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## **DIGBY WIND POWER PROJECT ADDENDUM**

Addendum to Environmental  
Assessment Registration Document



Report Prepared for:  
SkyPower Corp.  
250 Yonge Street  
Toronto, ON M5B 2L7

File: 1030972.02

July 3, 2009

DIGBY WIND POWER PROJECT ADDENDUM

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## **1.0 Introduction**

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SkyPower Corp. (SkyPower) is proposing to construct and operate a wind energy generation facility located in Gulliver's Cove, Digby County, Nova Scotia.

SkyPower, partnering with Scotian Windfields Inc. (together, the Proponent) filed an environmental assessment (EA) registration with Nova Scotia Environment (NSE) for the Digby Wind Power Project (the Project), in accordance with Part IV of the *Environment Act*.

The Deputy Minister of Nova Scotia Environment responded to the Environmental Assessment (EA) Registration on June 19, 2009 that additional information was required from the Proponent before a decision could be made regarding the application. The two primary issues included potential Project effects to landscape connectivity and wildlife movement, and noise from wind turbines. It is intended that this addendum document provides the additional information required to satisfy the Deputy Minister's request.

In order to provide context to the additional information requests and responses, the Proponent is also providing information concerning a refined turbine layout that addresses the NSE comments and input from the community gained through consultation conducted for the Project.

## **2.0 Project Update**

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The Proponent has revised the layout for the Project based on various considerations including stakeholder feedback, from both the public and regulators, and construction feasibility issues identified during detailed planning and design. Figure 1 in Appendix A displays the revised Project layout.

The revised layout has been assessed from technical, financial, socioeconomic and biophysical perspectives. This layout would result in less potential effects on the socioeconomic and biophysical environment and the constructability of the Project has improved (e.g., less road network, less watercourse crossings).

This section of the Addendum provides a summary comparison of the revised layout with the layout presented in the EA Registration document, as well as a brief description of the layout planning process to demonstrate how multiple factors were considered and balanced to determine turbine placement.

### **2.1 SITE LAYOUT REVIEW**

Although the modifications to the layout are not substantial, and are consistent with the analysis and conclusions presented in the EA Registration document, the revised layout is expected to result in improvements with respect to predicted biophysical and socioeconomic effects. In general, the revised layout results in an overall reduction of the physical footprint of the Project through consolidation of some turbine sites and a reduction in access roadway. This has improved habitat connectivity in the Project area as well as reduced the overall amount of habitat directly affected by Project components. The average distance from residential receptors has increased with the revised layout and the predicted noise received by those receptors has decreased.

Table 1 summarizes the changes associated with the revised layout for each Valued Environmental Component (VEC) previously evaluated in the EA Registration document.

As discussed in Section 3.2 of the EA Registration document, a significant adverse effect is defined as a permanent change in the quality or condition of a component of the environment. It must be spatially and temporally extensive and not within acceptable limits in terms of magnitude or nature based on guidelines, standards and professional judgment. Natural Resources Canada criteria and definitions provided in “Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms under the *Canadian Environmental Assessment Act*” (2003) were used to determine level of impact after mitigation measures. The EA Registration document concluded that residual effects associated with Project construction and operations were predicted to be not significant, after application of mitigation measures, and regional economic benefits would result. As summarized in Table 1, the revised layout would result in an improvement in respect of the interaction of the Project with a number of VECs. The

EA Registration document conclusion that there is no significant adverse residual effect remains valid considering the revised layout.

**Table 1 Summary of Effects and Significance Prediction Comparison of Site Layouts (EA Registration and Revised)**

VEC	Summary of Effects Comparison	Biophysical/ Socioeconomic Effect Change	Significance Prediction
Birds and Other Wildlife	The revised layout reduces physical footprint across the peninsula, resulting in less habitat fragmentation and less constraint of wildlife movement and migration along the peninsula. Reduced access roadway will also reduce direct effects on habitat. Mitigation remains valid.	Positive	No significant adverse residual effect
Soils and Vegetation	The revised layout reduces physical footprint with less access roadway. Turbines and roadways remain preferentially located in previously disturbed areas (e.g., clearcut, existing woods roads. Mitigation remains valid.	Positive	No significant adverse residual effect
Wetlands	The revised layout maintains avoidance of wetlands where possible. No turbines are sited within wetland areas; access roads designed to minimize interaction with wetlands. Mitigation remains valid.	Neutral	No significant adverse residual effect
Water Quality/Aquatic Environment	The layout presented in the EA Registration document contained three potential watercourse crossings. The revised layout results in two potential watercourse crossings (WC-1 and WC-3), neither of which were identified as potential fish habitat during the 2008 field surveys. Mitigation remains valid.	Positive	No significant adverse residual effect
Noise	The revised layout will result in a measureable improvement with respect to received sound pressure levels at nearby receptors. As shown on Figure 2 in Appendix A, change in sound pressure levels for the village at Gulliver's Cove, the houses south of the west block, and the houses south of the east side decrease from 39, 39, and 38 to 38, 34, and 36 dBA, respectively resulting in a small but positive change. Mitigation remains valid.	Positive	No significant adverse residual effect
Recreation and Tourism	The revised layout is not likely to result in any appreciable difference in effects on recreation and tourism compared with results presented in the EA Registration document.	Neutral	No significant adverse residual effect
Visual	The revised layout results in minor changes to the visual effects predicted in the EA Registration document. An updated figure showing the shadow flicker modelling results is included in Appendix A. Section 5.2.1.5 of the EA Registration document reported that, in a worst case analysis, no residence will experience shadow flicker for more than 30 hours per year and approximately nine residences would experience shadow flicker for between 1 and 30 hours a year. With the revised layout, no residence will experience shadow flicker for more than 30 hours per year and approximately 5 residences will experience shadow flicker for between 1 and 30 hours per year, resulting in a minor improvement. The general level of visibility of turbines from selected viewpoints presented in the EA registration document is improved (i.e., less visible) with the revised layout. Mitigation remains valid.	Positive	No significant adverse residual effect

**Table 1 Summary of Effects and Significance Prediction Comparison of Site Layouts (EA Registration and Revised)**

VEC	Summary of Effects Comparison	Biophysical/ Socioeconomic Effect Change	Significance Prediction
Archaeological and Cultural Resources	The revised layout avoids areas identified during a preliminary archaeological review as high potential for First Nation and Acadian artifacts as did the layout evaluated in the EA Registration document. However, the revised layout places the closest turbines and associated access roads at a greater distance from these high potential areas and thus may be considered an improvement. Mitigation remains valid.	Positive	No significant adverse residual effect
Land Use	The revised layout results in a greater average distance to residences. Table 2 in Section 3.2 compares the relative proximity between the two layout scenarios. Given the predicted improvements in noise and visual effects, there is predicted to be an improvement in predicted effects on land use. Mitigation remains valid.	Positive	No significant adverse residual effect
Health and Safety	There is not likely to be any appreciable differences in predicted health and safety effects associated with the revised layout. As indicated in Section 5.2.1.8 of the EA Registration document, there are no predicted residual (i.e., after mitigation is applied) effects on health and safety. Mitigation remains valid.	Neutral	No significant adverse residual effect
Local Community	There is not likely to be any appreciable differences in predicted effects on the local community associated with the revised layout. In general, the Project is expected to result in a number of benefits to the local and regional community through landowner leases, employment and tax revenue. Mitigation remains valid.	Neutral	No significant adverse residual effect

## 2.2 SITE SELECTION PROCESS

Several issues communicated during the review of the EA Registration document, including those identified as requiring additional information by the Deputy Minister relate to the issue of site selection.

The Proponent considers a number of aspects when developing a Project layout. Key considerations include: environmental constraints; wind resource management; landowner agreements and preferences; and community/stakeholder feedback.

The Proponent identified Gulliver's Cove as a potential area for development based on community interest, land availability, and access to connect to the utility.

Prior to evaluating the wind resource, the Proponent initiated an environmental issues scan of the potential Project area to characterize the existing biophysical, socioeconomic, and regulatory environment based on available information (e.g., relevant literature, provincial mapping databases, species at risk and habitat databases, etc.). This work was completed in June 2007 and did not identify any critical biophysical, socioeconomic, and regulatory issues that would preclude site development in this area.

Research was also conducted to determine the setback and constraint requirements and/or recommendations for wind power development projects in Nova Scotia and other jurisdictions in Canada. In the absence of specific setback requirements at a provincial or municipal level (*i.e.*, Digby County), setbacks were applied from several features including, but not limited to: residences, property lines, roads, communication towers, transmission lines, watercourses, and wetlands.

After the environmental constraints analysis, the Proponent's scientists and engineers measured the wind speeds and other climatic conditions. This data was then used to estimate how much energy the Project would produce, and as well to generate a wind resource map. This information became vital in focusing on the locations within the Project area where the best wind resources were available and where landowners should be approached to solicit potential interest in Project participation. (*e.g.*, possible wind turbine locations). Available lands with sufficient wind resource were then screened against a series of environmental and social constraints to further refine suitable turbine locations.

Inputs from the environmental constraints analysis and the wind measurement data provided an indication of the areas whereby the wind project may be developed. All of the lands under consideration were privately owned. Based on this analysis landowners were identified and negotiations on landowner agreements commenced in the middle of 2007.

Input from participating landowners was also considered, taking a variety of forms, including preference for the location of potential wind turbines (and other components of the Project) and their own potential future development of their property. Integral to the success of the development process is the continuing support and cooperative relationship the Proponent fosters with participating landowners. This relationship plays a significant role in the specific location of wind turbines within the Project area.

Ongoing communication with Project stakeholders also influenced Project design. For example, feedback from the community during a municipal council meeting in November 2008 resulted in the relocation of wind turbines originally located south of Highway 217 near Rossway to address visibility concerns.

Specific constraints revealed during environmental surveys and/or during regulatory review of the draft EA Registration document also influenced refinement of the layout. In particular, concerns raised by NSDNR on cliff habitat and a sighting of a Peregrine Falcon during a vegetation survey, resulted in a setback of turbines and roads more than 300 m from the cliff areas and more than 900 m from the location where the Falcon had been observed.

Through various consultation mechanisms, including the open house in November 2008 and the public review of the EA Registration document, community members expressed concerns about proximity of wind turbines to residences. In addition, regulatory and non-governmental organization reviewers expressed concern about Project layout relative to habitat connectivity

and potential effects on wildlife migration. These concerns influenced the development of the revised layout.

Over the course of the planning period for the Project, the layout has undergone several modifications, notwithstanding diminishing economic returns, in response to environmental and socioeconomic siting considerations. However, the revised layout achieves a balance between socioeconomic and biophysical constraints while ensuring the Project remains economically viable.



### 3.0 Responses to Additional Information Requests

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#### 3.1 LANDSCAPE CONNECTIVITY

**Additional Information Request:**

*“During the environmental assessment review it was determined that additional information is required concerning turbine placement and their impact on landscape connectivity and species movement. This information must be developed in consultation with Nova Scotia Department of Natural Resources. Additional information may also be required with respect to potential adverse environmental effects of the Digby Wind Power Project in the event turbines are relocated to accommodate species movement.”*

**Response:**

A common issue raised in respect of wind projects is the potential impact on species movement and landscape connectivity. Nova Scotia Department of Natural Resources (NSDNR) has commented that the Project could potentially impede wildlife migration along Digby Neck. The Proponent has taken efforts to minimize effects on habitat fragmentation and species movement through Project design.

As discussed above in Section 2.2, an environmental issues identification exercise was undertaken prior to any initial turbine layouts to identify significant environmental issues using available information including, but not limited to, species at risk, significant habitats and protected areas. Environmental constraints such as wetlands, watercourses and intact forest habitat were identified as constraints to be avoided to the extent possible during site design. Plant and wildlife surveys were conducted in 2008 to provide additional information on local habitat and species. As a result of survey work and aerial photography interpretation, effort was made to make use of existing disturbed areas (e.g., clear cut areas, woods roads) to the extent practical and minimize additional habitat fragmentation.

As indicated in Section 5.1.1 of the EA Registration document, the Proponent has committed that, “where possible, micro-siting of infrastructure will also take into consideration connectivity of landscape to maintain potential corridors for wildlife migration through the area. Appropriate construction work zones will be chosen, to the extent practical, in order to limit the degree of disturbance” (p. 5.4). Section 5.1.2 of the EA Registration document (p. 5.9) characterizes the types of habitats to be affected by Project development and emphasizes the Proponent’s commitment to minimize the area of habitat to be cleared by using, the extent possible, previously disturbed areas (e.g., clear cut areas, woods roads).

Consultations were undertaken with NSDNR to clarify review comments around the endangered American Marten (*Martes americana*) and sensitive Fisher (*Martes pennanti*), as well as

landscape connectivity. As indicated in Section 4.4.2.1 of the EA Registration Document, it was determined that it is unlikely that the American Marten and Fisher would be affected by the Project based on consultation with the NSDNR regional biologist. Regarding the issue of landscape connectivity, NSDNR clarified their concerns about constricted species movement along the peninsula given the Project footprint as presented in the EA Registration document.

As shown in Figure 1, the revised Project layout minimizes the Project footprint by consolidating turbines in roughly two parallel lines along the mountain ridge on the western parcel of Project lands. This configuration is located more than 300 m from the Bay of Fundy coast resulting in avoidance of cliff habitat previously identified by NSDNR as a sensitive habitat to be avoided and also maintains approximately 50 percent of the peninsula width to the south side of the turbine alignment. This alignment option has turbines placed predominantly within previously disturbed (e.g., clear cut) areas and minimizes effects on wetland complexes and residences located to the south.

In the eastern parcel, Project infrastructure was sited, to the extent possible given other constraints (refer to Section 2), to avoid sensitive environmental features such as wetlands and watercourses. The turbines in the eastern parcel are aligned as two parallel lines, approximately 700 m apart, running in a northeast/southwest direction, to avoid a large wetland complex associated with Haight Brook which could potentially serve as key wildlife habitat and corridor for wildlife movement through the area.

The conclusions of the EA Registration document remain valid in that there are no predicted significant adverse residual effects on wildlife species with the revised layout. The Proponent has committed to working with NSDNR and Canadian Wildlife Service (CWS) to develop appropriate follow-up monitoring programs including post-construction bird use surveys that will build on existing data of bird use in the area further contribute to the understanding of potential effects of habitat fragmentation.

## **3.2 NOISE ISSUES**

### **3.2.1 Proximity to Receptors**

#### **Additional Information Request:**

*“During the review local residents expressed concern about the potential for noise from the wind farm. The Registration Document failed to provide sufficient detailed information about the proximity of nearby residents to the turbines. SkyPower Corp. must, therefore, provide a description of the proximity of the proposed project to affected receptors including the number of residences and sensitive receptors such as day cares, hospitals, or seniors’ residences within intervals of 600 m, 1 km, 1.5 km and 2.0 km”.*

**Response:**

A field-truthing study was conducted to confirm potential receptors within the Project area including a 1 km buffer. This study identified 133 receptors. Of these, there were no day care centers, hospitals or seniors' residences identified; there are no such facilities within 2 km of any turbine in the Project area. Table 2 shows the number of receptors within distances of 600 metres, 1 km, 1.5 km and 2 km, from the Project turbines.

**Table 2        Number of Receptors at 600 metres, 1 km, 1.5 km and 2 km, from Project Turbines**

<b>Distance from Wind Turbine (m)</b>	<b>Number of Receptors (Using EA Registration Turbine Layout)</b>	<b>Number of Receptors (Using Revised Layout)</b>
600	2	0
1000	62	39
1500	109	82
2000	124	113

**3.2.2    Effect of Water on Noise Levels**

**Additional Information Request:**

*"In addition, although the Registration Document states that sound levels at receptor locations will likely be dominated by existing background levels and not by the sound produced from the operations of the proposed Digby Wind Power Project, there is no assessment of the possible effect of the nearby water on noise levels. SkyPower Corp. must include this assessment within the noise simulation model and identify potential effects of the ocean on noise levels".*

**Response:**

As wind speeds increase, typically the sound power output from turbines increases, but the background sound level also increases. It has generally been considered that the increased background wind noise will cause some masking of the sound levels from the turbines. In certain situations, the situation may be more complex. In meteorological terms, the vertical temperature structure of the atmosphere is a measure of its stability. In a stable atmosphere, temperature tends to increase with height. In an unstable atmosphere, temperature decreases with height. A neutral atmosphere is between the two. If the atmosphere is very stable, the vertical mixing of the atmosphere is reduced. It is this mixing action that brings the faster winds aloft to the surface and makes the surface "windier". Most people are familiar with this phenomenon, it accounts for the fact that wind speeds at the surface are generally higher during the daytime, and lower at nighttime. This is because the atmosphere is generally unstable or neutral in the daytime and stable at nighttime. This daily stability regime is dominated by the role of the sun, but can also be affected to some degree by factors such as the proximity of cold water bodies. If the wind blows across cold water, it tends to be cooled at the surface, resulting in a localized stable atmosphere. Although the mechanical turbulence due to topography itself

causes mixing, and the mixing tends to remove the stability effect, some degree of stability may remain beyond the coastline.

The existence of a stable atmosphere has two potential effects in sound analysis for wind turbines. First, if the surface wind speed is used to estimate the wind speed at hub height, the hub height speed may be underestimated. In the analysis for the Project, this method was not used. Rather, the maximum sound power level at turbine height was used, not the maximum computed from the wind speed. This prevented underestimation of the sound power level. The second potential effect is the lower level of masking noise that is produced relative to turbine noise. The masking noise is produced by wind in the lower levels of the atmosphere. The Ontario guidelines were used in this analysis. The Ontario guidelines assume that there is an increase in both the turbine sound and background sound with wind speed in normal situation. At the low end of the wind speeds, the Ontario guideline limit is 40 dBA, but increases with wind speed under the assumption that the background sounds increase with wind speed. If there is an enhanced stability, then the wind that causes background sound may not increase as much as that which causes sounds from the turbine. If it is assumed that these background sounds do not increase with wind speed (*i.e.*, the hub height speed increases, but the surface level does not), then the limit should also be 40 dBA at higher wind speeds. The Project meets this more stringent criterion, as has been demonstrated in the acoustic modeling.

In adopting an effective limit of 40 dBA, the analysis has allowed for a decreased level of masking sound that may occur during conditions where stability is enhanced by winds off the colder ocean. It is likely that the background sounds will increase to some degree, but, as an additional safeguard, the Proponent has adopted this approach.

### **3.2.3 Noise Mitigation**

#### **Additional Information Request:**

*"In addition, they must provide mitigation measures that will be taken to reduce public exposure to noise, in accordance with the requirements of the Proponent's Guide to Wind Power Projects."*

#### **Response:**

As indicated in the EA Registration document (Section 5.2.1.6, Table 5.10 and Appendix F), the Project is not likely to have a significant adverse residual effect with respect to sound levels. However, the Proponent is committed to monitoring noise as required, and will consider appropriate mitigation measures, if necessary.

Mitigation of noise, if necessary, would include the measures identified in Table 6.1 of the EA Registration document:

- Noise monitoring on a routine or complaint-driven basis;
- Strict adherence to equipment maintenance schedule; and/or

- Root cause analysis if further analysis is required.

Additional mitigation measures may be necessary based on the results of any root cause analysis and would be determined in consultation with NSE.

### **3.2.4 Low Frequency Noise and Health Effects**

#### **Additional Information Request:**

*“SkyPower Corp. must also further assess potential project-related sources of low frequency noise and identify any potential health effects. This information should be used to assess whether or not monitoring for low frequency noise is warranted.”*

#### **Response:**

As indicated in the EA Registration document (Section 5.2.1.8), there is no evidence that the wind turbine technology proposed for the Project presents any potential problems related to the generation of infrasound energy. Although it is acknowledged that wind turbines are capable of generating infrasound, the level of infrasound near a wind turbine is similar to ambient infrasound levels existing in the natural environment. No adverse health effects due to infrasound are likely. In addition to the evidence referenced in the EA Registration document, there are additional recent studies which corroborate this conclusion. The Canadian Wind Energy Association (CanWEA) has prepared a paper summarizing publications on the subject of turbines and human health, including infrasound issues (refer to Appendix B). The paper reiterates that surveys of peer-reviewed scientific literature have consistently found no evidence linking wind turbines to human health concerns. Please note, the Hepburn 2005 citation in the EA Registration document should be corrected as follows: *Hepburn, Howard G. 2006. “Acoustic and Geophysical Measurement of Infrasound from Wind Farm Turbines.” Canadian Acoustics 34.2 (June 2006).*

## 4.0 Public Issues and Concerns

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Section 7 of the EA Registration document details the stakeholder consultation process undertaken for the Project and includes a discussion of comments received at the November 17, 2008 Open House as well as the Proponent's response to these comments.

Various comments were submitted to NSE during the public review process of the EA Registration document. The Proponent has considered each of these comments, some of which are addressed by the revised site layout which is presented in this document.

A total of 47 comments were received, of which fourteen (29.8%) were in support of the Project. Some of these comments included:

- *"[the] Project is an excellent giant step to demonstrate our commitment to create more renewable energy in the province."*
- *"I applaud the efforts of that Scotian WindFields and SkyPower to establish a wind park in Digby."*
- *"I give my full support for the project and want to see more in the province."*
- *"I believe that the investment in renewable energy is not only good for the environment, it is also good for their local economy."*
- *"It will bring economic growth to the community, while also providing clean power."*
- *"We expect that alternative energy projects such as wind farms would have a positive impact on air quality these projects reduce the reliance on fossil fuels."*

Based on a review of all the comments received, the following issues and concerns were deemed to be of greatest concern to the local community:

- Noise/infrasound;
- Public consultation/level of communication;
- Effects on property value;
- Proximity to residences; and
- Potential health effects.

## **ISSUE 1: Noise/Infrasound**

Section 5.2.1.6 and Appendix F of the EA Registration document addressed the issue of noise emissions from the Project and concluded that the Project will not have a significant effect with respect to sound levels, on nearby receptors. A noise modeling exercise was undertaken for the revised layout demonstrating a measurable improvement in sound pressure levels at nearby receptors.

In order to assess the effect of the layout revision on the sound levels of the Project, the Project was remodeled using the same software and methods as in the EA Registration document. In brief, CADNA, an internationally accepted noise model based on the ISO 9613-1 and ISO 9613-2 algorithms, was employed and set to evaluate every turbine as if the wind were oriented from the turbine to each source, and at the temperature and humidity levels most conducive to sound transmission in the atmosphere. Although not strictly worst-case, the settings are considered to overestimate the sound transmission. Figure 2 (Appendix A) shows an overall decrease in received sound pressure levels as a result of the revised layout (refer also to Table 1).

Additional information with respect to noise and infrasound in response to the Deputy Minister's request for additional information is provided in Section 3.2 of this Addendum.

## **ISSUE 2: Public Consultation/Level of Communication**

Several respondents expressed concern about what they perceived to be a lack of communication by the Proponent regarding the Project. The Proponent has demonstrated its commitment to public and stakeholder consultation through a number of initiatives, some of which are described in the following section.

### **Open House Meetings**

The Proponent conducted a public Open House meeting on November 17, 2008 at the Gulliver's Cove Community Centre. Comments from the public were solicited at this information session and considered by the Proponent.

The Proponent will continue to engage the community concerning the Project and has refined the Project layout, in part, to respond to concerns relating to the proximity of turbines to residences.

The next public Open House is planned for July 9, 2009 in Digby at the Fire Department Hall. The focus of the meeting will be to discuss: the Project, the status of regulatory approval, the revised Project layout, in particular highlighting revised setback distances and noise and visual assessments. Several representatives from SkyPower and Scotian Windfields will also be on hand to address questions or concerns raised by members of the community.

### **Newsletter and Website**

The Proponent distributed its first newsletter in June 2009 and will continue this practice throughout the construction and operational phases of the Project. The Proponent has established an Internet site (<http://www.digbywindproject.com>) to provide information to interested stakeholders through the life of the Project. Project plans, activities, public meetings, open houses, and other information will be provided in the newsletters and posted on the website. Updates and new information will be issued from time to time as the Project continues in order to inform the public concerning Project activities and schedules.

### **ISSUE 3: Effects on Property Values**

Section 5.2.1.4 of the EA Registration document addresses the issue of potential effects on property values and concludes that impacts on property values as a result of the Project are likely to be negligible.

### **ISSUE 4: Proximity to Residences**

Section 3.2.1 of this document provides information on proximity of Project turbines to residences, comparing the layout presented in the EA Registration document with the revised layout. As discussed above, one of the key issues driving the revision of the layout was the stakeholder concern about proximity of turbines to residences. The revised layout results in a reduction of receptors within 1 km of Project turbines from 62 to 39 (refer to Section 3.2.1 of this Addendum for more information).

### **ISSUE 5: Potential Health Effects**

Section 5.2.1.8 of the EA Registration document addresses the potential health and safety effects associated with the Project and concludes there are not likely to be any residual effects on health and safety. Section 3.2.4 of this Addendum addresses the issue of potential health effects associated with low frequency noise (*i.e.*, infrasound).



## **5.0 Closure**

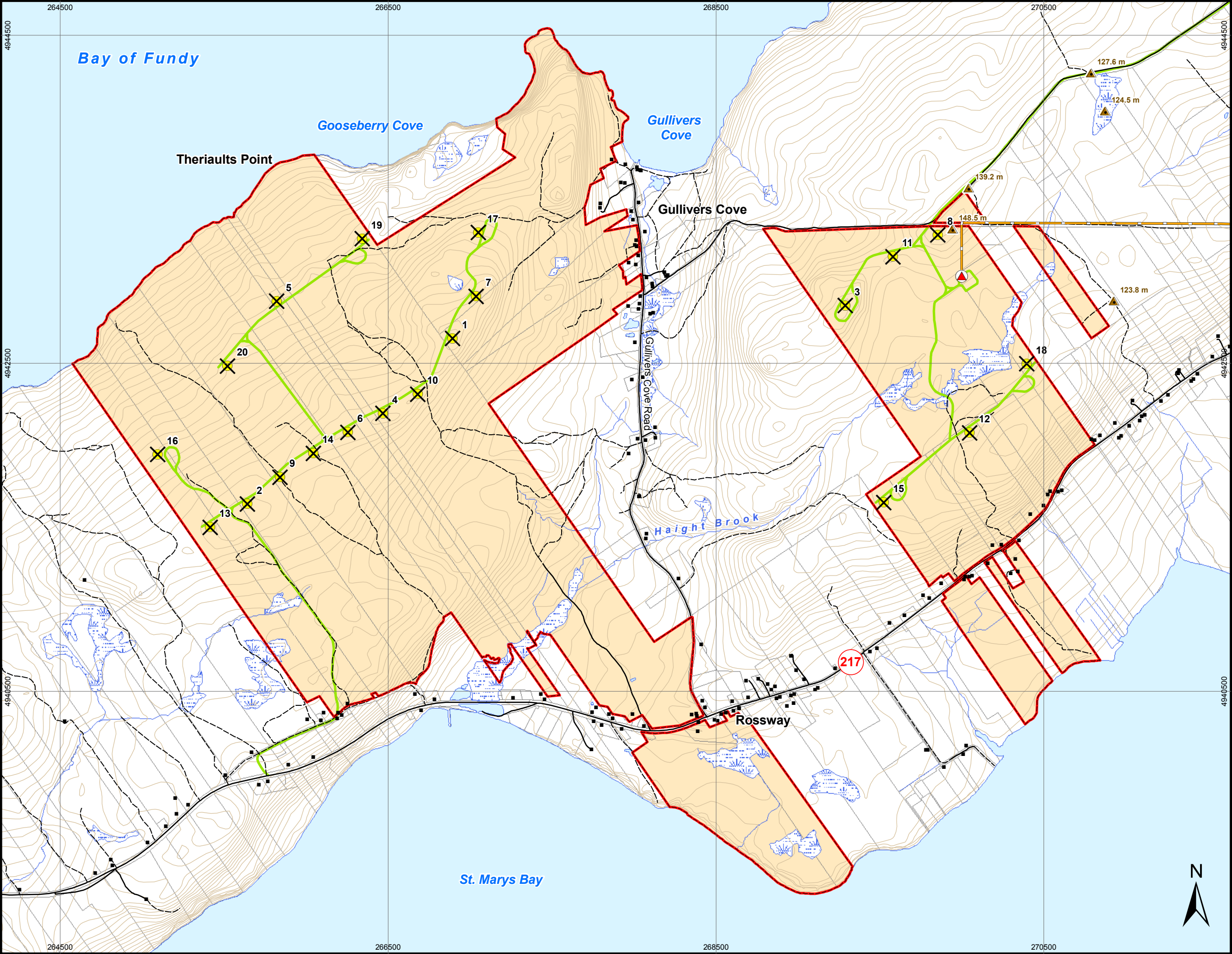
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This document has been prepared with the intent of addressing the request for additional information issued by the Deputy Minister of Environment on June 19, 2009 thereby meeting regulatory requirements for the environmental assessment process to proceed.

Additional information has also been provided concerning a revised turbine layout that addresses NSE comments and input from the community gained through consultation conducted for the Project.

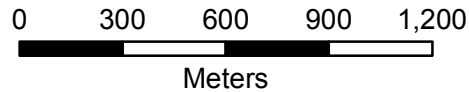
In closing, the Proponent looks forward to moving ahead with this Project, aimed at having a positive effect on the environment through displacement of burning fossil fuel. We are committed to helping Nova Scotia meet its Climate Change Action Plan target of 5 megatonne annual greenhouse gas emission reduction by 2020, ultimately reducing harmful emissions by at least 10 percent from 1990 levels. Finally, we remain committed to working with the stakeholders and the public through all stages of the Project to ensure that their concerns are addressed.

**APPENDIX A**  
**Report Figures**



**Figure 1**  
DIGBY WIND POWER PROJECT  
**Site Plan**  
(REVISED LAYOUT)

- Project Components**
- Proposed 69 kV Substation
  - Proposed Turbine Location
  - Proposed Turbine Access Road
  - Proposed Transmission Route
  - Nov. 28-08
  - Proposed Site Development Area
- Map Features**
- Building
  - Spot Elevation
  - Road
  - Unpaved Road
  - Railroad
  - Contour (5m)
  - Watercourse
  - Wetland
  - Waterbody
  - Property Boundary

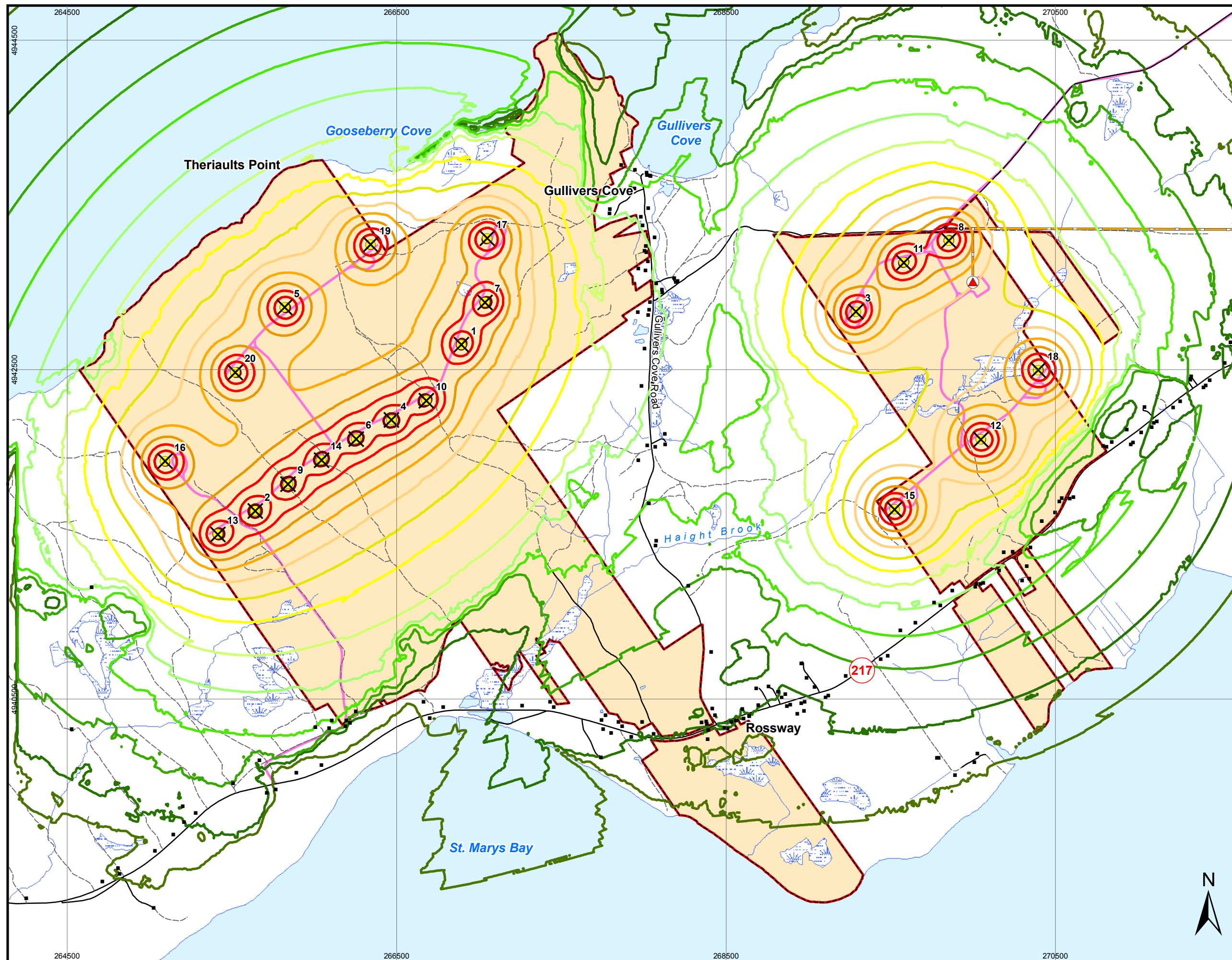



Data Sources:  
Planimetric Data - NSGC; Nova Scotia Topographic Database (NSTDB), 1997, 1:10 000 (GeoNOVA)  
Project Components - Skypower, Nov. 2008  
Wetlands - NSTDB & NSDNR; Wetland Inventory Mapping, 2007, 1:10 000

Map Parameters  
Projection: UTM/NAD83/Z20  
Scale 1:22,000  
Date: July 2009  
Project No.: 1030972.01









**Figure 2**

DIGBY WIND POWER PROJECT

**Noise Contours**

**at a Wind Speed of 7 Metres/Second**

**(REVISED LAYOUT)**

**Noise Contours**

30 db	44 db
32 db	46 db
34 db	48 db
36 db	50 db
38 db	52 db
40 db	54 db
42 db	56 db

**Project Components**

- Proposed Turbine Location
- Proposed 69 kV Substation
- Proposed Turbine Access Road
- Proposed Transmission Route Nov. 28-08
- Proposed Site Development Area

**Map Features**


- Building
- Road
- Unpaved Road
- Railroad
- Watercourse
- Wetland
- Waterbody

0 300 600 900 1,200

Meters

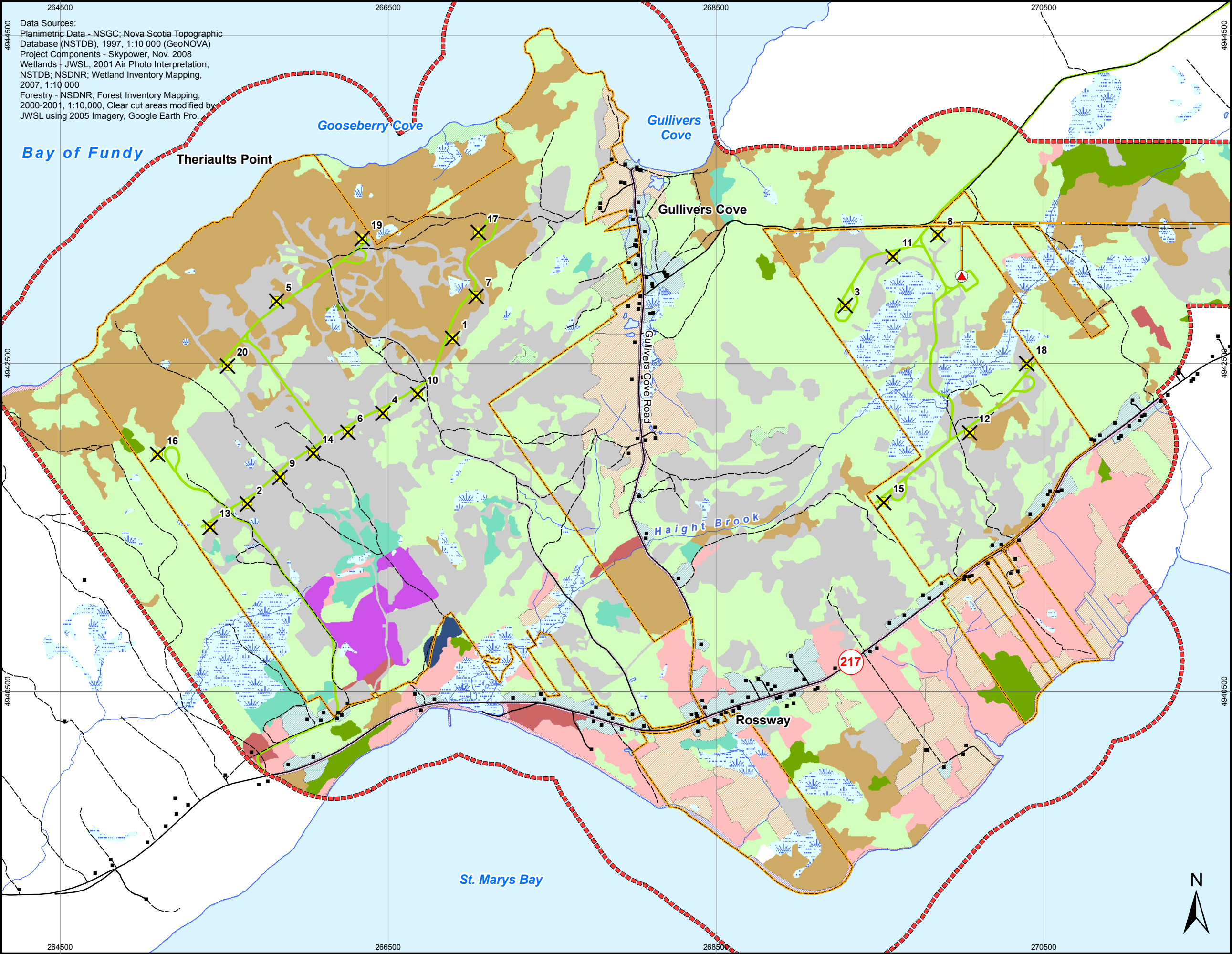
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Scale 1:22,000  
Date: July 2009  
Project No.: 1030972.01



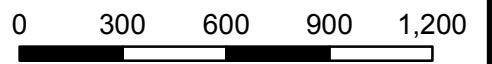
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**Figure 3**  
DIGBY WIND POWER PROJECT  
**Habitat Map**  
(REVISED LAYOUT)

- Project Components**
- Proposed Turbine Location
  - Proposed 69 kV Substation
  - Proposed Turbine Access Road
  - Proposed Transmission Route
  - Nov. 28-08
  - Study Area
  - Proposed Site Development Area
  - Watercourse
  - Wetland
  - Waterbody
- Main Forested Land Cover**
- Softwood - 75% softwood species
  - Mixedwood - 74-26% softwood species
  - Hardwood - < 25% softwood species
- Other Forested Land Cover**
- Natural Stand
  - Treated
  - Old Field
  - Dead
  - Tall Shrub Thicket
  - Clear Cut
- Non-Forested Land Use**
- Cliff, Dunes, Coastal Rock
  - Barren
  - Agriculture
  - Urban
  - Beach
  - Gravel Pit
  - Road Corridor



Map Parameters  
Projection: UTM/NAD83/Z20  
Scale: 1:22,000  
Date: July 2009  
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**APPENDIX B**  
**Supporting Documentation**

## ***ADDRESSING CONCERNS WITH WIND TURBINES AND HUMAN HEALTH***

**Revised: April 2009**

At present there are well over 10,000 wind turbines installed and operating in North America, and tens of thousands of people who live and work in proximity to these wind turbines. Of these individuals, a very small number have claimed that their health has been negatively impacted by wind turbines. However, surveys of peer-reviewed scientific literature have consistently found no evidence linking wind turbines to human health concerns. It is important to note that all wind energy projects are required to undertake environmental assessments that assess the potential impacts of wind turbines on ecosystems and human health. The studies also ensure that the installations meet strict government regulations with respect to sound.

Certain individuals contend that wind turbines can adversely impact the health of individuals living in proximity to wind turbines. A prominent advocate of this view is Dr. Nina Pierpont of Malone, New York who claims that people living in proximity to wind farms may suffer from “Wind Turbine Syndrome”. This view, however, is not supported by scientists who specialize in acoustics, low frequency sound and related human health impacts. It is important to point out that none of the work by Dr. Pierpont - or others claiming similar impacts – has been published in peer-reviewed journals. This fact raises questions as to the scientific validity of these assertions.

The following is a concise summary of articles and publications on the subject from reputable sources in Europe and North America:

1. *“Infrasound from Wind Turbines – Fact, Fiction or Deception?”* by Geoff Leventhall in Vol. 34 No.2 (2006) of the peer-reviewed journal Canadian Acoustics. This paper looks at the question of whether or not wind turbines produce infrasound at levels that can impact humans. It directly addresses assertions frequently made by Dr. Nina Pierpont, author of a recent book entitled “Wind Turbine Syndrome”. “In the USA, a high profile objector (Nina Pierpont of Malone NY) placed an advertisement in a local paper, consisting entirely of selected quotations from a previously published technical paper by van den Berg (Van den Berg 2004). However the comment “[i.e. infrasonic]”, as shown in Fig 3, was added in the first line of the first quotation in a manner which might mislead naive readers into believing that it was part of the original. The van den Berg paper was based on A-weighted measurements and had no connection with infrasound. So, not only is the advertisement displaying the advertiser’s self deception, but this has also been propagated to others who have read it. [...] Claims of infrasound are irrelevant and possibly harmful, should they lead to unnecessary fears.”  
[www.wind.appstate.edu/reports/06-06Leventhall-Infras-WT-CanAcoustics2.pdf](http://www.wind.appstate.edu/reports/06-06Leventhall-Infras-WT-CanAcoustics2.pdf)
2. *“Context and Opinion Related to the Health Effects of Noise Generated by Wind Turbines”*, Agence Française de Sécurité Sanitaire de l’Environnement et du Travail

(Afsset), 2006. Afsset was mandated by the Ministries responsible for health and the environment to conduct a critical analysis of a report issued by the *Académie nationale de médecine* that advocated the use of a minimum 1,500 metre setback distance for 2.5 MW wind turbines or more. The Afsset report concluded that “It appears that the noise emitted by wind turbines is not sufficient to result in direct health consequences as far as auditory effects are concerned. [...] A review of the data on noise measured in proximity to wind turbines, sound propagation simulations and field surveys demonstrates that a permanent definition of a minimum 1,500 m setback distance from homes, even when limited to windmills of more than 2.5 MW, does not reflect the reality of exposure to noise and does not seem relevant.” <http://www.afsse.fr/index.php?pageid=1862&parentid=523> (in French only – please contact CanWEA for an English translation of this text)

3. Summary of research on wind turbines, noise and possible health effects, commissioned by the UK Government’s Department for Business, Enterprise & Regulatory Reform:
  - a. In 2006 the UK Government published a study by Hayes McKenzie which investigated claims that infrasound or low frequency noise emitted by wind turbine generators was causing health effects. The report concluded that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines. The report went on to note that a phenomenon known as Aerodynamic Modulation (AM) may be the cause of these complaints. ([www.dti.gov.uk/energy/sources/renewables/publications/page31267.html](http://www.dti.gov.uk/energy/sources/renewables/publications/page31267.html))
  - b. The Government then commissioned experts at Salford University to investigate Aerodynamic Modulation and the broader issue of noise from wind turbines. The Salford research looked at 133 wind farms and concluded that “... in terms of the number of people affected, wind farm noise is a small-scale problem compared with other types of noise; for example the number of complaints about industrial noise exceeds those about windfarms by around three orders of magnitude” and that “The low incidence of AM and the low numbers of people adversely affected make it difficult to justify further research funding in preference to other more widespread noise issues.” [http://usir.salford.ac.uk/1554/1/Salford\\_Uni\\_Report\\_Turbine\\_Sound.pdf](http://usir.salford.ac.uk/1554/1/Salford_Uni_Report_Turbine_Sound.pdf).
  - c. Based on these findings, the U.K. Government published a statement indicating that “Government does not consider there to be a compelling case for further work into AM and will not carry out any further research at this time.” <http://www.berr.gov.uk/files/file40571.pdf>
4. “*Health impact of wind turbines*”, prepared by the Municipality of Chatham-Kent Health & Family Services Public Health Unit. This is a comprehensive review of available literature on the subject. This paper concludes and concurs with the original quote from Chatham-Kent’s Acting Medical Officer of Health, Dr. David Colby: “In summary, as long as the Ministry of Environment Guidelines for location criteria of wind farms are followed, it is my opinion that there will be negligible adverse health impacts on Chatham-Kent citizens. Although opposition to wind farms on aesthetic grounds is a legitimate point of view, opposition to wind farms on the basis of potential adverse health



consequences is not justified by the evidence.” <http://www.chatham-kent.ca/NR/rdonlyres/CA6E8804-D6FF-42A5-B93B-5229FA127875/7046/5a.pdf>

5. “*Wind Turbine Acoustic Noise*”, A White Paper by Dr. Anthony Rodgers at the University of Massachusetts at Amherst. This paper looked into the issue of both sound and infrasound (low frequency sound) and concluded “There is no reliable evidence that infrasound below the perception threshold produces physiological or psychological effects.”  
[http://www.ceere.org/rerl/publications/whitepapers/Wind\\_Turbine\\_Acoustic\\_Noise\\_Rev\\_2006.pdf](http://www.ceere.org/rerl/publications/whitepapers/Wind_Turbine_Acoustic_Noise_Rev_2006.pdf)
6. “*Recent Studies of Infrasound from Industrial Sources*” by William Gastmeier and Brian Howe, presented at the Canadian Acoustical Association, October 2008. The authors “conducted several infrasound studies using refined measurement methods to isolate the infrasound energy produced by industrial sources from naturally occurring infrasound in the environment.” The results conclude “that infrasound from wind turbine generators is well below any realistic human perception limits.” Available from the Canadian Acoustical Association, [www.caa-aca.ca](http://www.caa-aca.ca)
7. “*Electricity generation and health*” in the peer-reviewed journal The Lancet. The paper concludes that “Forms of renewable energy generation are still in the early phases of their technological development, but most seem to be associated with few adverse effects on health” <http://www.ncbi.nlm.nih.gov/pubmed/17876910>
8. “*Energy, sustainable development and health*”, World Health Organisation, June 2004. The study finds that “Renewable sources, such as photovoltaic and wind energy, are associated with fewer health effects. [...] The increased use of renewable energy, especially wind, solar and photovoltaic energy, will have positive health benefits, some of which have been estimated.” There is also a table on page 79 showing the relative health effects of nearly all sources of energy, which clearly shows wind as negligible.  
<http://www.euro.who.int/document/eehc/ebakdoc08.pdf>

These findings clearly show that there is no peer-reviewed scientific evidence indicating that wind turbines have an adverse impact on human health.