APPENDIX F

NOISE IMPACT STUDY

Sound Impact Assessment Digby Wind Power Project

SKYPOWER CORP.

Project No. 1030972.

Stantec

EXECUTIVE SUMMARY

Project developer SkyPower Corp. (SkyPower) is proposing to construct and operate a wind energy facility located in Digby County in Gulliver's Cove, Nova Scotia (the Digby Wind Power Project; the Project). The Toronto-based renewable energy developer SkyPower has partnered with Nova Scotia-based community economic development organization Scotian WindFields Inc. To evaluate the potential sound impacts resulting from this Project, Jacques Whitford Stantec Limited was asked to conduct a sound impact assessment.

The key issues dealt with in the sound impact assessment were sound produced by Project operations. A set of receptors were selected (receptors 1-17), which were considered potentially sensitive to Project-related sound. Jacques Whitford Stantec Limited recorded background sound measurements for receptors 4, 10, and 15.

The Ontario Ministry of Environment (MOE) guideline NPC-232 *Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)* (MOE, 2004) was consulted in terms of general assessment guidelines for industrial sound impacting land use that has qualities of rural areas (Class 3), such as the area considered in the current study. In addition, the MOE's guidance document *Interpretation for Applying MOE NPC Technical Publications to Wind Turbine Generators* (MOE, 2004) was used to determine wind turbine sound criteria according to wind speed.

Sound modelling was conducted using CadnaA version 3.7, which includes the calculation methodology of the International Organization for Standardization (ISO) *Standard 9613 – Attenuation of Sound during Propagation Outdoors* (ISO 9613) (ISO,1993). Local meteorology and terrain was considered in modelling. Sound power level data provided by the manufacturer were used to model operational sound at the selected receptors. Predicted sound levels at receptors increased with increasing wind speed due the fact that the sound power level of the wind turbine generators also increased with increasing wind speed.

In general, the sound levels at the receptor locations are predicted to be mostly dominated by existing background sound levels and not by the sound produced from operations of the proposed Digby Wind Power Project. Therefore, it was concluded that that the Project is not expected to have a significant sound impact on nearby receptors.

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SOUND IMPACT ASSESSMENT

1 INTRODUCTION

Project developer SkyPower Corp. (SkyPower) is proposing to construct and operate a 30-megawatt (MW) wind power facility located in Digby County in Gulliver's Cove, Nova Scotia (the Digby Wind Power Project; the Project). The Toronto-based renewable energy developer SkyPower has partnered with Nova Scotia-based community economic development organization Scotian WindFields Inc. The wind power facility will consist of twenty 1.5 MW wind turbine generators with a 34.5 kV collection system connected to a new substation, on land located in Gulliver's Cove, Digby County, Nova Scotia. The proposed Project is referred to as the Digby Wind Power Project ("the Project").

The sound impact assessment included sound level data representative of the existing ambient sound environment in the study area and modeling results, showing the predicted sound levels at receptors resulting from Project operation.

2 ASSESSMENT FOCUS

Sound modelling was undertaken to predict the impact of the Project on the sound environment in the study area to support the preparation of the Sound Impact Assessment (SIA) for the Project. Table 2.1 lists the key issues taken into consideration during the modelling exercise.

Table 2.1 Summary of Sound Issues Associated with Construction and Operation of the Digby Wind Power Project

Project Phase	Key Issue	Relevance to Project
Construction	Effects of construction sound on local residents	Construction sound included site leveling, grading, pile driving, excavation, concrete pouring and steel erection. The level of sound will vary depending on the types of construction activities occurring at any given time. Because materials will have to be transported to the site during construction and operations, there may be an increase in trucks and/or traffic overall in the area. The level of sound will vary depending on the speed and type of vehicle.
Operations	Effects of operations sound on local residents	Operations sound includes sound emitted by equipment associated with the wind turbine, which can vary according to wind speed. Other sound sources related to Project operations could include increased road traffic during maintenance periods.

2.1 Study Area

The proposed Project is to be located in the Municipality of Digby, in the community of Gulliver's Cove, Nova Scotia. The wind energy facility will be constructed on undeveloped woodlands generally bounded to the north by the Bay of Fundy; to the east and west by undeveloped land and sparsely populated residential areas; and to the south by the Evangeline Trail (Route 217), sparsely populated residential areas and St. Mary's Bay. Gulliver's Cove Road divides the property. The Study Area identified for the Project is considered that area within which direct Project interactions with the natural environment could occur. Within this area, there are a number of potentially sensitive receptors (residences), which were considered in this sound impact assessment. The locations of each receptor are presented in Figure 2.1

Background sound measurements were collected for receptors 4, 10, and 15, which were used to assess the existing sound levels in the Study Area. The calculated 1-hour L_{eq} values for each background noise monitoring site are presented in Appendix B.

SKYPOWER

Figure 2.1

DIGBY WIND POWER PROJECT

Noise Model Receptor Locations

Noise Model Receptor Location

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

0 300 600 900 1,200

Meters

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: April 2009
Project No.: 1030972.01

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2.2 Sound Design and Mitigation

The Digby Wind Power Project will be designed to reduce sound from the installed turbines and the transmission of sound to potentially sensitive receptors.

Best practices will be followed at all times, including low sound equipment where applicable and local sound control. Specific mitigation that will be applied at the site during the construction and operations phases is described in the following sections.

2.3 Construction

Construction sound will occur during site leveling and grading, pile driving (if required), excavation, concrete pouring and steel and component erection. Nova Scotia does not have any provincial regulations or guidelines to regulate sound emitted during construction. Alberta's Energy Utilities Board (EUB) *Directive 038: Noise Control Directive* states that reasonable measures must be undertaken to reduce the effect of construction sound from new facilities (or modifications to new facilities) on nearby residences (EUB,1999). Based on this, the following mitigation measures will be applied:

- Nearby residents will be advised of significant sound generating activities and these will be scheduled to create the least disruption to receptors.
- All internal combustion engines will be fitted with appropriate muffler systems.

The EUB allows for construction to occur 24 hours/day; however it recommends attempting to limit construction activities during the hours of 07:00 and 22:00 to reduce the potential impacts of construction sound on receptors. While an attempt should be made to adhere to this recommendation, construction activities may occur outside of this period, as required by the Project schedule. In particular, efforts should be made to limit the operation of noisier activities associated with construction (i.e., impact pile driving, if required) to daytime hours.

2.4 Operations

Wind turbine generators produce sound through a number of different mechanisms which can be categorized into mechanical and aerodynamic sound sources. The major mechanical components including the gearbox, generator and yaw motors each produce their own characteristic sounds, including sound with tonal components. Other mechanical systems such as fans and hydraulic motors can also contribute to the overall sound emissions. Mechanical sound is radiated at the surfaces of the turbine, and by openings in the nacelle casing. Mechanical issues involving yaw motor supports or power train design can result in anomalous sounds such as periodic booming or tonal sounds.

The interaction of air and the turbine blades produces aerodynamic sound through a variety of processes as air passes over and past the blades. The sound produced by air interacting with the turbine blades tends to be broadband sound, but is amplitude modulated as the blades pass the tower, resulting in a characteristic 'swoosh'. Generally, wind turbines radiate more sound as the wind speed increases.

To reduce sound impacts resulting from Project operations the following mitigative measure are recommended:

- attending to routine maintenance of the wind turbines and associated equipment, as recommended by the manufacturer.

3 PROJECT RESIDUAL EFFECTS

3.1 Analyses

3.1.1 Determining Environmental Sound Criteria

Nova Scotia does not have specific sound guidelines for assessing the acoustic impact of wind turbines on residential properties. Consequently, the sound guidelines of the Ontario Ministry of Environment (MOE) have been used for the basis of this assessment.

Specifically, MOE guideline NPC-232 *Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)* (MOE, 1995) provides general assessment guidelines for industrial sound impacting land use that has qualities of rural areas (Class 3). Characteristics that may indicate the presence of a Class 3 area include:

- a small community with less than 1000 population;
- agricultural area; and
- a rural recreational area such as a cottage or a resort area; or a wilderness area.

The MOE refers to one-hour energy equivalent average sound levels (Leq), in units of A-weighted decibels (dBA), which are unites weighted to reflect the spectral sensitivity of human hearing. NPC-232 indicates that the applicable sound level limit for a stationary sound source is the existing background sound level. The sound level limit must be representative of the minimum background sound level that occurs or is likely to occur during the operation of a stationary source. Data from background sound monitoring conducted during times when the background sound level is at its lowest can be used to determine the lowest one hour L_{eq}, which will represent the background sound level. However, where background sound levels are low, exclusionary minimum criteria apply, with an exclusionary limit of 45 dBA specified for quiet nighttime periods, and 50 dBA specified for quiet daytime periods.

Wind turbines are unique in that they generate more sound as wind speeds increase, and because increasing wind speeds cause elevated background sound levels, MOE have set out supplementary guidance for the assessment of wind turbine generator sound in the *Interpretation for Applying MOE NPC Technical Publications to Wind Turbine Generators* (MOE, 2004). The guidance document gives criteria for the combined impacts of all wind turbine generators in an area as a function of wind speed (Table 3.1).

Table 3.1 MOE Criteria for Wind Turbines

Wind Speed (m/s)	4	5	6	7	8	9	10	11
Wind Turbine Sound Criteria, NPC-232 (dBA)	40	40	40	43	45	49	51	53

The lowest sound level limit at a point of reception in a Class 3 area, under conditions of average wind speed below 6 m/s, expressed in terms of the hourly L_{eq}, is 40 dBA or the minimum hourly background sound level established in accordance with requirements in Publications NPC-232, whichever is higher.

The sound level limit at a point of reception in a Class 3 area, under conditions of average wind speed above 6 m/s, expressed in terms of the hourly L_{eq}, is determined by the wind turbine sound criteria (Table 3.1) or the minimum hourly background sound level established in accordance with requirements in Publications NPC-232, whichever is higher.

Background (or baseline) sound monitoring was conducted for receptors 4, 10, and 15 by Jacques Whitford Stantec Limited on June 2nd and 3rd, 2008 and the minimum hourly background L_{eq} values were determined for these three receptors (Table 3.2).

Table 3.2 Background Sound Levels for Selected Receptors

Receptor No.	Lowest One Hour Leq (dBA)
4	46
10	27
15	26

Due to the proximity of receptor no. 4 to wetlands the background data was elevated by the chorus of a Northern Spring Peeper (*Pseudacris crucifer*) and song birds. The baseline sound for that location would be more typical of that measured at receptor no.'s 10 and 15.

No background measurements were taken for the remaining receptors; however receptor 4 is located closest to receptors 1-8, therefore the minimum hourly background L_{eq} at receptor 4 was used for receptors 1-8. Receptor 10 is located closest to receptors 9-12, therefore the minimum hourly background L_{eq} at receptor 10 was used for receptors 9-12, and receptor 15 is located closest to receptors 13-17, therefore the minimum hourly background L_{eq} at receptor 15 was used for receptors 13-17. The lowest one hour L_{eq} values replace the wind turbine sound criteria given in Table 4.1 for receptors 1-8, since they indicate higher sound levels. For receptors 9-17 the MOE criteria for wind turbines (Table 3.1) applies.

Interpretation for Applying MOE NPC Technical Publications to Wind Turbine Generators (MOE, 2004) details the method of sound impact assessment to undertake whereby the manufacturers sound power level data is entered into the sound model, which predicts sound at a receptor over a full range of wind speeds. It also specifies using the calculation methodology of the International Organization for Standardization (ISO) *Standard 9613 – Attenuation of Sound during Propagation Outdoors* (ISO 9613) (ISO, 1993). ISO 9613 yields a receptor sound level under a downwind propagation situation, which is favorable to the propagation of sound from a source to a receptor. ISO 9613 does not describe a method for predicting sound levels under a specific meteorological condition, nor does it claim to predict a sound level impact under a worst-case atmospheric condition.

A number of jurisdictions, including the Province of Ontario and the United States Environmental Protection Agency (US EPA), have established specific regulatory limits for sound pressure levels from industrial or construction activities. In the province of Nova Scotia the Nova Scotia Department of Environment and Labour (NSDEL) *Guidelines for Noise Measurement and Assessment* (NSDOE, 1989) set sound pressure levels for the day, evening and nighttime. The criteria in these guidelines are:

- Leq 65 dBA between 0700 h and 1900 h
- Leq 60 dBA between 1900 h and 2300 h
- Leq 55 dBA between 2300 h and 0700 h

These guidelines are intended to "facilitate the evaluation of noise pollution in the environment". The guidelines were intended to apply to the environments where the members of the public "live, work and play".

There is not a specific noise bylaw in place for Digby County.

3.1.2 Modelling Methods

3.1.2.1 General Overview

Sound modeling was completed to predict the effects of the Project on the sound environment in the local study area. The sound modelling was undertaken in accordance with the requirements of *Interpretation for Applying MOE NPC Technical Publications to Wind Turbine Generators* (MOE, 2004*)* and ISO 9613.

3.1.2.2 Model Description

Sound modelling was conducted using CadnaA (Computer Aided Noise Abatement) version 3.7, a computer program capable of predicting sound levels at specified receiver positions originating from a variety of sound sources. Applicable national or international standards can also be included in its analysis, such as those prescribed by ISO 9613.

CadnaA can also account for such factors as:

- distance attenuation (i.e., geometrical dispersion of sound with distance);
- atmospheric attenuation (i.e., the rate of sound absorption by atmospheric gases in the air between sound sources and receptors);
- ground attenuation (i.e., effect of sound absorption by the ground as sound passes over various terrain and vegetation types between source and receptor);
- screening effects of surrounding terrain; and
- meteorological conditions and effects.

The influences of meteorology and terrain and vegetation on sound attenuation in the local study area were considered to be of particular importance and are described in the following topics.

3.1.2.3 Meteorology

Meteorological factors, such as temperature, humidity, wind speed and direction influence sound propagation. The effects of wind on outdoor sound propagation during different weather conditions could cause large variations in project-related sound levels measured at a receptor. If the receptor is upwind of the facility, the wind could cause greater than normal outdoor sound attenuation and lower sound levels at the residence than would occur with no wind. However, if the residence is downwind of the facility, the opposite effect could occur, resulting in higher sound levels than normal at the residence. Crosswinds have less effect on outdoor sound propagation and would render sound levels that are similar to those in calm conditions. The ISO 9613 sound model simulates downwind propagation under a mildly developed temperature inversion (both of which enhance sound propagation) and provide a case representation of potential effects during conditions that favor transmission of sound to the receptor.

The following meteorological elements were assumed for the sound assessment:

- temperature = 10°C;
- relative humidity = 70 percent; and
- wind conditions = variable.

The relative humidity was assumed to be 70 percent because this condition enhances sound propagation. Based on the likelihood of receiving complaints in the summer, an average temperature value typical of summer conditions in the area was used in the sound model. These meteorological parameters can be considered typical of night-time conditions in the spring and summer (when outdoor activities are more likely) and representative of the sound effects during these seasons.

3.1.2.4 Terrain and Vegetation

Factors such as terrain conditions, types of vegetation and ground cover can all affect the absorption that takes place when sound waves travel over land. For example, if the ground is moist or covered in fresh snow or vegetation, it will be absorptive and aid in sound attenuation. In contrast, if the ground is hard-packed or frozen, it will be reflective and will not aid in sound attenuation.

With the exception of the town of Digby and the presence of Highway 101, the study area is mostly forested, but does support other habitats for vascular plants including wetlands, abandoned agricultural land, disturbed habitats and sea cliffs. The turbines will be in operation throughout the year; therefore, a variety of ground conditions will occur that affect sound attenuation potential. Typically, ground conditions in summer promote sound attenuation, whereas winter ground conditions often do not. At the same time, residents are more likely to be outdoors or have their house windows open, which can make them more sensitive to potential sound effects. The topography of the area was included during modelling; therefore any terrain shielding effects that may attenuate sound were taken into account.

3.1.2.5 Model Prediction Confidence

The sound propagation algorithm used in the sound model is from ISO 9613 standard. The published accuracy for ISO 9613 is ± 3 dBA over source-receiver distances between 100 m and 1000 m. A similar degree of accuracy would be expected over the distances considered in this assessment.

In terms of meteorological conditions, ISO 9613 produces results that are representative of meteorological conditions favouring sound propagation (i.e., downwind and inversion conditions). Because these conditions do not occur everyday, model predictions are conservative and actual sound levels at the receptors might be less than predicted the majority of the time.

In general, the predictive capacity of the model is considered to be high, leading to a high level of confidence in the results of the model.

3.2 Construction Sound

Typical construction activities that would create sound are presented in Table 3.3. The actual equipment used on site might differ from those listed below.

Table 3.3 Typical Sound Emission Levels of Construction Equipment

Construction Equipment	Typical Sound Level at 15 m (dBA)
Earth Moving	
Loader	**85**
Bulldozer	**85**
Backhoe	**80**
Scraper	**89**
Grader	**85**
Materials Handling	
Crane (mobile)	**83**
Concrete mixer	**85**
Concrete pump	**82**

Table 3.3 Typical Sound Emission Levels of Construction Equipment

Construction Equipment	Typical Sound Level at 15 m (dBA)
Concrete vibrator	**76**
Stationary Equipment	
Air compressor	**81**
Generator	**81**
Impact Equipment	
Jack hammer	**88**
Pile driver (impact)	**101**

SOURCE: US Department of Transportation (2006)

Since noisier construction activities will likely occur between the hours of 07:00 and 22:00, construction activity is expected to have little to no effect on night-time sound levels. The level of sound will vary according to the type of construction activity and the number of pieces of equipment in operation at any given time.

To reduce the sound pressure levels at the nearest residents to below the threshold of significance, a combination of mitigative measures will be employed, including but not limited to:

- limiting the amount of construction equipment operating simultaneously; and
- ensuring all equipment have quality mufflers and are well maintained.

3.3 Operations Sound

Operational sound associated with the Project was modelled, excluding other existing sound sources. Modelling the sound generated from operations of the 20 wind turbine generators was conducted by first obtaining the manufacturer sound power level data as a function of wind speed (Table 3.4).

Table 3.4 Manufacturer Sound Power Level Data

Wind Speed at 10 m	Sound Power Level (db) at Hub Height of 80 m
3	<96
4	<96
5	99.1
6	103
7	<104

Source: GE Energy, 2005

The information provided in Table 3.4 was included in sound modelling. In addition, the coordinates and tower height of the wind turbine generators were also incorporated. These details are given in Table 3.5.

Table 3.5 Wind Turbine Generator Locations

Wind Turbine No.	Coordinates		Turbine Hub Height (m)
	Easting (UTM)	Northing (UTM)	
1	264893	4942205	80
2	265481	4941472	80

Table 3.5 Wind Turbine Generator Locations

Wind Turbine No.	Coordinates		Turbine Hub Height (m)
	Easting (UTM)	Northing (UTM)	
3	265549	4941862	80
4	265705	4943019	80
5	266000	4942386	80
6	266023	4943481	80
7	266148	4942007	80
8	266182	4941582	80
9	266366	4942926	80
10	266582	4941059	80
11	266599	4942276	80
12	266898	4942695	80
13	266922	4943143	80
14	267087	4941307	80
15	267402	4942835	80
16	269244	4942786	80
17	270399	4942480	80
18	269496	4941685	80
19	269684	4943195	80
20	270005	4942021	80

Sound modelling was conducted for five different scenarios, which varied according to the wind speeds presented in Table 3.5. The predicted sound levels at receptors resulting from these scenarios are shown in Tables 3.6 - 3.9. Other sound sources contributing to baseline sound levels were not included when predicting sound levels.

Table 3.6 Modeled Project Operational Sound Levels at a Wind Speed of 3 and 4 m/s

Receptor No.	Receptor Location		Wind Speed (m/s)	Predicted Operational Sound Level (dBA)	Wind Turbine Sound Criterion (dBA)
	Northing (UTM)	Easting (UTM)			
1	267932	4943629	3 & 4	28	46
2	267779	4943446	3 & 4	30	46
3	267982	4943431	3 & 4	30	46
4	268076	4943024	3 & 4	31	46
5	267962	4942851	3 & 4	32	46
6	267982	4942399	3 & 4	31	46
7	267972	4941953	3 & 4	30	46
8	268091	4941442	3 & 4	28	46
9	265194	4939852	3 & 4	22	40
10	266175	4940383	3 & 4	30	40
11	266656	4940492	3 & 4	31	40
12	267420	4940502	3 & 4	29	40
13	268956	4940720	3 & 4	24	40
14	269554	4940933	3 & 4	28	40
15	270035	4941201	3 & 4	30	40

Table 3.6 Modeled Project Operational Sound Levels at a Wind Speed of 3 and 4 m/s

Receptor No.	Receptor Location		Wind Speed (m/s)	Predicted Operational Sound Level (dBA)	Wind Turbine Sound Criterion (dBA)
	Northing (UTM)	Easting (UTM)			
16	270526	4941726	3 & 4	26	40
17	271066	4942250	3 & 4	24	40

Table 3.7 Modeled Project Operational Sound Levels at a Wind Speed of 5 m/s

Receptor No.	Receptor Location		Wind Speed (m/s)	Predicted Operational Sound Level (dBA)	Wind Turbine Sound Criterion (dBA)
	Northing (UTM)	Easting (UTM)			
1	267932	4943629	5	31	46
2	267779	4943446	5	33	46
3	267982	4943431	5	33	46
4	268076	4943024	5	34	46
5	267962	4942851	5	35	46
6	267982	4942399	5	34	46
7	267972	4941953	5	33	46
8	268091	4941442	5	31	46
9	265194	4939852	5	25	40
10	266175	4940383	5	33	40
11	266656	4940492	5	34	40
12	267420	4940502	5	32	40
13	268956	4940720	5	27	40
14	269554	4940933	5	31	40
15	270035	4941201	5	33	40
16	270526	4941726	5	29	40
17	271066	4942250	5	27	40

Table 3.8 Modeled Project Operational Sound Levels at a Wind Speed of 6 m/s

Receptor No.	Receptor Location		Wind Speed (m/s)	Predicted Operational Sound Level (dBA)	Wind Turbine Sound Criterion (dBA)
	Northing (UTM)	Easting (UTM)			
1	267932	4943629	6	35	46
2	267779	4943446	6	37	46
3	267982	4943431	6	37	46
4	268076	4943024	6	38	46
5	267962	4942851	6	39	46
6	267982	4942399	6	38	46
7	267972	4941953	6	37	46
8	268091	4941442	6	35	46
9	265194	4939852	6	29	40

Table 3.8 Modeled Project Operational Sound Levels at a Wind Speed of 6 m/s

Receptor No.	Receptor Location		Wind Speed (m/s)	Predicted Operational Sound Level (dBA)	Wind Turbine Sound Criterion (dBA)
	Northing (UTM)	Easting (UTM)			
10	266175	4940383	6	37	40
11	266656	4940492	6	38	40
12	267420	4940502	6	36	40
13	268956	4940720	6	31	40
14	269554	4940933	6	35	40
15	270035	4941201	6	37	40
16	270526	4941726	6	33	40
17	271066	4942250	6	31	40

Table 3.9 Modeled Project Operational Sound Levels at a Wind Speed of 7 m/s

Receptor No.	Receptor Location		Wind Speed (m/s)	Predicted Operational Sound Level (dBA)	Wind Turbine Sound Criterion (dBA)
	Northing (UTM)	Easting (UTM)			
1	267932	4943629	7	36	46
2	267779	4943446	7	38	46
3	267982	4943431	7	38	46
4	268076	4943024	7	39	46
5	267962	4942851	7	40	46
6	267982	4942399	7	39	46
7	267972	4941953	7	38	46
8	268091	4941442	7	36	46
9	265194	4939852	7	30	43
10	266175	4940383	7	38	43
11	266656	4940492	7	39	43
12	267420	4940502	7	37	43
13	268956	4940720	7	32	43
14	269554	4940933	7	36	43
15	270035	4941201	7	38	43
16	270526	4941726	7	34	43
17	271066	4942250	7	32	43

All predicted sound levels, for each wind speed scenario, are in compliance with the corresponding Wind Turbine Sound Criterion, NP-205. As the predicted operational sound levels indicate, the sound levels at receptors increased with increasing wind speed. This increase in predicted sound level resulted from a rise in the wind turbine sound power level, which is directly related to wind speed, as provided by the manufacturer (refer to Table 3.4).

Some jurisdictions outside of North America are adopting more stringent guidelines such as *"Wind Farms: Environmental Noise Guidelines*" (EPA, 2007) from the state of South Australia. These guidelines stipulate a maximum of 35 dBA or 5 dBA above background (refer to Appendix B for Project background data). This project meets the second criterion, and this provides further support for the conclusions that sound should not be of concern. It does not preclude the possibility that sound be alleged to be a problem when other factors, such as aesthetics, are not accepted by local residents.

In summary, it is useful to combine the predicted operational sound levels with background sound data to obtain a more accurate representation of the potential sound levels at the selected receptor locations (Table 3.10).

Table 3.10 Combined Predicted Operational and Background Sound Levels at Receptors

Receptor No.	Predicted Operational and Background Sound Level (dBA)			
	3 & 4 m/s	5 m/s	6 m/s	7 m/s
1	57	57	57	57
2	57	57	57	57
3	57	57	57	57
4	57	57	57	57
5	57	57	57	57
6	57	57	57	57
7	57	57	57	57
8	57	57	57	57
9	42	42	42	42
10	42	42	42	42
11	42	42	42	42
12	42	42	42	42
13	42	42	42	42
14	45	45	45	45
15	45	45	45	45
16	45	45	45	45
17	45	45	45	45

4 CONCLUSIONS

The results presented in Table 3.10 show that sound levels at the receptor locations will be primarily dominated by existing background sound levels and not by the sound produced from operations of the Digby Wind Power Project. Therefore, it is not expected that the Project will have a significant impact, with respect to sound, on nearby receptors.

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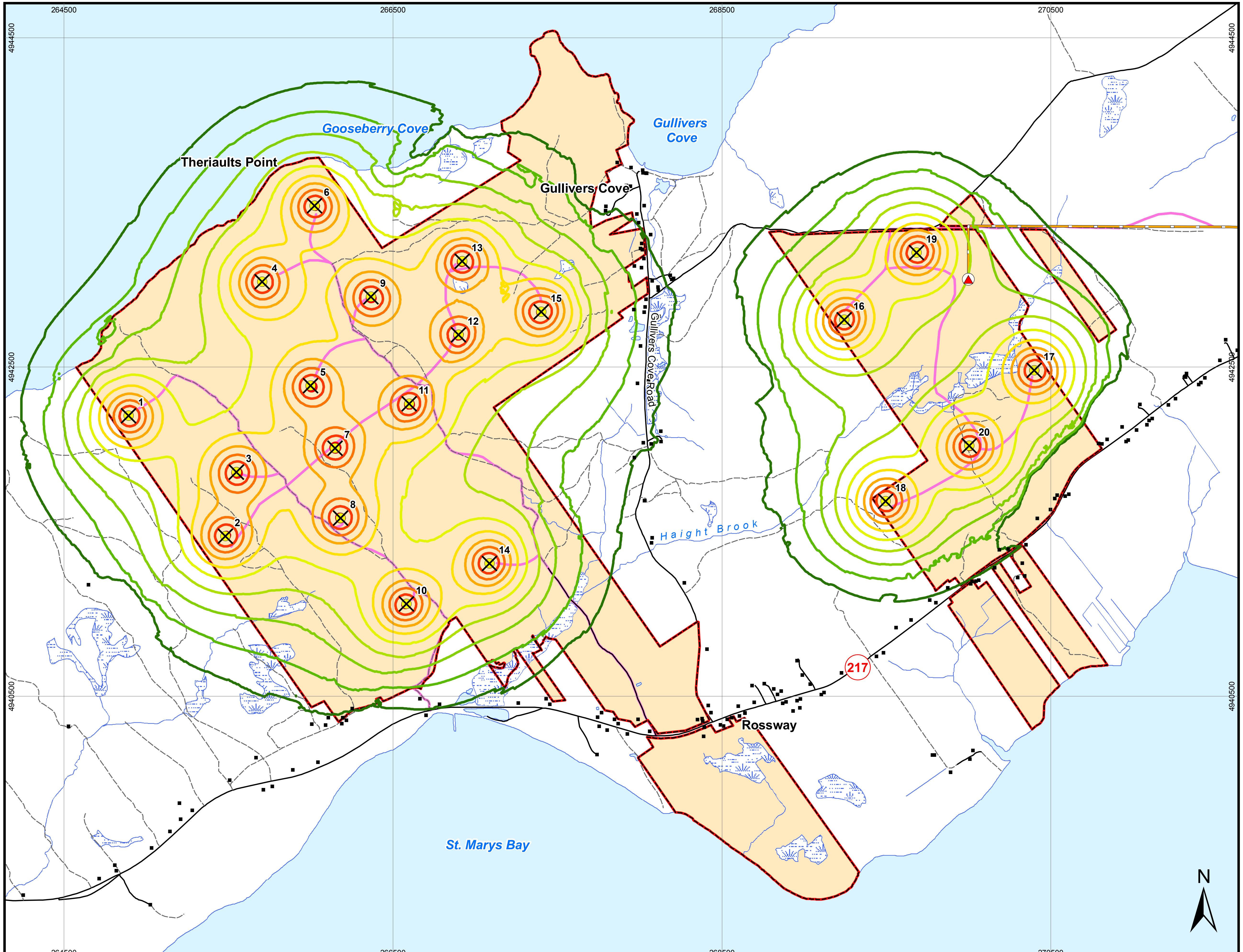
6 APPENDICES

Appendix A- Operation Sound Contour Maps

Appendix B- Background Noise

APPENDIX A

Operation Sound Contour Maps



SKYPOWER

Figure A1

DIGBY WIND POWER PROJECT

Noise Contours at a Wind Speed of 3 & 4 Metres/Second

Noise Contours

30 db — 40 db
32 db — 42 db
34 db — 44 db
36 db — 46 db
38 db — 48 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

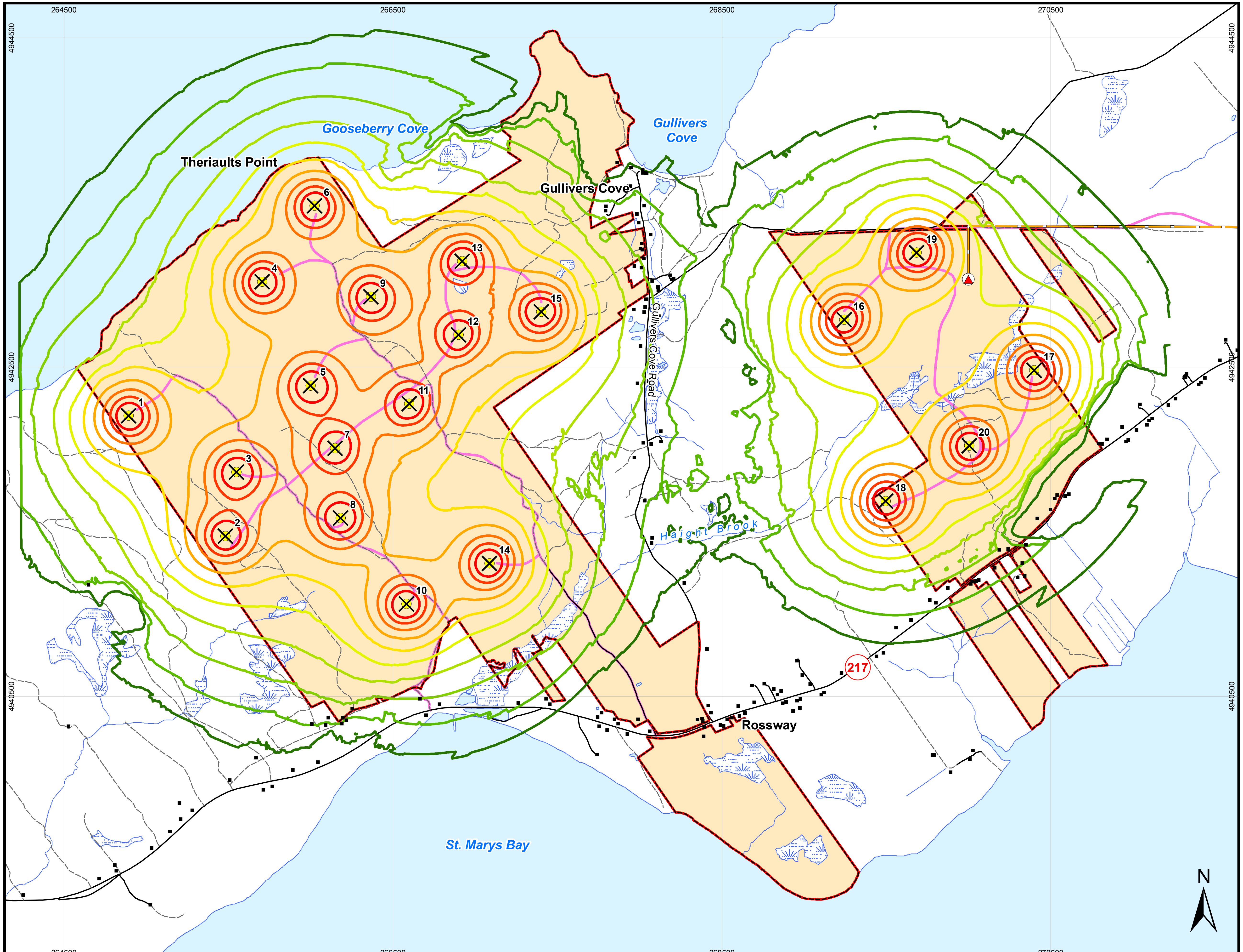
Building
Road
Unpaved Road
Railroad
Watercourse
Wetland
Waterbody

0 300 600 900 1,200
Meters

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: April 2009
Project No.: 1030972.01

Stantec



SKYPOWER

Figure A2

DIGBY WIND POWER PROJECT

Noise Contours at a Wind Speed of 5 Metres/Second

Noise Contours

- 30 db
- 32 db
- 34 db
- 36 db
- 38 db
- 40 db
- 42 db
- 44 db
- 46 db
- 48 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

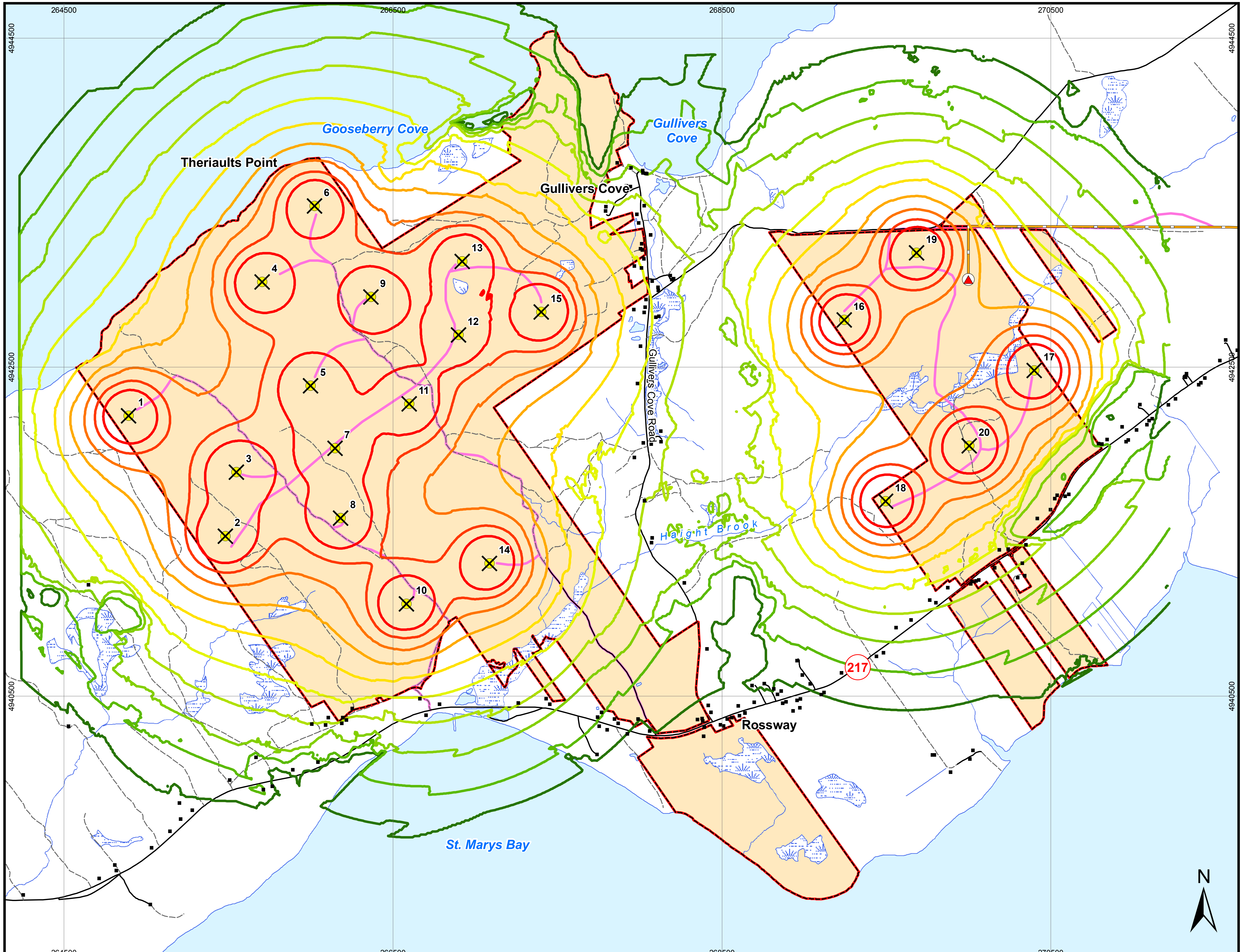
0 300 600 900 1,200

Meters

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: April 2009
Project No.: 1030972.01

Stantec



SKYPOWER

Figure A3

DIGBY WIND POWER PROJECT

Noise Contours at a Wind Speed of 6 Metres/Second

Noise Contours

30 db
32 db
34 db
36 db
38 db
40 db
42 db
44 db
46 db
48 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

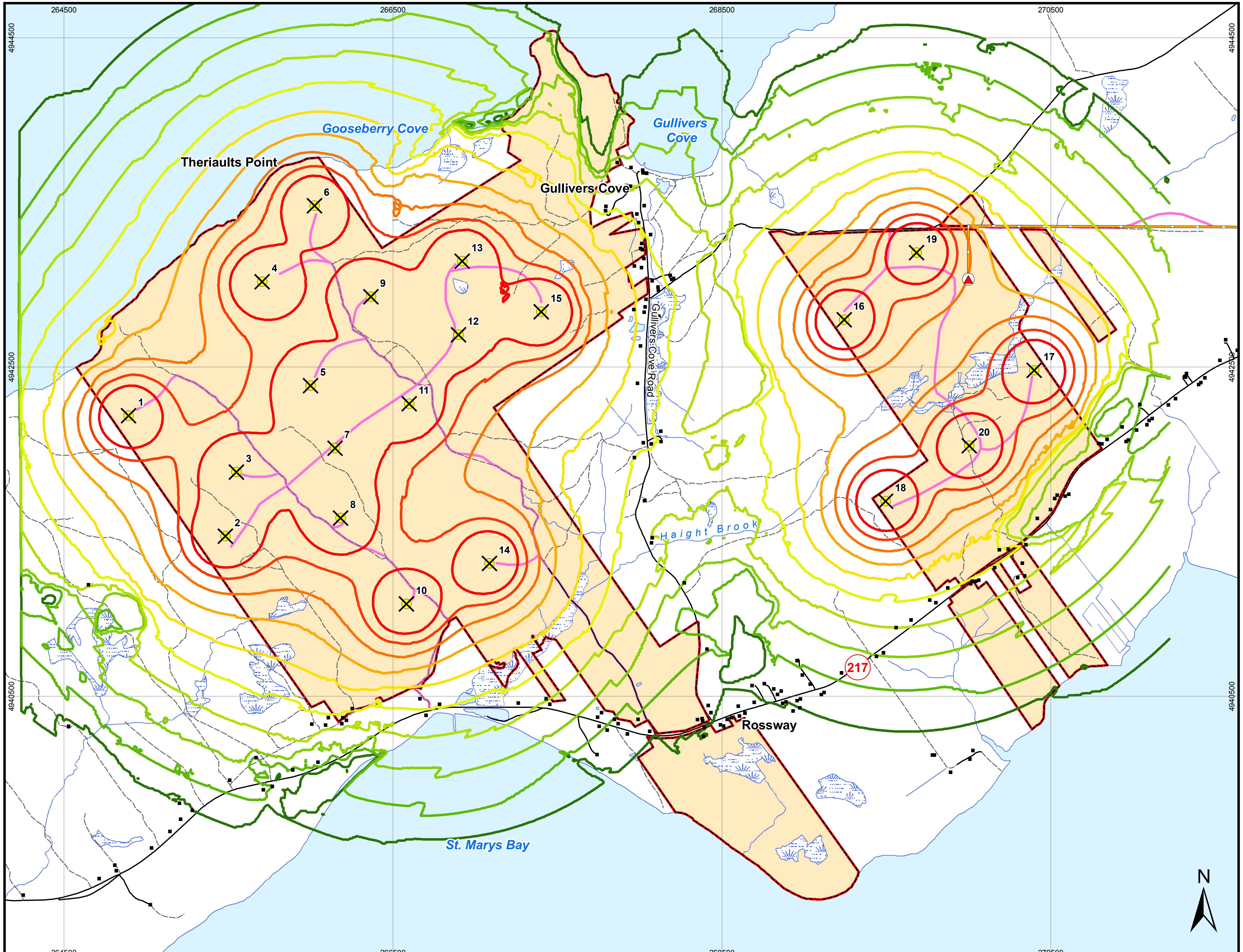
Building
Road
Unpaved Road
Railroad
Watercourse
Wetland
Waterbody

0 300 600 900 1,200
Meters

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: April 2009
Project No.: 1030972.01

Stantec



SKYPOWER

Figure A4

DIGBY WIND POWER PROJECT

Noise Contours at a Wind Speed of 7 Metres/Second

Noise Contours

- 30 db
- 32 db
- 34 db
- 36 db
- 38 db
- 40 db
- 42 db
- 44 db
- 46 db
- 48 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

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: April 2009
Project No.: 1030972.01

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APPENDIX B

Background Data

Table B1 Measured 1-Hour Background Sound Pressure Levels

Time	Site 1	Site 2	Site 3	NSDOE Guideline
15:00	-	-	-	65
16:00	57	38	-	65
17:00	48	38	48	65
18:00	47	37	45	65
19:00	56	36	44	60
20:00	54	44	46	60
21:00	65	41	41	60
22:00	65	34	38	60
23:00	62	30	34	55
0:00	58	27	36	55
1:00	56	28	29	55
2:00	53	36	33	55
3:00	55	41	26	55
4:00	57	45	36	55
5:00	49	40	45	55
6:00	49	40	40	55
7:00	49	47	47	65
8:00	49	37	46	65
9:00	53	37	45	65
10:00	50	40	45	65
11:00	49	38	46	65
12:00	48	40	46	65
13:00	46	44	46	65
14:00	47	50	47	65
15:00	49	48	50	65
16:00	50	-	48	65
Average	57	42	45	-