average be three to four bats per turbine per year. For the three turbines, this may result in approximately 10 bat deaths per year. Although this may result in a slight decline in total species numbers in the study area during the life of the project, the impact on the total populations is likely negligible.

iii) Monarch Butterfly

The operation of the WTGs would have no impact on the monarch butterfly.

iv) Wood Turtle

Once the construction has been completed and the turbines are operational, there would be no further impact on the wood turtle and its habitat.

v) Invertebrates

Once the construction has been completed and the turbines are operational, there would be no further impact on the identified invertebrates.

In summary, of the species identified above, only the bat species may be adversely impacted by the operation of the WTGs.

Project Decommissioning: the decommissioning of the Project would involve the dismantling and removal of the WTGs. Effects on the species identified, if any, would be comparable to, but less than that associated with, construction.

In summary, the decommissioning of the Project site will not result in a significant adverse environmental effect on species of concern.

Malfunctions and Accidents: beyond the accidental release of a hazardous material, malfunctions are most likely to involve the stoppage of one or more of the WTGs, or a break in a cable. Given the very limited footprint that would likely be involved in addressing any such event, no significant adverse impact on the identified species of concern is predicted.

Cumulative Assessment: there are no proposed new works known that will take place in, or in the vicinity of, the WTG sites that might act cumulatively with the construction, operation or decommissioning of the proposed turbines to cause a significant adverse effect on the identified species of concern.

Sustainable Use of Renewable Resources: N/A

Residual Environmental Impact: **the Project is not anticipated to have a significant residual effect on the identified species of concern, i.e., the impact is predicted to be low.**

4.2.3 Avian Species Including Migratory Birds

Pathways: there are several pathways associated with the construction and operation of the Project that could have an adverse impact on the bird population of the area. These include:

- The disturbance of the ground and the construction of the towers, i.e., loss of habitat and interference with normal behaviour such as feeding and breeding; and
- The WTGs as freestanding structures with rotating blades.

Boundaries: the spatial boundaries encompass the entirety of the area where the WTGs are being located and extends to include those areas that are frequented by birds that may be impacted by the construction or operation of the WTGs. The temporal boundaries encompass both the construction and the operation of the WTGs.

Project Construction: construction activities, such as clearing and grading, and turbine assembly can result in the temporary disturbance of birds due to noise and the presence of humans in the area. The land used for the turbines and lay down areas may result in the temporary or permanent loss, fragmentation, alternation or degradation of habitat for certain species. Construction may also lead to the direct injury or death of birds, nestlings or eggs depending on the timing of the construction activities.

With one exception, all the breeding birds found, including the raptor, are common throughout the province. Given the existence of the much disturbed access roads to the turbine locations, disturbance of habitat as a consequence of turbine construction will affect at most one or two territories of any given species. No raptor nest sites were found that would be disturbed.

The two breeding species of concern that were noted in the area are the Boreal Chickadee and the Vesper Sparrow. Although ACCDC lists the Boreal Chickadee as S3S4, it is abundant throughout the province (pers. comm., Andy Horn, Ornithologist). They are strictly forest birds with no flight display so the only issue would be habitat destruction of appropriate nesting habitat, i.e., pure stands of spruce. The turbine locations do not offer this type of habitat. There would be no detectable effect on their overall population in the province as a result of the construction of the three WTGs.

There is an estimated population of 200 pairs of breeding Vesper Sparrows in the province, but this is considered “little more than guesswork” (Erskine, 1992). If it is correct, the two Pairs found in the vicinity of the turbine sites would constitute only one per cent of the province’s share of this species. Although the species is quite common elsewhere in North America, it is listed as May be at Risk and S2B in New Brunswick and as S1S2B in Prince Edward Island. The two territories involved extend no more than 100 m from the song posts mapped in Figure 3.2 (based on flush mapping of one territory and on Best and Rodenhouse, 1984). Located between Turbines 1 and 2, they do not intersect with the turbine footprints. There is some evidence that suggests that such open country species avoid nesting near turbines because of the high profile of the structures (Kingsley and Whittam, 2003), but this may not be true of the Vesper Sparrows, which preferentially place their territories along forest edges (Best and Rodenhouse, 1984).

In the Maritime Breeding Atlas, Bicknell’s Thrush, a federally listed species, was reported as a breeding species in the Folly Lake Atlas square, i.e., 10 km UTM grid (Erskine, 1992). The surveyed area off the Higgins Mountain Road is lower than the 450 m most authorities suggest as the minimum altitude for this species’ inland nesting habitat, but higher than the 300 m listed in the atlas. The area surveyed does include some patches of dense stunted spruces suitable for nesting, i.e., near Turbine #3; it is also acknowledged that the species is notoriously difficult to detect. No Bicknell’s Thrushes were located during the survey, and the main atlasser for the Folly Lake square has no record of the registration (pers. comm. Blake Maybank). The possibility that the Birknell’s Thrush nests in the vicinity of the turbine sites is remote. If they do, their habitat there, young coniferous second growth, is ephemeral, and as argued above, habitat destruction will be negligible.

A Mr. Wilson, who reported that he has worked the blueberry field in the area for 60 years, indicated that large numbers of swallows used to forage over the fields in the late summer, but have not done so in recent years. No swallows were seen during the filed program though the survey ended June 28, before the swallows had left their nesting areas to flock up and forage more extensively.

In summary, although the area provides habitat for a number of species, including the Boral Chickadee and the Vesper Sparrow, the clearance of the turbine sites and the construction of the turbines is unlikely to result is a significant adverse effect on the avian population of the province, including avian species of concern.

Project Operation: several facets of Turbine operation may affect bird behaviour or lead to bird injury or death. The noise and rotor movement associated with the turbine operation can cause an interruption in regular behaviour such as feeding, migrating and breeding. If birds are displaced to avoid disturbance, this effectively means a loss of habitat. Such effects are species, season and site specific (Langton and Pullan, 2003), but there are few studies and no conclusive results. Some species may habituate to the new conditions, but others may not. Since there are only three turbines proposed, the long term disturbance effect is considered negligible.

Turbines are also associated with direct bird injury and death due to bird strikes. An increasing number of studies, both by independent academic researchers and the wind industry, indicate that mortality from wind turbines vary, but are generally very low.

Raptors can be susceptible to collision with rotor blades. No raptor nests were found within 0.5 km of the proposed turbine sites, but the fields and forest edges around the site are used for foraging by local breeders. No young hawks, which can be particularly susceptible to collisions, were seen during the survey, but local nests may not have fledged by the time of the last visit (June 30th). The risk of collision cannot be truly evaluated without more extensive observations at different times of the year and in different weather conditions. Further, although no raptor nests were found this year, the proximity of nests and hence the use of the area will likely vary form year to year. Nevertheless, based on the conditions, on what is known and the number of turbines, the number of collisions that might be expected is low. The effect of collisions on local foraging birds, including raptor populations, will be negligible, since only local breeders will be affected, and all are common species throughout the province.

On the other hand, if the surveyed area is used by migrating hawks, a greater proportion of those species' populations may pass through the area. The limited sightings in the April survey (which could have comprised either local birds or migrants) are consistent with the speculation (Horn 2005, based on Kerlinger, 1989) that any migrants in the area will likely ride the updrafts over the north slope of the mountain. The northernmost of the three turbines is set back from the edge of the north slope which should reduce the risk of collisions by raptors following that route. Again the size of the wind farm is an important consideration when determining the risk of collision.

As stated in Section 2.2.1, there will be a flashing white strobe on each of the turbines at night. This is in accordance with the guidance provided by Environment Canada (2006a); at page 25 it is stated:

> *"The US Fish and Wildlife Service recommends that only flashing white lights should be used on towers at night, and that these should be the minimum number of flashes per minute (i.e., longest duration between flashes (allowable). Solid red or flashing red lights should be avoided as they appear to attract nocturnal migrants more than white flashing lights (US Fish and Wildlife Service, 2003). These lights also appear to disrupt night-migrating birds (causing circling or hovering behaviour) at a much higher rate than white flashing lights (Gauthreaux and Belser, 1999; Gauthreaux, 2000)."*

In summary, although there is always a risk of disturbance and collision associated with the operation of WTGs, their location and numbers mitigate that risk. There is unlikely to be a significant adverse effect on the avian population of the province, including species of concern, from the operation of the proposed project.

Project Decommissioning: the decommissioning of the Project would involve the dismantling and removal of the WTGs. Effects on the bird population, if any, would be comparable to those experienced during Project construction. In summary, the decommissioning of the Project site will not result in a significant adverse environmental effect.

Malfunctions and Accidents: beyond the accidental release of a hazardous material, malfunctions are most likely to involve the stoppage of one or more of the WTGs. The mitigative measures advocated to address spills would be applied. Malfunctions and accidents are not predicted to have a significant adverse impact on birds.

Cumulative Assessment: there are no proposed new works known that will take place in, or in the vicinity of, the WTG sites that might act cumulatively with the construction, operation or decommissioning of the proposed turbines to cause a significant adverse effect on the identified species of concern.

Sustainable Use of Renewable Resources: N/A

Residual Environmental Impact: **the Project is not anticipated to have a significant residual effect on the identified species of concern, i.e., the impact is predicted to be low.**

4.2.4 Land Use

Pathways: the pathways that could adversely affect land use include:

- Any activity that would inhibit access along or from the Higgins Mountain Road to adjacent fields and lands;
- The removal of lands from other uses; and
- Introduction of new use.

Boundaries: during construction the spatial boundaries will encompass the foot print associated with the WTG foundations, the areas in the immediate vicinity, the necessary lay down areas and the access roads to the turbine sites. During project operation the footprint will be restricted to WTG sites themselves and the associated access roads. The temporal boundaries are primarily those associated with Project construction or decommissioning, but include the loss of land associated with the turbine footprint to other uses.

Project Construction: the construction of the three turbines will involve the movement and handling of large structural components and may for very short periods of time inhibit movements on the Higgins Mountain Road, or movements from the road to adjoining lands. The transportation of the turbine components will be coordinated as required with the NS Department of Transportation and Public Works and the RCMP to ensure safe passage and minimal interference to public access to adjoining properties. The construction work at each of the three turbine locations will be organized to ensure that use of adjacent lands, e.g., the harvesting of commercial blueberries is not inhibited.

The lands where the turbines are to be sited and the access roads to them are either unused at the present time, or are wooded and will have to be cleared. The construction of the WTGs will not remove lands from productive use, or inhibit the productive use of adjacent lands. Indeed, the proponent has entered into a contractual relationship with each of the landowners, i.e., a new and compatible land use is being introduced into the area.

Project Operation: once the turbines are in place there will be no further impact on land use. Indeed, their operation will introduce a new revenue source to the involved land owners.
Project Decommissioning: the decommissioning of the WTGs would pose issues for land use comparable to those associated with their construction.

Malfunctions and Accidents: beyond the accidental release of hazardous material, malfunctions are most likely to involve the stoppage of one or more WTGs, or a break in a cable. Malfunctions and accidents are unlikely to impact land use in the area.

Cumulative Assessment: there are no proposed new works in the area that will take place in or in the vicinity of the sites and that would act cumulatively with the construction or operation of the proposed project to cause a significant effect, or any effect, on land use in the area.

Sustainable Use of Renewable Resources: as indicated in Section 3.5, land uses in the area include forestry and agriculture, particularly the cultivation of blueberries. These sustainable uses will continue. The construction and operation of the proposed turbines will have no impact on the sustainable use of the renewable resources in the area.

Residual Environmental Impact: **The Project is not anticipated to have a significant residual environmental effect on land use in the area, i.e., no impact is predicted.**

4.2.5 Air Quality

There are at present no air quality concerns in the area surrounding the project site. Wind farms also differ substantially from most other electrical generation facilities as they do not use a combustion process and therefore do not produce any air emissions. The generation of limited amounts of dust may occur during project construction.

Pathways: As indicated above, the generation of dust in the immediate vicinity of the proposed works during construction may be of some concern.

Boundaries: The spatial boundaries associated with those construction activities that may affect air quality can be defined in relation to the transposition of the component parts of the WTGs on unpaved roads, the clearing and grubbing of areas for the turbine pads, and any works necessary to facilitate access to the turbine locations. The temporal boundaries relate to the period associated with construction.

Project Construction: Construction will take place over a period of approximately two months. Should dust become a problem, the site can be sprayed with water as circumstances warrant and dust kept under control. The construction phase of the Project is unlikely to result in significant adverse effects on air quality.

Project Operation: there is no air emissions associated with the operation of the Project. Once the access roads and the WTGs have been constructed, there are no major sources of dust to impact upon air quality. The access roads to the WTGs will not be surfaced, but they will be used intermittently during Project operations; their use will not be a major source of dust.

Project Decommissioning: The decommissioning of the Project will involve the dismantling of the WTGs and their removal from the site as detailed in Section 2.3.3. The probability of dust being generated is comparable to the circumstances described for Project construction. If similar mitigative measures are employed, the dust will be suppressed and there will be minimal, if any, effects on air quality.

Malfunctions and Accidents: malfunctions are most likely to involve the stoppage of one or more of the WTGs or a break in one or other of the transmission cables. The works necessary to facilitate the repairs, particularly if these works involve the use of heavy vehicles on the unsurfaced access road, could generate dust. This would be local in nature, but could in dry and windy conditions influence air quality in the surrounding area. Watering, as detailed above with respect to dust suppression, would work as an effective mitigation measure if such was required.

Cumulative Assessment: Based on the above analysis, dust is the only matter associated with the construction and operation of the proposed works that could have an adverse impact on air quality. These effects are primarily associated with construction and are localized to the Project site. The proposed Project will not act cumulatively with any other activities taking place in the area to cause a cumulative effect on air quality.

Sustainable Use of Renewable Resources: N/A

Residual Environmental Impact: **The Project is not anticipated to have a significant residual effect on air quality, i.e., the impact is predicted to be minimal.**

4.2.6 Noise

Pathways: noise will be generated during the construction and operation of the proposed Project. During construction the noise will be generated by the vehicles and activities on site. During Project operation, the rotation of the blades will generate some noise. During decommissioning, the noise associated with the WTGs will cease and will be replaced for a short period by the noise associated with deconstruction activity.

Boundaries: the spatial boundaries are defined by the distance construction, operational or decommissioning noise carries. The temporal boundaries associated with a specific noise relate to the phase of the Project involved, i.e., construction, operation or decommissioning.

Project Construction: in preparing the site and during construction, noise will be generated by construction vehicles and related activities.

Table 4.3 Provides noise levels (dBA) for a variety of heavy duty construction equipment at varying distances. It would be expected that the most intense noise would occur during site preparation and the assembly of the turbine towers and associated components. During this period a variety of light and heavy duty construction vehicles will operate in the vicinity of each tower; these may include bulldozers, backhoes, cranes, dump trucks, ready mix concrete trucks and flat-bed trucks.

Table 4-3: Typical Construction Equipment Noise Levels at a Distance of 30 m (100 ft)

Type of Equipment	***Noise Level (dBA)***	***@ 250 m***	***@ 500 m***	***@1,000 m***
Dump truck	67.1 @ 30 m	58.1	55.1	52.1
Front end loader	80.2 @ 30 m	71.2	68.2	65.2
Bulldozer	80.2 @ 30 m	71.2	68.2	65.2
Crane	81.3 @ 30 m	72.3	69.3	66.3

Type of Equipment	Noise Level (dBA)	@ 250 m	@ 500 m	@1,000 m
Backhoe	81.3 @ 30 m	72.3	69.3	66.3
Ready-mix concrete truck	85.2 @ 30 m	76.2	73.2	70.2

Note: Table 4.3 is based on the assumption that sound pressure levels diminish with distance from a point source at a rate

The nearest occupied residence to a turbine site is approximately 1,000 m to the north. Table 4.4 Provides noise levels associated with selected residential environments for reference purposes.

Table 4-4: Noise Levels Associated with Common Environments

Location Description	***Typical Sound Pressure Level (dBA)***
Rural Residential Environment	38-46
Suburban Residential	48-52
Urban Residential	58-62

As distance from the site increases, noise levels will be mitigated. Nevertheless noise from construction activities may be heard by, but is unlikely to be a nuisance to, the occupants of the closest houses. Construction noise may also temporarily disrupt the activities of fauna and birds at or in the vicinity of the Project site.

In summary, although noise resulting from construction activities may cause some temporary inconvenience, the noise generated by the necessary construction activates will not result in a significant environmental effect.

Project Operation: rural areas are often more sensitive to noise intrusion than urban areas because of relatively low ambient noise levels. Such levels will vary and will depend on various factors including the nature of rural activities, e.g., the passage of tractors, and other factors, including climatic conditions. As indicated in Table 4.4, noise in a typical rural residential environment can be expected to be in the vicinity of 38 – 46 dBA. Noise levels of most wind turbines at 200 m from the source are typically the equivalent of ambient noise levels, and are approximately what would be experienced in the interior of an average home, i.e., 45 dBA. As the nearest occupied residence is approximately 1,000 m distant from the most northerly sited turbine, the noise generated should be inaudible. In summary, the noise levels associated with the operation of the proposed turbines will not result in a significant environmental effect.

Project Decommissioning: the decommissioning of the WTGs would necessitate the use of vehicles and the activities associated with Project construction. As noise levels could be predicted to be comparable to those associated with project construction, the impact would likely be similar. In summary, the noise impacts that would be associated with decommissioning will not result in a significant environmental effect.

Malfunctions and Accidents: malfunctions and accidents are unlikely to cause any increase in noise levels apart, perhaps, for the temporary sounds associated with construction or emergency vehicles. In summary, any noise that may be associated with malfunctions and accidents are not predicted to have a significant adverse environmental effect.

Cumulative Assessment: There are no proposed new works that will take place in or in the vicinity of the sites and that might act cumulatively with the construction and operation of the proposed turbines to significantly aggravate noise in the area.

Sustainable Use of Renewable Resources: N/A

Residual Environmental Impact: **noise generated by the Project, during construction, operation or decommissioning, is not anticipated to have a significant residual effect, i.e., the impact is predicted to be minimal.**

4.2.7 Safety

Icing of the blades is perhaps the most likely event to pose technical and safety concerns. Icing is also the predominant safety concern expressed by the general public with respect to wind turbines. Icing is a technical issue that is addressed through sound and detailed engineering and quality control. The braking and associated controls that are integral to the design of the WTGs automatically stop the turbine from turning in high wind speeds.

Icing occurs at temperatures below 0ºC when there is humidity in the air. The type, amount and density of ice depends on both meteorological conditions and on the dimensions and type of structure. The engineering of the WTGs will take this and other climatic factors into account in the design, installation specifications and operating procedures. Since turbines are operating in many countries in northern latitudes, e.g., Finland and Sweden, and at high altitudes, there is a substantive track record of them operating safely in comparable and worse climatic conditions to those experienced in the Cobiquid Hills.

Pathways: the factors that could cause icing to occur and cause a safety hazard are specific climatic conditions, i.e., freezing rain or melting snow.

Boundaries: the spatial boundaries associated with icing are restricted to the turbine locations. The temporal boundaries include both construction and decommissioning, but are primarily associated with Project operation.

Project Construction: since it is the intent to construct the turbines outside periods of severe winter weather, the likelihood of icing posing a problem is minimal. Nevertheless, those who will be responsible for the construction of the turbines will receive instruction on the hazards associated with ice forming on tall structures during construction. Based on appropriate instruction and construction taking place in moderate weather conditions, icing is not anticipated to be an issue during construction.

Project Operation: ice has been known to accumulate on rotating blades under conditions of freezing rain, or melting snow. Safety issues can arise if anyone is in the vicinity of a turbine when ice slides, or is thrown off the blades. In a remote location, such as the Higgins Mountain Road, the distance between the individual turbine locations and other land uses serves as effective mitigation, but the sites will also be posted with warning notices. In summary, icing is not anticipated to pose a significant adverse environmental effect during Project operation.

Project Decommissioning: the decommissioning of the WTGs would pose comparable safety issues associated with icing as would occur during Project construction. Comparable mitigation strategies should be employed. In summary, icing is not anticipated to pose a significant adverse environmental effect during decommissioning.

Malfunctions and Accidents: N/A.
Cumulative Assessment: safety, and more specifically icing, is an issue related to the proposed Project. There is no interaction with other works or activities taking place in a similar timeframe that would aggravate icing.

Sustainable Use of Renewable Resources: N/A.

Residual Environmental Impact: **icing that may occur during the construction, operation or decommissioning of the Project is not anticipated to have a significant residual effect, i.e., the impact is predicted to be minimal.**

4.2.8 Landscape Aesthetics

Despite a significant literature search, the value of one landscape in comparison to another, or what attracts or adds to landscape, is largely subjective. Wind farms in Britain and in parts of Europe have been opposed as spoiling valued rural and coastal scenery. Many people, however, also find modern wind turbines attractive. As detailed in Section 3.5.6, some of the three WTGs rising approximately 100 m, above the landscape off Higgins Mountain Road will be visible for some distance and from the higher points near Highway 104 and from the heights above the ski slopes.

Pathways: The pathways are those activities during project construction that change the visual features of the Project site, particularly the transportation and assembly of the large WTGs. The WTGs themselves become the pathway during Project operation.

Boundaries: the spatial boundaries relate to the viewshed of the site during both construction and operation. The temporal boundaries are associated with Project construction and operation, but the latter is usually perceived as the more important.

Project Construction: the construction of the WTGs may be viewed by some as a visual nuisance. No one, however, lives in close proximity to the turbine sites. It is more likely, given the nature and size of the structural elements that will be handled, that construction will attract some local curiosity. The proponent will designate someone during the construction process to provide information to visitors and to instruct them to where they may safely observe what is taking place. The more normal visual effects of a construction site can to some extent be offset by the maintenance of a tidy site, the restoration of disturbed areas in a timely manner and the expedient removal of excess construction material and equipment. In summary, the construction of the wind farm may generate some interest and attract casual visitors to the site; it will not result in a significant adverse environmental effect on the landscape.

Project Operation: once constructed and in operation concerns pertaining to the visual affect of the proposed turbines on the landscape are largely subjective. Some people may dislike the visual appearance of WTGs in a rural landscape, but this site, it must be stressed, is far removed from high trafficked areas and is not in proximity to a park or other comparable destination. Equally clearly, many people are curious about and like the visual appearance of modern wind towers. In summary it is concluded that the operation of the three turbines will not result in a significant adverse environmental effect on the landscape. One turbine will be visible from Highway 104, all turbines will be seen from either side of the Higgins Mountain Road and Turbines 2 and 3 will be seen from the heights above the ski slopes on the western side of Wentworth Valley. The turbines will not be seen from the floor of the Wentworth Valley or from Westchester Station.

Project Decommissioning: The decommissioning of the turbines would involve activities comparable to Project construction, and may generate some local interest. In summary, the decommissioning of the Project site will not result in a significant adverse environmental effect.

Malfunctions and Accidents: N/A.

Cumulative Assessment: there are no known other works taking place in the area, or in the vicinity of the site, that might act cumulatively with the construction and operation of the proposed turbines to cause a significant effect on landscape aesthetics.

Sustainable Use of Renewable Resources: N/A.

Residual Environmental Impact: **The Project is not anticipated to have a significant residual environmental effect on landscape aesthetics, i.e., the impact is predicted to be low.**

4.3 Effects of the Environment on the Project

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

Pathways: fire and extreme weather could adversely effect the proposed turbines as they could damage the installed facilities, reduce productivity and/or cause the turbines to be shut down.

Boundaries: the spatial boundaries for these effects are restricted to the footprint of the proposed WTGs. Temporal boundaries include all project phases: construction, operation and decommissioning.

Project Construction: fire and extreme weather events could adversely impact the project schedule, but such events are likely to be of short duration. The adverse effect is unlikely to be significant.

Project Operation: fire in the area could be instigated by both natural events, e.g., a lightning strike, or by humans. In addition to temperature related alarms on the turbines and transformers, there are fire watches during the most sensitive dry summer months in the region. It is therefore likely that any fire would be quickly detected and a prompt emergency response instigated. The turbine towers are also sufficiently high that damage to the nacelle is unlikely. Damage to power poles would be quickly repaired.

Extreme weather events, including any such events aggravated by global warming, including ice formation, hall or lightning strikes, could damage the turbines. During extreme high winds, or ice formation, the design is such that the wind turbines will cut out. These factors have been taken into consideration and losses to productivity are not a concern. The turbine towers will be equipped with lightning protection, and damage to turbines from such an event is considered a very rare event. The turbines are also designed to withstand severe events including hurricanes such as Juan in October 2003.

In conclusion, extreme weather events are unlikely to pose a significant adverse effect on project operation.

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

Malfunctions and Accidents: Extreme weather events would of their nature generate conditions that make malfunctions and accidents more likely to occur. The safety protocols and design criteria that will be employed will mitigate against these risks. Serious adverse effects are considered unlikely.

Cumulative Assessment: there are no known other works taking place in the area, or in the vicinity of the site, that might act cumulatively with severe weather events to increase the likelihood of an adverse environmental effect on the Project.

Sustainable Use of Renewable Resources: N/A.

Residual Environmental Impact: **extreme environmental events are not anticipated to have a significant residual environmental effect on the Project, i.e., the impact is predicted to be low.**

4.4 Summary of Potential Environmental Impacts

The anticipated impacts of Project construction, operation and decommissioning are summarized in Table 4.5.

Table 4-5: Summary of Environmental Impacts

VEC	Activity/Pathway	Potential Impact	Mitigation	Residual Environmental Effect
Surface and Groundwater Quality	Construction: i) disturbance of sediments ii) accidental release of hazardous materials	• siltation of ditches and/or watercourses • ground or surface water contamination	• distance from watercourses and wetlands • defined procedures to control run-off • adherence to all	Minimal residual effect

VEC	Activity/Pathway	Potential Impact	Mitigation	Residual Environmental Effect
			regulatory requirements for the handling of hazardous materials	
	Operation: i) accidental release of hazardous materials	• ground or surface water contamination	• adherence to all regulatory requirements for the handling of hazardous materials	Minimal residual effect
	Decommissioning: see construction above	• see construction above	• see construction above	Minimal residual effect
Species at Risk (except Avian Species)	Construction: i) ground disturbance	• individual kills • habitat disturbance	• most species will avoid human activity • minimal area involved relative to habitat	Low residual effect
	Operation: i) rotating blades	• apart from the potential for impact to bats, no impact to other species	• none advocated	Low residual effect
	Decommissioning: i) ground disturbance	• see construction above	• see construction above	Low residual effect
Avian Species	Construction: i) ground disturbance	• individual kills • habitat loss	• none advocated	Low residual effect
	Operation: i) rotating blades	• disturbance and individual kills	• none advocated	Low residual effect
	Decommissioning: i) ground disturbance	• see construction above	• see construction above	Low residual effect
Land Use	Construction: i) interference with access ii) removal of lands from productive use	• minimal interference or loss of productive use anticipated	• coordination of transportation of turbines with regulatory authorities	No impact
	Operation: i) introduction of new use	• new source of local revenue	• none required	No adverse impact, but some benefit
	Decommissioning: i) interference with access	• see construction above	• see construction above	No impact
Air Quality	Construction: i) ground disturbance	• generation of dust	• watering if necessary	Minimal residual effect

VEC	Activity/Pathway	Potential Impact	Mitigation	Residual Environmental Effect
	Operation: i) no pathway	• no impact	• none required	No impact
	Decommissioning: i) ground disturbance	• generation of dust	• watering if necessary	Minimal residual effect
Noise	Construction: i) vehicles and activities on-site	• temporary inconvenience	• none required	Minimal residual effect
	Operation: i) rotation of blades	• noise should be inaudible at nearest residence	• none required	No impact
	Decommissioning: i) vehicles and activities on-site	• temporary inconvenience	• none required	Minimal residual effect
Safety	Construction: i) icing and weather events	• care required for duration of construction	• instruction on hazards • construction in moderate weather conditions	Minimal residual effect
	Operation: i) icing and weather events	• ice sheeting	• none required	Minimal residual effect
	Decommissioning: i) icing and weather events	• see construction above	• see construction above	Minimal residual effect
Landscape Aesthetics	Construction: i) construction activities including transportation	• local curiousity	• none required	No impact
	Operation: i) presence of WTGs	• new structural element in landscape	• none required	Low residual effect
	Decommissioning: i) construction activities including transportation	• little, if any impact	• none required	No impact

4.5 Environmental Management and Monitoring

The proponent will honour all commitments made in this environmental assessment and will comply with all applicable laws and regulations. Many, if not all potential adverse effects, can be avoided through the application of good engineering and construction practices, the careful timing of activities and the adherence to appropriate environmental management techniques. All work in and around the site will be undertaken in accordance with the standards and protocols set out in the *Erosion and Sedimentation Control Handbook for Construction Sites.*

4.5.1 Bird Monitoring Protocol

The design of the bird monitoring program is based on the categorization of the proposed facility according to Environment Canada (2006a). The desktop and field breeding surveys show that the turbine sites may be within an area of high sensitivity, because of the presence of a rare breeding species with aerial displays, i.e., the Vesper Sparrow, and the presence of a landform, the north slope of the Cobequid Hills, which might concentrate migrants, specifically diurnal raptors. Combining this potentially high sensitivity with the small size of the proposed works suggests a Category 2 level of concern. It should be noted that further surveys might indicate a lower level of concern. The Vesper Sparrow territories noted at the site in 2006 were well away from any of the turbine locations, and the presence of autumn raptor movements is presently speculative; it is being field tested by an autumn background survey. If Vesper Sparrow territories remain distant from the turbine locations, and if no concentration of raptors is found in the autumn survey, the sensitivity of the site would be classed as medium and yielding a Category 1 level of concern.

Category 2 projects require pre-construction surveys that, apart from the autumn raptor survey, are now complete. These pre-constructions surveys did not yield significant concentrations of birds in the area that would require follow-up surveys, exceptions being the Vesper Sparrows and the possibility of fall raptor concentrations. Both Category 1 and 2 projects require carcass searches, although these may be minimal in Category 1 projects.

As a result, the proposed monitoring protocol is as follows:

- autumn raptor watches in the fall 2006, and possibly in the fall of 2007;
- breeding bird survey, with the focus on mapping Vesper Sparrows in the spring-summer of 2007; and
- carcass searches - one year, starting from the completion of turbines.

Protocols for each of the above are detailed below:

Raptor Watches

Watches for raptors will be conducted on at least three days during the peak of raptor migration, i.e., late September - early October (Tufts 1986), between 9:00 and 16:00 and on days with favorable tailwinds that are perpendicular to the north slope (northeast, north, or, preferably, northwest), as recommended by Environment Canada (2006a). Vantage points that offer views that include all three turbine sites, as well as the north slope which might concentrate migrants, are found on Webb Road, about 2 km west of Higgins Mountain Road. However, some time may also be spent watching from vantage points in fields between turbines 1 and 3, which offer more limited views but may offer better information on altitudes and flight paths. This work is underway.

If the 2006 fall survey reveals a concentration of migrant raptors near the turbine sites, the survey will be repeated in 2007, and modified to include both more of the migration period, i.e., about 10 days as recommended by Environment Canada (2006a) and also more detailed information on flight paths.

Breeding Bird Survey

It is proposed that Vesper Sparrow territories be mapped over three days in the spring and summer of 2007. Depending on the location of the territories, some behavioural observations may also be conducted to determine flight display heights and pathways. This work will also include a breeding bird survey that follows the protocol of the background survey, including point counts and area searches.

Carcass Searches

At least one year of carcass searches should be undertaken during the spring and fall migrations to check the assumption that nocturnal migrants will be unaffected by the turbines, and during the spring and summer because of the use of the fields by locally breeding raptors and aerially displaying Vesper Sparrows. The exact protocols, including the frequency of the searches, will be worked out according to the recommendations of Environment Canada (2006a).

4.5.2 Bat Monitoring Protocol

A bat monitoring protocol will be prepared once the results of the fall monitoring program have been compiled and analyzed. These results, together with recommendations as to whether further work in the field is necessary, will be submitted to the regulators.

Chapter 5 Conclusions

The proposed development off the Higgins Mountain Road in Cumberland County, Nova Scotia, will involve the construction of three wind turbines to generate approximately 3.5 MW of electricity. The electricity will be sold to NSPI.

The work undertaken to prepare this submission was designed to:

i) identify the potential environmental effects of the construction, operation and decommissioning of the proposed works; and
ii) satisfy the requirements of the *Nova Scotia Environment Act* for a Class I Environmental Assessment.

The proposed Project is located in the Cumberland Hills region of Nova Scotia, an area characterized by stands of mixed wood forest interspersed with open fields; many of the latter support commercial blueberries. Higgins Mountain Road is one of several largely unsurfaced roads in the area that provide access to the heights of land on the Cumberland Hills plateau. The WTG sites have been located to avoid a classic Black Spruce Bog and Harts Brook, a tributary of the Roaring River. No streams or wetlands are impacted by the proposed works.

Field investigations and databases searches were carried out to describe archaeological resources, the habitats and plants, the birds and the bats that use the lands in the vicinity of the WTG sites. The field programs took place at different times over a period from late spring to summer 2006. There are no archeological resources, rare plants or habitat critical to rare species in the Project footprint. Additional programs with respect to migratory raptors and migratory bats are being undertaken; the results will be forwarded on receipt. There are two bird species, the fisher, some invertebrates and the potential for bat species of concern to use habitat in the hills and slopes of the Cumberland Hills, but given the very limited Project footprint involved, no significant impact is predicted on any identified species.

The generation of electricity from renewable resources such as wind is in accordance with federal and provincial strategies to seek means to reduce the generation of green house gas emissions and air pollutants. The development of the three wind turbines off the Higgins Mountain Road would contribute to the reduction of such emissions in Nova Scotia.

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