Lingan 4 MW Wind Power Project

Registration and Environmental Assessment

October 2005

Cape Breton Power Limited

05-4359-0200

Submitted by:

Dillon Consulting Limited

REGISTRATION OF A 4-MEGAWATT WIND POWER PROJECT, LINGAN, NOVA SCOTIA

This document represents formal registration of a 4MW wind power project on a site located in Lingan, Nova Scotia (the project) by Glace Bay Lingan Wind Power Limited to meet the requirements of the Nova Scotia *Environmental Assessment Regulations*, as defined under Section 9 of the Regulations.

Name of Undertaking

4-Megawatt Wind Power Project, Lingan, Nova Scotia

Location of the Undertaking

The project includes plans to construct two 2-megawatt wind turbines on vacant land near Lingan, Nova Scotia.

Proponent

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Nature of the Undertaking

The term "undertaking" is defined in the *Environment Act* as:

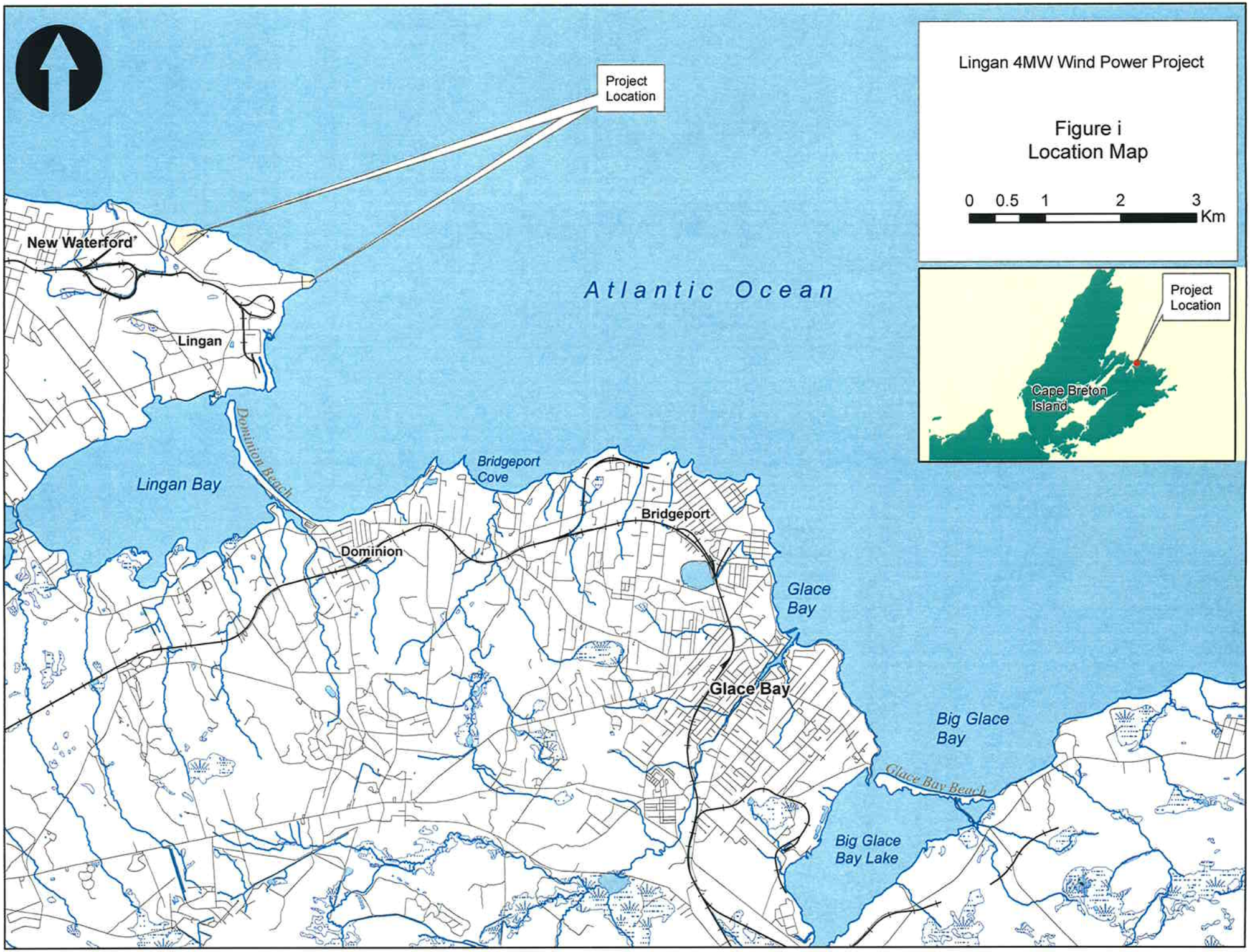
> "...an enterprise, activity, project, structure, work or proposal and may include, in the opinion of the Minister, a policy, plan or program that has an adverse effect or an environmental effect and may include, in the opinion of the Minister, a modification, extension, abandonment, demolition or rehabilitation, as the case may be, of an undertaking".

The project consists of construction and operation of two 2-megawatt (MW) wind turbines near Lingan, Nova Scotia (Figure i). The project will consist of two (2), 2MW turbines, access roads, and transmission cables to connect the facility with the Nova Scotia Power Inc. (NSPI) grid.

Environmental planning and management is an integral part of the undertaking and is described, primarily, in the protection measures and mitigation described in detail in these documents.

Background

Cape Breton Power is a Nova Scotia company dedicated to renewable energy development with a desire to develop large-scale renewable energy production facilities. In April 2005, NSPI signed an agreement with Cape Breton Power to purchase energy from its Lingan turbines. Currently, Cape Breton Power has a total of 16MW of wind energy under development through two agreements with NSPI.


Lingan 4MW Wind Power Project
Figure i
Location Map
0 0.5 1 2 3
Km
Project Location
Project Location
Cape Breton Island
Atlantic Ocean
New Waterford
Lingan
Lingan Bay
Dominion Beach
Bridgeport Cove
Bridgeport
Dominion
Glace Bay
Glace Bay
Big Glace Bay
Glace Bay Beach
Big Glace Bay Lake

The construction of the facility proposed by Cape Breton Power falls within the definition of a Class I undertaking under the *Environmental Assessment Regulations* pursuant to the Nova Scotia *Environment Act*. An undertaking of this type requires the submission of a Registration to the Minister of Environment for Nova Scotia, upon which the project will be evaluated under the review requirements set out in the *Environmental Assessment Regulations*. Cape Breton Power believes that the undertaking poses no significant risk of adverse environmental impacts that cannot be mitigated, and that it should be approved by the Minister of Environment, subject to applicable and appropriate Conditions of Approval. In order to support this position, Cape Breton Power has prepared an Environmental Assessment (EA) to accompany its Registration, and has also conducted a stakeholder and public consultation program in order to obtain comments from the public and stakeholder groups concerning environmental aspects of the proposed project.

Purpose and Need for the Undertaking

The purpose of the undertaking is to construct a wind power generating facility to generate electricity for transmission via the existing NSPI grid. This project and a subsequent 10MW wind farm facility combined are anticipated to provide an estimated 49 GWh annually. This project is part of Nova Scotia Power Inc.'s initiative to increase Nova Scotia's renewable energy production to 25% from 10%. The electricity provided by the combined projects will displace the equivalent power supplied by NSPI's fossil fuel fired generating stations and reduce total GHG emissions by approximately 10,600 tonnes

Alternatives

Selecting a suitable location for a wind turbine requires that the proposed site meet specific criteria:

- Available source of wind resource;
- Close proximity to a connection to the NSPI electrical grid;
- A community where there is a reasonable level of acceptance of wind energy and wind turbines;
- Sufficient land for the required infrastructure, and;
- Access to roads/rail for the transportation of the turbines and other materials.

The Lingan site meets all of the above criteria for the proposed project. In addition, the Lingan site is not a on a major avian flight path, unlike other headlands in the area. Although there are migratory bird habitats in Lingan Bay, the primary flight path is directly in and out of the Bay along the shore of Shanty Bay past North Head.

A lack of watercourses and wetlands on the site and past uses for coal extraction reduces the likelihood of impacting sensitive aquatic or terrestrial habitat during construction.

The Lingan site presents the best available option for a wind power project in this region of Cape Breton with the least probability of adversely impacting the environment.

Proposed Construction and Operation Schedules

When the required approvals and permits are received, Cape Breton Power plans to begin construction in the fall of 2005 and operation to begin in early 2007.

Description of the Undertaking

The project includes the construction and operation of a 4MW wind generation project consisting of two, 2MW wind turbines, access roads, interconnecting cables and a connection to the NSPI grid

Cape Breton Power will construct, operate, and maintain the wind turbines, the connection to the NSPI grid and the ancillary components.

The physical aspects of the undertaking are as follows:

- Two 2MW turbines, which will be 64m in height (hub) and 71m rotary diameter;
- Approximately 1.6 km of interconnecting cables and the connection to the NSPI grid at the Lingan substation;
- Crane pads (for erecting each of the turbines), and;
- Approximately 1.6 km of access roads between the turbines across the site.

Approvals Required and Other Forms of Authorization

The following approvals and other forms of authorization are anticipated for the project.

- Aeronautical Obstruction Clearance from Transport Canada.

- Land Use Approval from Nav Canada.

- Approval to burn cleared vegetation, NSDEL/NSDNR - required for burning of slash and cleared vegetation during construction.

Aggregate will be required for construction of the access roads and crane pads. Cape Breton Power will obtain this aggregate from an offsite provider.

Issues of Concern

Issues of concern have been scoped by the Cape Breton Power EA study team through:

- reviewing applicable provincial and federal environmental laws and regulations;
- meeting with regulatory agencies at provincial and federal levels;
- conducting consultation meetings with stakeholders and documenting concerns;
- considering available environmental literature and references;
- incorporating the experience of the EA study team in conducting environmental assessments in Nova Scotia and elsewhere in Canada; and,
- considering the experience and suggestions about wind turbine operation and maintenance elsewhere in Canada and from other knowledgeable team members and associates.

The Issues of Concern identified by the study team and addressed in the accompanying EA include:

- Migratory/Breeding Birds
- Other avian species
- Species at risk
- Terrestrial habitats
- Air quality
- Land use
- Accidents and malfunctions
- Cultural heritage resources

Sources of Public Funding

No sources of public funding will be used for this project.

Summary of Concordance With Factors Relevant to the Minister's Decision

This section presents the concordance of the following EA with the factors that the Minister of the Environment must consider when formulating a decision following the registration of a Class I Undertaking. It is intended to provide a summary of the EA, as a convenience to the Minister in making that decision, and is based on the registration document and the specific commitments of, and studies and consultations carried out by Cape Breton Power.

The following is an extract from the *Environmental Assessment Regulations* made under Section 49 of the *Environment Act*, S.N.S. 1994-95, c.1, O.I.C. 95-220, N.S. Reg. 26/95, as amended by O.J.C. 2003-67 (February 28, 2003), N.S. Reg. 44/2003.

Factors relevant to the Minister's decision.

The following information shall be considered by the Minister in formulating a decision following review of the registration documents for a Class I undertaking:

(a) *The location of the proposed undertaking and the nature and sensitivity of the surrounding area;*
(b) *The size and scope of the proposed undertaking;*
(c) *Concerns expressed by the public about the adverse effects or the environmental effects of the proposed undertaking;*
(d) *steps taken by the proponent to address environmental concerns expressed by the public;*
(e) *potential and known adverse effects or environmental effects of the technology to be used in the proposed undertaking;*
(f) *project schedules where applicable;*
(g) *planned or existing land use in the area of the undertaking;*
(h) *other undertakings in the area; and*
(i) *such other information as the Minister may require.*

Each of the nine factors listed has been addressed below. The notes following each of the nine factors provide both a summary of key points detailed in the EA and the sections that address these factors in the EA.

1. The location of the proposed undertaking and the nature and sensitivity of the surrounding area:

The project is located between the communities of New Waterford and Lingan in Cape Breton Regional Municipality, Nova Scotia. (Figure i). The lands on the site are a combination of coastal barren and scrub forest (balsam fir, back spruce and birch), which is common along the coast in this part of Cape Breton Island. The site is adjacent to the Lingan Power Generating Station and former coal mining operations.

2. The size and scope of the proposed undertaking:

The project consists of construction and operation of a 4MW wind power project consisting of two 2MW turbines, access roads, interconnecting cables, and a connection of the NSPI grid system.

3. Concerns expressed by the public about the adverse effects or the environmental effects of the proposed undertaking:

No comments were received from the public at the Open House regarding the proposed facility.

Cape Breton Power has consulted with provincial and federal regulatory agencies and government scientific specialists to identify issues that might not be identified through other means. Cape Breton Power has also requested input from the Union of Nova Scotia Indians regarding traditional use and knowledge.

4. Steps taken by the proponent to address environmental concerns expressed by the public:

As summarized in Section 4 of the accompanying EA, the environmental effects of the project are minimal, and are mitigable. Furthermore, the environmental issues that have been raised are addressed fully in the EA and the environmental protection approach adopted by Cape Breton Power.

5. Potential and known adverse effects or environmental effects of the technology to be used in the proposed undertaking:

The potential adverse and beneficial environmental effects of the technology to be used in this project are well known and documented in the accompanying EA.

6. Project schedules where applicable:

The anticipated start-up date for construction is the fall of 2005. Surveying and geotechnical investigations of the turbine sites will happen first followed by the necessary clearing for the access roads and turbine sites in the fall of 2005 through the winter of 2005/2006.

The roads, crane pads and foundations of the turbines will be constructed beginning in the fall of 2005 and erection of the turbines will occur in the fall of 2006.

7. Planned or existing land use in the area of the undertaking:

Existing land use in the project area consists predominantly of undeveloped barrens and scrub forest on the project site, while the surrounding land use is former collieries, a coal fired power-generating plant and mixed residential and commercial.

8. Other undertakings in the area:

Cape Breton Power will be registering another wind power project on the same site as this project at a later date. That project will consist of five 2MW turbines. Cape Breton Power is not aware of any other undertakings as defined by the Environmental Assessment Regulations in the area.

9. Such other information as the Minister may require:

Cape Breton Power has planned the project and prepared this document and the accompanying EA in recognition of the environmental issues particular to wind power projects in Nova Scotia. Through its discussions with regulatory and other stakeholders, Cape Breton Power does not anticipate that the Minister will require additional information. However, Cape Breton Power is prepared to provide more information should it be required by the Minister.

LIST OF ACRONYMS

ACCDC	Atlantic Canada Conservation Data Centre
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EA	Environmental Assessment
ECP	Environmental Construction Plan
EPP	Environmental Protection Plan
GIS	geographic information system
ha	hectare
km	kilometre
L	litre
m	metre
mm	millimetre
NS	Nova Scotia
NSEL	Nova Scotia Department of Environment and Labour
NSNR	Nova Scotia Department of Natural Resources
NSTPW	Nova Scotia Department of Transportation and Public Works
NSM	Nova Scotia Museum
NSPI	Nova Scotia Power Inc.
O&M	operations and maintenance
PPE	personal protective equipment

GLOSSARY

abandonment	terminating use of facilities at the end of project life.
abiotic	non-biological; a process not mediated by or resulting from the activity of organisms. Weather is an example of an abiotic process.
archaeological resource	archaeological sites consisting of pre-contact and historical, in ground, resources.
bedrock	the more or less solid rock in place either at or beneath the surface of the earth.
channel	a natural stream that conveys waters; a ditch excavated to control the flow of water.
commuting (birds)	the daily movement of birds from roosting areas to feeding sites.
COSEWIC status	the status or rank (*e.g.*, extinct, extirpated, threatened, endangered or rare) given to species of wildlife by the Council on the Status of Endangered Wildlife in Canada (COSEWIC).
decommissioning	preparing facilities for abandonment at the end of project life.
discharge	the process by which groundwater feeds into surface water bodies, or the general flow of water from a source to a receiving body of water.
drainage	the removal of excess surface water or groundwater from land by means of surface or subsurface flow.
endangered	descriptive of a species threatened with imminent extinction or extirpation.
erodible	susceptible to erosion.
erosion	detachment of soil particles by agents such as water, wind, and ice.
extinct	a species that no longer exists on the planet.
fauna	animals.
field truthing	on-site verification of information gathered from primary and secondary sources.
fine-grained texture	generally refers to the silt- and clay-size particles in soil.

fish habitat	the spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes (federal definition).
flora	plants.
gravel	rock or mineral pieces larger than two mm and up to 76 mm, in diameter, may include larger diameter cobbles.
habitat	the environment in which the life needs of a plant or animal are supplied.
hazardous materials	any prohibited, restricted, or controlled product.
heritage resources	archaeological resources, heritage structures, designated historic sites, sacred sites, burial sites, and areas of historical importance.
heritage structure	standing structure meeting Canadian Inventory of Historic Building (CIHB) criteria.
herpetiles	a category of animal consisting of amphibians and reptiles.
historic	after European arrival.
impact	an observable and measurable response of a population, individual or abiotic factor to an external source of disturbance.
migration (birds)	movement of birds, usually in large numbers, with the purpose of reaching areas used for breeding.
mitigation measures	measures applied to eliminate or minimize the potential adverse effects of an activity on the environment.
mudstone	a fine-grained sedimentary rock consisting mainly of clay mineral particles.
mulch	material such as baled hay, straw, or shredded straw mixed with newsprint and raw cotton fibres, which covers the surface of the soil and protects against the impact of erosion.
mulching	the application of mulch on slopes and other exposed ground as a temporary measure to prevent erosion of the exposed ground and siltation of watercourses.

organisms	any life forms.
passerine	perching birds.
pH	a quantitative measure from 0 to 14 of the acidity or alkalinity of a solution. Low pH indicates acidity, high pH indicates alkalinity, pH7 indicates neutrality.
pre-contact	an event that predates European arrival, typically referring to First Nations peoples and their activities before contact with Europeans.
project, the	The Cape Breton Power 4MW Lingan Wind Power Project.
rare species	species which occur in low numbers in a given area, but which are in little danger of extinction.
runoff	portion of the precipitation on a drainage area that is discharged from the area in the stream channels. Includes surface runoff, groundwater runoff, or seepage.
sandstone	a sedimentary rock consisting of sand-sized particles cemented by silica or clay.
sediment	fine soil material that is generated by erosion and deposited from water.
sedimentary rock	rock formed by the accumulation of sediment in water (aqueous deposits) or from air (eolian deposits).
sedimentation	deposition of soil particles or other solids.
sensitive	descriptive of a species that normally exhibits a well-defined response to an external source of disturbance when measured under controlled conditions. However, population characteristics of sensitive species may render them non-susceptible to disturbance under field conditions (see vulnerable).
silt	soil particles from 1/256 mm to 1/16 mm in diameter.
siltation	see also sedimentation. Denotes sediment pollution of a watercourse.
slate	a fine-grained metamorphic rock that originated as shale, easily split into flat smooth plates.
species	a self-perpetuating population of animals or plants which is more or less genetically isolated.

study area	refers to the EA study area for the Lingan 4MW Wind Power Project (refer to Figure *i*).
study team	Cape Breton Power Inc. and Dillon Consulting Limited.
surface runoff	see runoff.
surface water	all water, the surface of which is exposed to the atmosphere.
surficial	characteristic of, pertaining to, formed on, situated at, or occurring on the earth's surface; especially, consisting of unconsolidated residual, alluvial, or glacial deposits lying on the bedrock.
threatened	descriptive of a species likely to become endangered.
till	non-sorted, non-stratified sediment carried or deposited by a glacier.
topography	the configuration of the Earth's surface, including the shape, elevation and position of its natural and man-made features.
undertaking, the	as described in the Registration Document and defined by the Nova Scotia *Environment Act* and *Environmental Assessment Regulations.*
vulnerable	descriptive of a species at risk because of low numbers or restricted occurrence.
watercourse	the full width and length, including the bed, banks, sides and shorelines, or any part of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not (provincial definition).
watershed	an area of land draining to a common collection system such as stream or lake.

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1.0 Introduction

1.1 Project Overview

Cape Breton Power Inc. plans to construct two 2MW wind turbines on the coastal barrens northwest of the Lingan power station in Cape Breton Regional Municipality. Figure 1-1 shows the proposed project location.

When the required approvals and permits are received, Cape Breton Power plans to begin construction in the fall of 2005 and operation to begin in early 2007.

The two turbines will be positioned at Davys Head and North Head. Five additional turbines will be located between these two as part of another undertaking by Cape Breton Power. The turbine selected for this project is Enercon's E70 model, which will be 64m high at the hub and have a 71 m blade diameter.

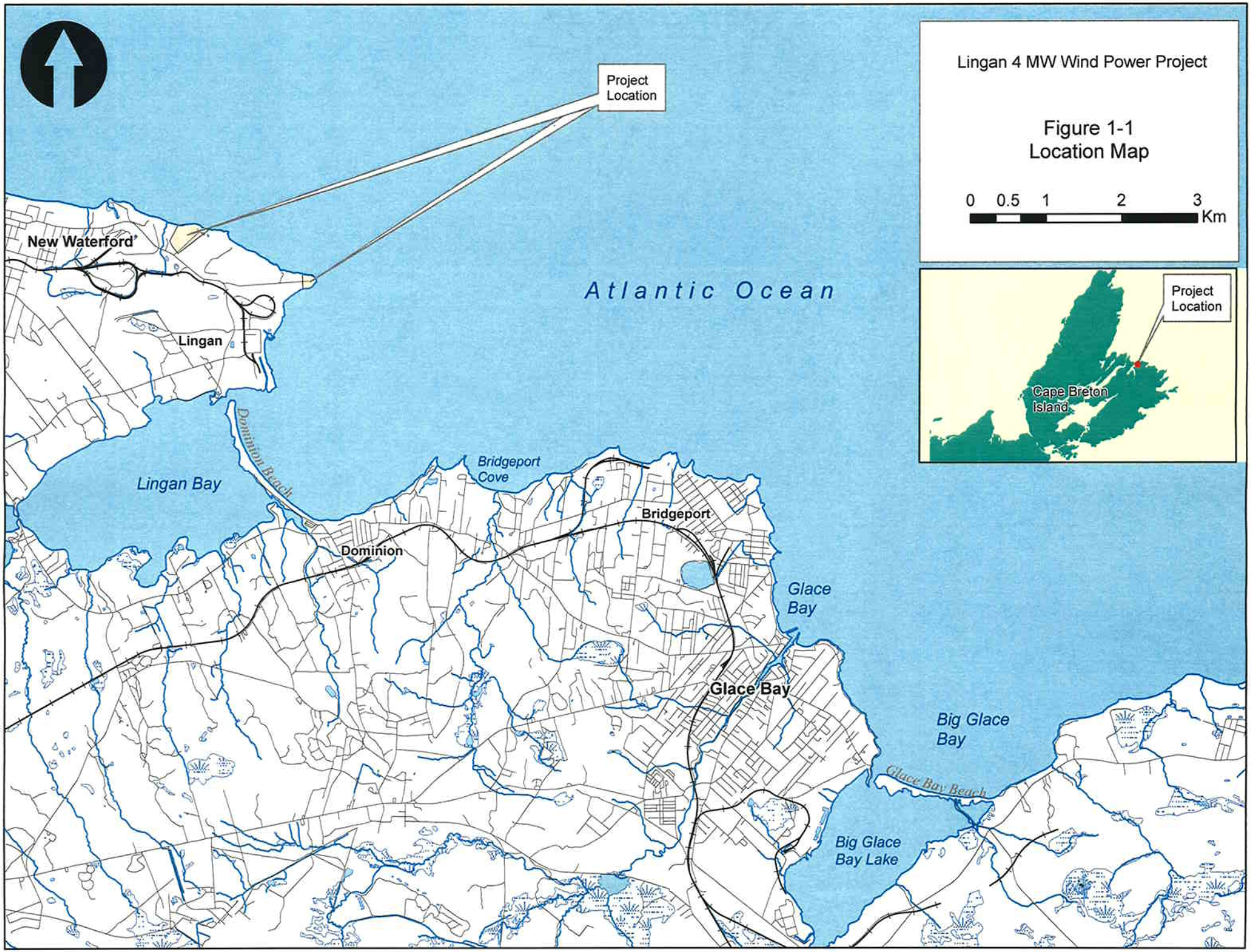
1.1.1 Need for the Project

The purpose of the undertaking is to construct a wind power generating facility to generate electricity for transmission via the existing NSPI grid. This project and a subsequent 10MW wind farm facility combined are anticipated to provide an estimated 49 GWh annually. This project is part of Nova Scotia Power Inc.'s initiative to increase Nova Scotia's renewable energy production to 25% from 10%. The electricity provided by the combined projects will displace the equivalent power supplied by NSPI's fossil fuel fired generating stations and reduce total GHG emissions by approximately 10,600 tonnes

1.1.2 Elements of the Project

The project includes the construction and operation of two 2MW wind turbines, access roads, interconnecting cables and a connection to the NSPI grid.

Cape Breton Power will construct, operate, and maintain the wind turbines, the connection to the NSPI grid and the ancillary components.


Lingan 4 MW Wind Power Project
Figure 1-1
Location Map
0 0.5 1 2 3
Km
Project Location
Project Location
Cape Breton Island
Atlantic Ocean
New Waterford
Lingan
Lingan Bay
Dominion Beach
Bridgeport Cove
Bridgeport
Dominion
Glace Bay
Glace Bay
Big Glace Bay
Glace Bay Beach
Big Glace Bay Lake

The physical aspects of the undertaking are as follows:

- Two 2MW turbines, which will be 64m in height (hub) and 71 m rotary diameter;
- Approximately 1.6 km of interconnecting cables and the connection to the NSPI grid at the Lingan substation;
- Crane pads (for erecting each of the turbines), and;
- Approximately 1.6 km of access roads between the turbines across the site.

1.1.3 Role of Environmental Planning

Environmental planning is fundamental to the successful execution of all stages of this project. The Environmental Assessment (EA), addresses the requirements for review of the project under the *Environmental Assessment Regulations.* The purpose of an EA is to identify the anticipated impacts of a proposed project, allowing for the identification of residual (remaining) impacts once reasonable and practical mitigation measures have been incorporated.

1.2 Alternatives

Selecting a suitable location for a wind turbine requires that the proposed site meet specific criteria:

- Available source of wind resource;
- Close proximity to a connection to the NSPI electrical grid;
- A community where there is a reasonable level of acceptance of wind energy and wind turbines;
- Sufficient land for the required infrastructure, and;
- Access to roads/rail for the transportation of the turbines and other materials.

The Lingan site meets all of the above criteria for the proposed project. In addition, the Lingan site is not a on a major avian flight path, unlike other headlands in the area. Although there are migratory bird habitats in Lingan Bay, the primary flight path is directly in and out of the Bay along the shore of Shanty Bay past North Head.

A lack of watercourses and wetlands on the site and past uses for coal extraction reduces the likelihood of impacting sensitive aquatic or terrestrial habitat during construction.

The Lingan site presents the best available option for a wind power project in this region with the least probability of adversely impacting the environment.

1.3 Approvals and Permits Required

Provincial and federal approvals required for the undertaking are summarized in Table 1-1.

Table 1-1 Permitting Plan

Action	Authority	Notes/Comments
ENVIRONMENTAL ASSESSMENT		
Provincial Environmental Assessment Process	Department of the Environment and Labour (NSDEL)	An electric generating facility which has a production rating of 2 megawatts or more derived from wind energy is defined as Class I undertakings in *Environmental Assessment Regulations*. Cape Breton Power is seeking Ministerial approval to be granted following Registration without requirement of formal Environmental Assessment (EA) Report and based on submitting a Registration that: • Meets all requirements for approval by the Minister under the EA Regulations. • Evidences that the assessment is guided by good planning and environmental management.
PROVINCIAL APPROVALS		
Notification and Approval for works affecting sulphide bearing material	NSDEL	As required by the *Sulphide Bearing Material Regulations,* this relates to construction activities in areas where there is sulfide-bearing material, primarily pyritic slate bedrock of the Halifax Formation. Not anticipated to be required for this project.
License of Driver to transport dangerous goods	NSTPW	Required for certain materials likely to be used in construction, which fall within the definition of "dangerous goods" under the *Nova Scotia Dangerous Goods Transportation Act.*
Permit to Generate, Carry or Receive Waste Dangerous Goods	NSDEL	"Waste dangerous goods" may be generated during some construction. Depending on volumes and characteristics, registration may be required.
Approval to Burn Cleared Vegetation	NSDEL NSDNR	Approvals under the *Air Quality Regulations* will be required when it is necessary for burning of materials cut to clear construction areas, if any burning is undertaken.
Heritage Research Permit	Nova Scotia Museum	The *Special Places Protection Act* requires a heritage research permit to carry out exploration or excavations seeking heritage artifacts (archaeological or cultural heritage resources). The permit holder must submit a report on the work above.
FEDERAL APPROVALS		
Aeronautical Obstruction Clearance	Transport Canada	Required to assess if structures present a hazard to aviation and to determine lighting requirements.
Land Use Approval	Nav Canada	Required to assess if structures have an impact on Nav Canada operations.

2.0 Project Description

2.1 Introduction

This provides a detailed description of the 4MW Lingan Wind Power project (the Project). The project was conceptually defined in the 2004 application by Cape Breton Power to the Nova Scotia Power Inc. This description presents a refinement and elaboration of the project as presented to NSPI, with reference to the components that make up the registered undertaking.

The Project description is presented in sufficient detail that reviewers can understand the potential environmental impacts of the project and the methods that will be applied to avoid or mitigate environmental effects. An overview of standard environmental management and protection measures are integrated with the project description.

2.2 Project Overview

Cape Breton Power plans to construct a 4MW wind energy generation project at near Lingan, Nova Scotia. The facility will consist of two 2MW wind turbines constructed between Hinchey Avenue and the shoreline. The turbines will be connected to the NSPI grid at Lingan, supplementing the output from the Lingan Generating Station. The area of the parcels chosen for the project is approximately 13.8ha.

The physical project consists of:

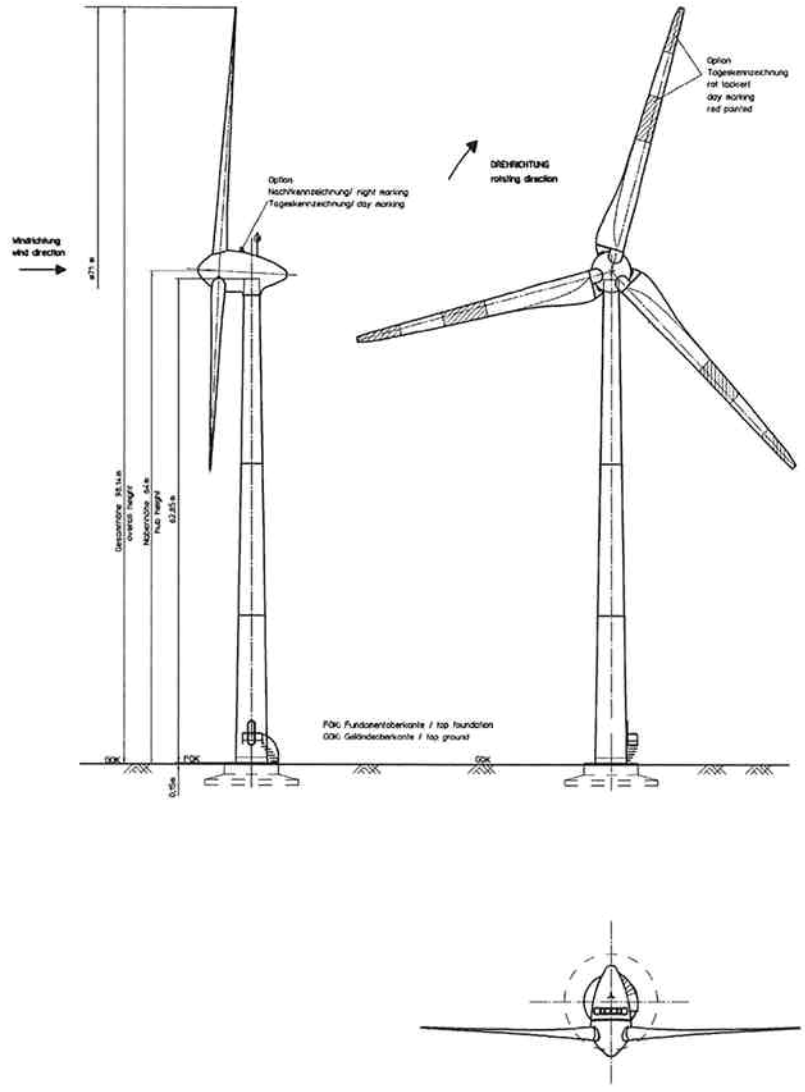
- Two 2MW Enercon E-70 wind turbines;
- Connection Cables (between turbines)
- Ancillary Components
  - Access Road
  - Service Areas (Assembly Areas)
  - Crane pads

2.3 Project Components

Turbines

The turbines selected for this project are built by Enercon. The model, the E-70, generates a maximum 2MW (in winds over 13 m/s). The rotor diameter of the E-70 is 71 m and consists of three fibreglass blades. The tip speed of the blades varies between 22 and 80 m/s while the rotational speed ranges from 6 to 21.5 rpm. The turbine will start rotation in wind speeds of 2.5 m/s and cut out between 28 and 34 m/s (100 km/hr. and 122 km/hr.) for safety (Enercon, 2005)

Figure 2-1 Typical Wind Turbine



The height of the tower from ground level to the hub (centre of the rotor) will be 64 m. The tower will be anchored in a circular reinforced concrete base. The advantage of a circular base is the equal distribution of force in all wind directions. Circular base construction also reduces the amount of re-bar required to reinforce the concrete and reduces the size of the base compared to an asymmetrical base. The depth of the foundation is dependant upon the nature of the material on the site.

Connection Cables (between turbines)

The turbines will be connected by approximately 1.6 km of cables that will be buried approximately one metre below the surface. Each turbine has its own transformer that will raise the current to a distribution level voltage of 25KV. The individual turbine transformers are connected via cables to a main transformer/substation that raises the voltage to 69KV for interconnection with the NSPI grid. Interconnection will occur at the DEVCO 80S substation.

Ancillary Components

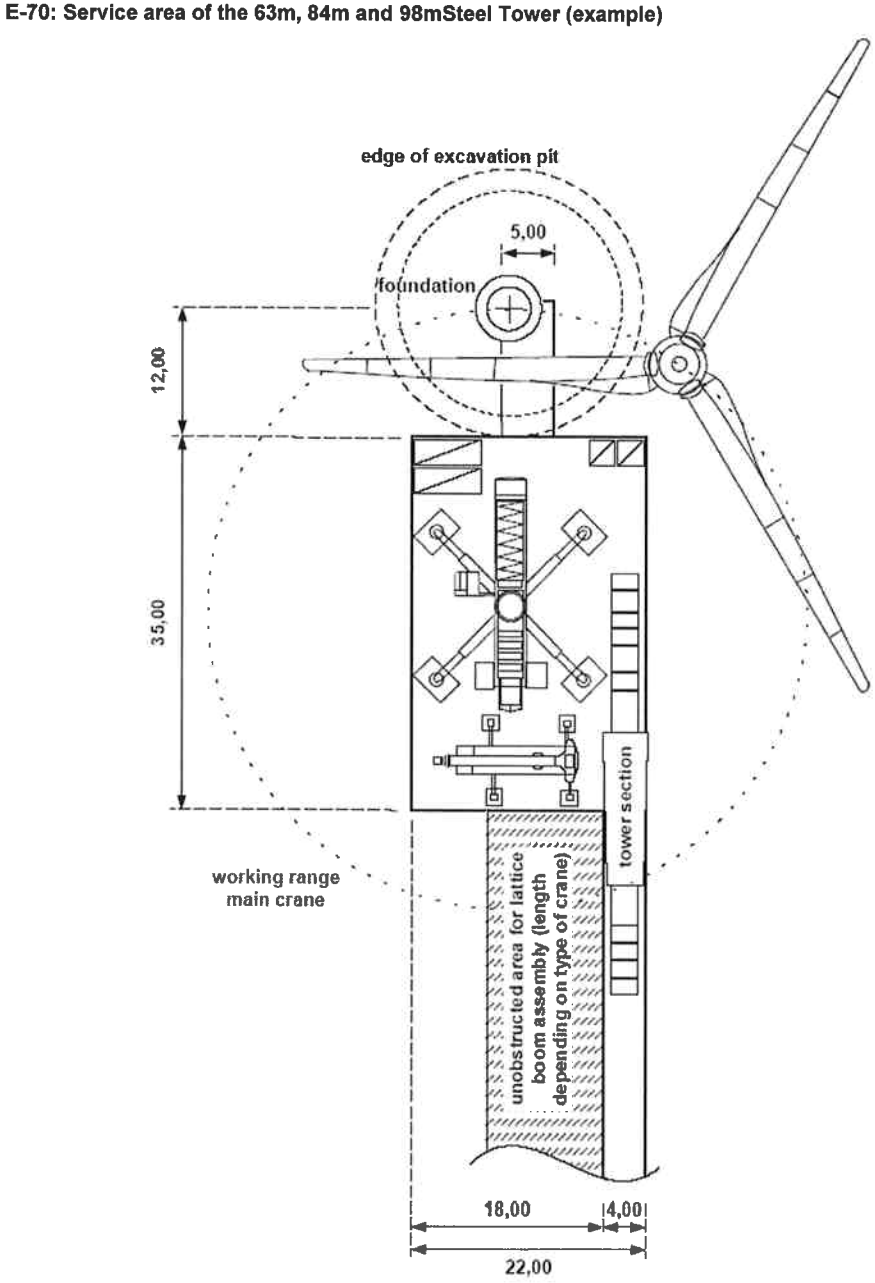
Access Road(s)

Cape Breton Power will construct approximately 1.6km of roads to access the site and to connect the turbines. The all season roads will have a right of way of approximately 5 m and will be surfaced with gravel. The maximum slope of the access roads will be no greater than 6%. The stone for the road surface will be imported from an approved offsite location. The roadbed will be constructed to permit a maximum axle load of 12 tonnes.

Service Areas (Assembly Areas)

The disturbed area associated with each foundation will be approximately 25 m in diameter. The crane pad will be constructed to permit a maximum axle load of 12 tonnes. The dimensions of the service area required for the E-70 are shown in Figure 2-2.

Figure 2-2 Service Area Requirements



2.4 Management, Schedule, Design and Pre-construction Activities

2.4.1 Pre-Construction Management

A number of management activities are conducted prior to construction of the turbines to facilitate timely project completion. These activities include:

- Project planning and design, focussing on the environmental and engineering aspects of the project;
- Pre-construction activities, including surveying and soils and environmental investigations;
- Regulatory permits and land access, to be secured in a timely manner;
- Materials procurement; and
- Contracted resources, to be tendered for prior to construction.

2.4.2 Construction Management

The construction stage of the project will include contract administration, construction, and pre-commissioning.

Key construction management activities include:

- Control of construction schedule and budget;
- Coordination of construction logistics;
- Coordination of contractors and contract administration;
- Communications with the public and stakeholders during construction;
- Execution of the work in accordance with project standards and specifications;
- Implementation of the safety, quality control, quality assurance and environmental management programs, including supervision of all independent testing and inspection requirements;
- Retention of construction records.

These activities are summarized in point form below.

Project Controls

- The construction of the turbines and components is managed to meet the budget, schedule and environmental management objectives set by Cape Breton Power.

Management and Coordination

- Construction logistics are managed with particular regard to construction staging, materials delivery, materials control, temporary facilities, emergency response during construction, and related factors;
- Contractors are coordinated and administered to meet their individual targets and objectives; and,
- Programs and procedures including environmental protection, construction safety and emergency response are applied to meet overall company goals, objectives and regulatory requirements.

Communications

- The public and affected property owners are kept informed of construction activities in a timely manner; and,
- Regulators and other stakeholders are kept informed of issues arising during construction.

Materials Quality Control

- Materials are received, and accepted from suppliers;
- Measures for material inventory control and storage are implemented;
- Delivery of material to contractors is coordinated and controlled; and,
- Records are maintained to track the location of material installation.

Installation Quality Control

- Standards and specifications are applied during construction;
- Design changes are reviewed and receive appropriate approval and sign-off; and,
- Quality control procedures are implemented to verify that construction proceeds in accordance with Cape Breton Power's specified requirements.

Environmental Compliance

- Environmental compliance is confirmed and measured against regulatory requirements, Terms and Conditions of Approvals;
- Procedures are put in place for conducting corrective actions in the event that non-compliance is discovered during construction;

2.4.3 Construction Schedule

The anticipated start-up date for construction of the two turbines is the fall of 2005. The road, crane pads and foundations will be constructed in the fall of 2005 with erection of the turbines in the spring of 2006.

2.4.4 System Planning and Design

The design process is a critical factor in assuring environmental resource protection. The planning and design of the project is described below under the following subsections:

- Regulatory Environment (2.3.3.1);
- Site Selection Process (2.3.3.2); and
- Design (2.3.3.3)

2.4.4.1 Regulatory Environment

The project will be completed in accordance with the requirements of the following federal and provincial environmental legislation and the regulations made pursuant to them.

- Migratory Birds Convention Act
- Canada Wildlife Act;
- Nova Scotia Environment Act;
- Nova Scotia Endangered Species Act;
- Nova Scotia Special Places Act; and
- Nova Scotia Wildlife Act.

In addition to the above act and regulations, the Project will be designed to meet applicable environmental regulations and guidelines. The permitting framework for the project is presented in Section 1.4.

2.4.4.2 Site Selection Process and Design

Cape Breton Power established specific set of criteria to determine the most suitable site for the project. The criteria included the following parameters:

- Sufficient available land
- Suitable wind resource
- Proximity to the NSPI grid for interconnection
- Required setback from nearby residences
- Nature of the soil (suitable for the turbine foundations)

The site at Lingan met all of the above criteria, and following the Open House, it was determined that the project was also supported by the local community. Cape Breton Power, through their design consultants, determined the best layout of the project based on the characteristics of the wind resource, the setback requirements, interconnection between the turbines and to the DEVCO substation, and onsite environmental conditions.

2.4.5 Pre-construction Activities

Supporting activities such as surveying and geotechnical investigations. These activities are required before detailed design is completed and construction begins. These activities have relatively low and localized impact on the environment, however, Cape Breton Power will implement the protection measures for these activities as described in an EPP, if required.

2.4.5.1 Surveying

Surveying includes gathering of location and elevation data required for the design of the system. Surveying requires cutting of vegetation along survey lines and cross-section offsets to provide clear line of sight for survey equipment. Given that the site is vegetated with shrubs and grasses, very little clearing will be required for surveying.

2.4.5.2 Geotechnical Investigations

Surficial soil conditions, depth to bedrock and the nature of the overburden and bedrock are investigated. Both excavation by mechanical equipment and drilling with a drill rig are used for these investigations. As with surveying, access to the site will be by existing roads.

2.4.5.3 Clearing

A minimal amount of clearing will be required for the turbines and access roads as the vegetation on the site is primarily brush and scrub. No merchantable timber is expected to be harvested during construction.

Stumps and root systems will be retained to the extent practical except in the access road right of way and where removal is necessary for safe equipment access. The need for, and extent of, stump and root system removal will be determined on a site-by-site basis. Merchantable timber, if any, will be salvaged and the remaining debris disposed of in accordance with landowner agreements.

2.5 Construction Methods

This section summarizes typical wind turbine construction activities and general environmental protection measures. Detailed environmental protection measures for each activity are detailed in the Cape Breton Power EPP.

2.5.1 Construction Equipment

The construction equipment used in the development of the site will include excavators, bulldozers and cranes. Excavation and grading equipment will be used to construct the access roads, crane pads and turbine foundations. Cranes will be used in the erection and assembly of the turbines.

2.5.2 Grading

Environmental control measures such as sediment fencing, diversion, ditching or sedimentation ponds will be installed by the crews prior to commencement of grading activities if required. Grading may be required to level the access roads and work area. Where required, graded areas will be grubbed and topsoil stripped and stockpiled for reuse. Roots and slash generated from the grubbing operation may be buried. The locations for burial will be determined in consultation with the landowner.

Given the nature of the bedrock geology (Morien Group mudstones and sandstones) in the project area and the depth of overburden, blasting is not anticipated. In addition, acid generating rock is not anticipated, as the Morien Group bedrock does not contain sulphides.

2.5.3 Construction of the Crane Pads

The crane pads for each turbine will be constructed in a similar fashion as the access roads. The pads will be constructed to permit a maximum axle load of 12 tonnes. The pads will be approximately 770m^2 and be 12m from the foundation.

2.5.4 Excavation of the Turbine Foundation Pits

The turbine foundation consists of a circular reinforced concrete base that is designed to transfer the stress and weight into the ground.

The depth of the foundation will be dependant upon the soil's ability to absorb compressive strain. Essentially, softer ground requires a deeper foundation.

Material excavated from the foundation pit will be used to fill the foundation, reducing the amount of reinforced concrete need to stabilize the foundation and reducing the amount of material to stockpile and stabilize on site.

2.6 Environmental Protection Methods

2.6.1 Purpose of Providing Environmental Protection Methods

Environmental protection is an integral component of the project. Cape Breton Power will develop environmental specifications to guide this aspect of the project. There are several important aspects of environmental protection that are common to several or all construction components. These include:

- soils and bedrock;
- sediment, erosion and drainage control;
- general protection measures; and,
- cultural heritage resources.

Soils are addressed relating to highly erodible soils. Bedrock in general is addressed relative to blasting, and the extent of shallow bedrock.

Cultural heritage resources refers to historic or pre-historic resources of cultural value. This section addresses the methods to be used to identify and evaluate these resources during construction, and to recover or protect the resources on their discovery.

The following subsections summarize the contents of the environmental specifications if required by site conditions.

2.6.2 Management of Soils and Bedrock

2.6.2.1 Waste Management

Construction operations will generate minor amounts of liquid and solid wastes. Liquid waste produced includes oils, solvents, grease, fuels and sewage. Liquid wastes such as fuel, oil and solvents will be recycled or reused wherever possible and the remaining materials disposed of at an approved facility. Waste storage will be minimized by prompt removal of waste following equipment servicing. However, if liquid waste storage is required, the storage areas will be located following the requirements for fuel and lubrication storage.

Solid waste produced will include materials such as strapping, temporary fencing, signs, and containers. Construction specifications will include requirements for litter control and management of construction wastes. Non-hazardous solid waste will be collected and disposed of at an approved facility by a licensed contractor.

2.6.2.2 Management of Bedrock

There are no plans to conduct blasting in the construction of the wind turbines. In the event that bedrock is used in the foundation of the turbines, anchor bolts will be drilled into the bedrock to secure the foundation. No breaking or blasting is anticipated for this process.

2.6.3 Management of Sediment, Erosion and Construction Drainage

2.6.3.1 Overview

Soils in the study area are characterized as sandy loams and the topography is a gradual slope towards the coastline.

2.6.3.2 Description of Erosion and Sediment Control Measures

The following is a brief summary of the erosion and sediment control measures to be used:

Sediment Control Fence

Sediment control fencing is a sheet of geosythetic fabric imbedded into the ground parallel to the contours. Sediment control fencing is used to filter sheet runoff. It will be used to contain sediment within the construction site.

Stabilization Methods

Stabilization methods will be used to minimize the potential for erosion. These include:

- tackified straw mulch, polyethylene sheets or other geosynthetic materials may be used as a temporary stabilization method if there is an impending rainfall event or if a disturbed area cannot be permanently stabilized immediately;

- erosion control blankets are sheets of biodegradable material that are installed before or after seeding; the blanket protects the seed from washing away with rain and provides soil splash protection while grasses become established; erosion control blankets may be necessary in areas with erodible soils;

- gravel including clear stone, surge rock or riprap may be used in ditches where the water velocities are high, in areas with erodible soils, or to dissipate energy from stormwater discharges; and

- for permanent stabilization disturbed areas of the site not covered with gravel will be seeded following NSTPWs standard specification.

2.6.4 Cultural Heritage Resource Protection During Construction

Cultural heritage resources is the collective term given to artefacts, buildings, features and landscapes that reflect past human activities. Archaeologically identified resources can take the form of First Nations campsites, fishing stations, burial sites, as well as the remains of historic farmsteads, residential or commercial buildings, and urban infrastructure. Existing historic buildings and landscapes, including cemeteries, are also considered cultural heritage resources. In addition to these observable resources, locations of spiritual and/or cultural significance to First Nations identified through traditional cultural or ecological knowledge are also recognized as part of our collective heritage.

Construction related activities include the turbine base construction, access roads, and ancillary features. In order to minimize these impacts and mitigate those that cannot be avoided, Cape Breton Power has undertaken a cultural heritage impact assessment to identify areas of resource potential, to design strategies for the pre-construction field verification of resource potential, to implement construction period monitoring and to propose appropriate and responsible mitigation strategies to address accidental cultural heritage resource impacts during construction. An overview of the cultural heritage impact assessment is provided in Section 4.6.12, and Appendix E.

In areas of high archaeological potential, no construction activities which would have an impact on the ground surface will be undertaken until requirements for cultural heritage resource protection have been addressed and approved by the Nova Scotia Museum.

In the event that human remains are encountered during construction, either associated with a known cemetery or an unmarked grave, work in the area of the discovery will stop immediately. Upon securing the site, the discovery will be reported to the closest detachment of the RCMP and the archaeological monitor. The subsequent contact with the Nova Scotia Museum will be detailed in the Archaeological Monitoring Protocol developed between Cape Breton Power and the Nova Scotia Museum.

Monitoring will be conducted by qualified archaeologists working under the terms of a Heritage Research Permit issued by the Nova Scotia Museum. As issuing agency for Heritage Research Permits, the Nova Scotia Museum reviews and approves research and field strategies before they are implemented.

2.7 Operations

2.7.1 Turbine Operation

The E-70 turbine is designed to begin rotation at wind speed above 2.5 m/s. This is known as the turbine's "cut-in wind speed". If the wind speed is less than 2.5 m/s, the rotors are idle. Conversely, the blades will stop rotating at wind speeds in excess of 28-34 m/s (exact cut-out speeds will be determined prior to installation). The turbine reaches its maximum power output at a wind speed of 13.5m/s. Beyond this wind speed, the turbine does not exceed its 2MW power output.

The power generated in the hub of the turbine is conducted via cables to a converter located near the base of the tower. From the converter, the energy is conducted along the network of underground cables to the DEVCO 80S substation and into the NSPI grid.

2.7.2 Maintenance

Enercon will conduct routine maintenance through their Enercon Partner Concept agreement. The equipment will be serviced and maintained four times per year as well as any unscheduled repairs. The operations and maintenance requirements of the turbines will be monitored remotely by Enercon's SCADA (Supervisory Control and Data Acquisition) system. Each wind turbine has a modem link to the central remote data transmission facility. If the turbine signals malfunction, the Service Centre and the responsible service branch are notified via the SCADA remote monitoring system. A service team can then locate the affected turbine using Geographic Information System (GIS) (Enercon, 2005).

2.8 Decommissioning, Closure and Abandonment

Once the project has reached the end of its life span (anticipated to be approximately 25 years), the site will be decommissioned. The turbines will be removed from the site and the foundations will be covered over to the existing grade and reseeded. Depending on the planned used for the site following decommissioning of the project, the access roads, crane pads and conduits will either be removed or left in place for re-use. If these ancillary components are removed, the site will be restored to the condition prior to construction.

3.0 Public Consultation Summary

3.1 Consultation

Cape Breton Power believes that public and stakeholder communication are an important means of providing information on the project and soliciting input into the construction of the wind turbines. In the planning for this project, Cape Breton Power communicated with stakeholders through a public open house.

3.2 Open House

An open house was held on June 2, 2005 in Lingan to present preliminary plans for the project and to solicit comments related to the project from local residents and stakeholders. In total, approximately 35 people attended the information session. Issues regarding birds and noise levels from the turbines were discussed. No specific concerns related to the project were raised. No changes to the project were required as result of the public meeting in Lingan.

3.3 Regulatory Meetings

Cape Breton Power has had meetings with Cape Breton Regional Municipality regarding zoning requirements for the Lingan site and has received the appropriate development permits from the Municipality. As well, Cape Breton Power has applied to Transport Canada and Nav Canada for approval for the turbines.

4.0 Description of the Environment and Environmental Impact Evaluation

4.1 Introduction

This section presents the description of the environment and the environmental impact evaluation in an integrated format. Introductory subsections describe how the impact evaluation was conducted, using an issues-based approach. Each of the issues identified is presented in detail and the impact evaluation is summarized at the end of each subsection.

4.2 Setting and Boundaries

The development of the impact evaluation first requires establishment of the environmental setting and the boundaries of the assessment itself. The establishment of study boundaries and issue scoping have been conducted with a primary focus on the potential effects of the project on the environment. The environmental assessment must also consider the potential effects of the environment on the project. Where applicable, this consideration has been incorporated in the boundaries and the scoping process.

4.2.1 Spatial Boundaries

The boundaries of the assessment vary depending on the issue being addressed. The bounded area within which the project could potentially interact with terrestrial or avian biology resources generally included the study area described above. Occasionally, additional areas outside the study area were included, such as migratory bird staging areas.

When considering cultural heritage resources, the bounded area is the area disturbed by construction, which are the turbine foundation sites and the access roads. For traditional land uses (i.e., hunting grounds, ceremonial areas, medicinal plants), the spatial boundaries may also fall outside the study area.

4.2.2 Temporal Boundaries

Temporal boundaries for the impact evaluation cover project phases involving physical activities. Therefore, temporal boundaries encompass certain pre-construction activities, construction, operation and maintenance, monitoring, and decommissioning. In effect these boundaries are approximately 25 -30 years.

4.2.3 Regulatory Boundaries

The regulatory boundaries of the project are the laws and regulations of the Province of Nova Scotia, of Canada, and the by-laws of the Cape Breton Regional Municipality. Federal laws and regulations will apply to the project and are primarily related to aspects of migratory birds. These requirements have been considered in the definition of the project and in environmental planning. However, federal jurisdiction is not considered as part of the regulatory boundaries of this project for the purposes of the registration under the Nova Scotia *Environmental Assessment Regulations*.

4.3 Issue Scoping

The purpose of scoping in an EA is to identify the key environmental Issues of Concern. Scoping involves defining the project scope; identifying the factors to be considered; and determining the interest of stakeholders in the project and how they can be incorporated. For this project, the project description presented in Section 2 of this report stands as a clear definition of the project scope. The experience of Cape Breton Power and Dillon has helped to identify factors and determine the interests of stakeholders. This work has included:

- conducting consultation meetings with stakeholders and documenting concerns;
- reviewing applicable provincial and federal environmental laws and regulations;
- meeting with regulatory agencies at provincial and federal levels;
- considering available environmental literature and references;
- incorporating the experience of the EA study team in conducting environmental assessments in Nova Scotia and elsewhere in Canada; and,
- incorporating Cape Breton Power's experience with wind turbine facility construction, operation and maintenance in Nova Scotia and elsewhere in Canada.

Through this scoping exercise, the EA study team developed a methodology for evaluating and presenting issues in this assessment. This methodology and the resulting Issues of Concern are described in the following subsection.

4.4 Method of Assessment

The EA is based on the assessment of *issues* identified through issues scoping and to emphasize the issues in the completion of the effects assessment. This approach is particularly relevant in applications such as wind turbine construction and operation where there exists an extensive database of literature, previously

completed EAs and well established environmental protection measures that can be used to support the review of potential project effects or a given issue. In this manner, an issue with well-defined mitigation, such as avoidance of designated areas, can be suitably addressed in the Project Description rather than in an effects assessment. This allows the assessment to focus on important site or project specific issues. The identified issues are reflected within an environmental effects assessment framework.

4.4.1 Impact Significance

The assessment methodology is based on EA study team experience and guidance from recent major environmental assessment studies undertaken elsewhere in Nova Scotia and Canada. Determination of significance is based on the consideration of the following results of interactions, as summarized in Table 4-1:

Table 4-1 Assessment of Criteria for Determination of Significance of Effects

Magnitude	Magnitude, in general terms, may vary among Issues, but is a factor that accounts for size, intensity, concentration, importance, volume and social or monetary value. It is rated as compared with background conditions, protective standards or normal variability.	
	Small	Small, relative to natural or background levels
	Moderate	Moderate, relative to natural or background levels
	Large	Large, relative to natural or background levels
Reversibility	Reversible	Effect can be reversed
	Irreversible	Effects are permanent
Nature	Positive	Net benefit
	Negative	Net loss or adverse effect
Extent	Intermediate	Confined to the project site
	Local	Effects extent beyond the project site but less than regional
	Regional	Effects on a wide scale
Duration	Short Term	Between 0 and 1 year duration
	Medium Term	Between 1 and 7 year duration
	Long Term	Beyond 7 years duration
Confidence in Prediction	Low	Based on limited understanding of cause and effect relationships and/or incomplete data
	Moderate	Based on a good understanding of cause and effect relationships using data from similar cases, or moderately understood cause and effect relationships and good site-specific information
	High	Based on a good understanding of cause and effect relationships and good site-specific information

4.4.2 Issues of Concern

The issues identified for assessment for the project through the issues scoping process are provided in Table 4-2 together with the section of the EA in which the issue is addressed.

Table 4-2 Issues and Location in the EA

No.	Aspect/Source	Issue	Primary Concerns	Location in EA	Included or Excluded from Impact Evaluation
1.	Air Emissions	Effects of emissions from combustion, air quality	- Dust during construction -Equipment/truck operation during construction	4.5.1	**Included** in impact evaluation. Mitigating factors include: - Excavation and grading over a minimal area - dust suppression to be employed as required
2.	Soil Erosion	Erosion of soil and sedimentation entering water courses	- Elevated sediment in watercourses	N/A	**Excluded,** there are no watercourses on the site. The Atlantic Ocean is downgradient of the site, however, the gradient is minimal.
3.	Water quality/quantity/flow	Effects on surface water or groundwater	-Contaminated surface runoff -Impact on groundwater quality	N/A	**Excluded** No nearby surface watercourse. Groundwater not used for drinking water supply as the area is serviced with municipal water. No expected groundwater withdrawal
4.	Acid Drainage	Acidification of surface water and mobilization of metals from disturbance of acid generating rock	- Effects on fish and fish habitat	N/A	**Excluded**, bedrock is not acid generating, no fish habitat present.
5.	Wetlands	Disturbance wetlands.	-Loss of wetland habitat or function;	N/A	**Excluded**, no wetlands on site.
	Terrestrial Habitats	Disturbance of habitats	-Clearing, habitat loss; disturbance; fragmentation	4.5.2	**Included** in the impact assessment. Mitigating factors include: - The actual footprint of the turbines and access road is minimal. - The area is already largely disturbed
	Species at Risk	Impacts to Species at Risk	Loss of Species at risk habitat or individuals/populations	4.5.3 4.7.1	**Included** in the impact assessment. Mitigating factors include: - The actual footprint of the turbines and access road is minimal.

No.	Aspect/Source	Issue	Primary Concerns	Location in EA	Included or Excluded from Impact Evaluation
	Migratory Birds	Impacts to Migratory Birds	Migratory bird losses from impact with turbines, loss of breeding habitat	4.5.4 4.7.1 4.7.5	**Included** in the impact assessment. Mitigating factors include: - Tower design is not conducive to roosting or nesting for birds. - The project site is not in a major flight path for migratory birds - The total amount of lost nesting habitat will be minimal due to the limited footprint of each turbine.
6.	Other Avian Species	Impacts to bats, avian invertebrates	Migratory bat, large dragonfly species and monarch butterfly losses from impact with turbines.	4.5.5	**Included** in the impact assessment. Mitigating factors include: - No known bat hibernacula in the study area, no records of bats from ACCDC - Avian invertebrates are unlikely to fly high enough to interact with the blades.
7.	Cultural Resources	Loss or disturbance of archaeological, historical, paleontological or architectural resources	-First Nations resources; -Archaeological sites	4.5.6	**Included** in the impact assessment. Mitigating factors include: - an archaeological assessment has been conducted to determine potential for cultural resources. - An intrusive test-pitting program will be conducted at the turbine sites to determine presence or absence of archaeological resources. - Direct impact to the WWII era forward observation post on North Head will be avoided by locating turbines a suitable distance from the site. Development of the project may serve to protect the observation post by restricting access.
8.	Ambient Noise	Increase or change in noise levels	-Elevated noise levels during construction or	4.5.7	**Included** in the impact assessment. Mitigating

No.	Aspect/Source	Issue	Primary Concerns	Location in EA	Included or Excluded from Impact Evaluation
			during operation		factors include: - Noise during construction is temporary - Operational noise (~ 45 db) not likely to exceed background noise levels.
9.	Land Use	Effects on use of lands	-Impacts on the uses of surrounding lands	N/A	**Excluded** in the impact assessment. Mitigating factors include: - Zoning for the site and land surrounding the site permit utility scale wind turbines - Minimum setback of turbines from residential structures is 175 m (575 feet).
10.	Traffic	Effects on traffic in the area	-Negative impacts on traffic patterns	N/A	**Excluded** in the impact assessment. Mitigating factors include: - Construction period is limited period of time. - Excess traffic during construction will be minimal
11.	Malfunctions or Accidents	Accidents during construction, operation or decommissioning	-Releases or spills of hazardous materials - Failure of turbines, cranes.	4.5.8	**Included** in the impact evaluation. Mitigating factors include: - Contingency plan for emergencies during all phases of the project - Geotechnical investigations will determine the most suitable location for turbines. Turbine foundation designed to withstand conceivable stresses during operation - Turbine rotors designed to "cut ut" at winds in excess of 34m/s.

4.5 Environmental Impact Evaluation

4.5.1 Air Quality

Local and global air quality issues relating to the proposed project include vehicle emissions (*e.g.,* carbon dioxide and oxides of nitrogen) as well as dust and noise. Air emissions must comply with the provincial *Air Quality Regulation* made under Section 112 of the *Environment Act*, 1995.

It is expected that the minimal emissions of greenhouse gases during construction resulting from the project will be greatly offset by reductions in greenhouse gas emissions by use of wind power for power generation. The estimated reduction in GHG is approximately 10,600 tonnes per year.

Dust at nuisance levels can be generated by construction, however, it is expected that dust generation will be limited. Dust suppression will be carried out as required during construction. Dust can be related to health issues, however, the project will not generate dust at levels or over periods of time that need to be addressed as a health risk for the public.

Guidelines are provided for dust levels by the NSDEL. These levels are related to the disturbance and nuisance of fugitive dust.

Results:

Magnitude	Small: similar to other small utility construction projects.
Reversibility	Reversible: Emissions, and dust are temporary. Positive reductions in GHG
Nature	Positive.
Extent	Regional: The extent of emissions and dust effects are limited to areas close to the project construction. Overall reduction of greenhouse gases from the project.
Duration	Short-term: The potential duration of impacts from emissions and dust is confined to the construction period events.
Confidence in prediction	High

Significance: Not significant. Fugitive and point source emissions from the project are minor to negligible on a local and global scale. In addition, greenhouse gas emissions associated with heating will be reduced as a portion of electricity generation from oil/coal is replaced by wind. The impacts of dust are not expected to be significant with protection measures.

Residual Impact Statement: The residual impacts of dust are considered not significant. During construction the effects will be mitigated by standard dust suppression methods. No residual long-term impacts on air quality are expected from the project.

4.5.2 Terrestrial Habitats

The project site is characterized by a combination of coastal barrens and mixed forest and scrub. Coastal barrens are a common habitat on the shoreline between New Victoria and Donkin. The barrens on this site range extend from the tree line to the cliffs that make up this headland and vary between 80 and 250 m wide.

The forest component of the site consists of mixed species with the majority being white spruce and intolerant hardwoods such as alder and red maple. Trees in these stands range in average age between 25 and 35 years.

No significant wildlife habitats, as listed by NSDNR, are present on the proposed site (refer to Figure 4-1). The closest NSDNR significant wildlife habitat is located in approximately 1 km south of the site. This habitat is located in the waters of Shanty Bay and is classed as migratory bird habitat. Other migratory bird habitat includes the waters of Lingan Bay, approximately 1.8 km south of the site.

Results:

Magnitude	Small
Reversibility	Irreversible: Some vegetation will be lost due to construction
Nature	Negative
Extent	Immediate: limited to access roads, turbine foundations and crane pads
Duration	Long-term: Life of the project (approx. 25 years)
Confidence in prediction	High: Sensitive habitat is not present on the site.

Significance: Not significant. No known significant wildlife habitat onsite, and the amount of habitat directly impacted is minimal.

Residual Impact Statement: No significant impacts are predicted on terrestrial habitats based on the limited amount of land required for the wind turbines and the degree of past disturbance.


Lingan 4 MW Wind Power Project
Figure 4-1
Site Map
Turbine Site Boundary
Forested
Barrens
Agriculture
Developed/Urban
Beach
Wetland
Significant Wildlife
Project Location
Cape Breton Island
New Waterford
Gillis Cove
North Head
Lingan
Laffins Cove
Shanty Cove
Indian Bay
Dominion Beach
Lingan Bay
Timmons Cove
Bridgeport Cove
Glace Bay
0 300 600 1,200 1,800 2,400 3,000
Meters

4.5.3 Species At Risk (Flora and Fauna)

Species at risk include those for which critical habitat is restricted to a few locations, or which are represented by a few individuals locally, nationally or globally. Species at risk are valued by numerous stakeholder groups. Provincial and pending federal legislation provides for the protection, designation, recovery and other aspects of conservation of species at risk. At Risk Species are identified nationally under the Committee on the Status of Wildlife in Canada (COSEWIC) listings and provincially under the status of wildlife process. Regulatory protection is extended under the federal Species at Risk Act (SARA) and the provincial Nova Scotia Endangered Species Act (NSESA). Under SARA, the initial List of Wildlife Species at Risk is Schedule 1 and is based on recent COSEWIC assessment of endangered or threatened species. As of June 1, 2004, SARA applies to aquatic or migratory bird (under MBCA protection) at risk species and listed endangered, threatened or extirpated species on federal lands. The NSESA provides "for the protection, recovery and other relevant aspects of conservation of species at risk in the Province, including habitat protection" (Nova Scotia Department of Natural Resources 1998). At risk species are designated for protection under the Act by the Species-at-risk Working Group.

Other species are identified as potentially rare within the province based on literature assessments such as the Atlas of Rare Vascular Plants of Nova Scotia (Pronych & Wilson, 1993).

While there is potential to encounter rare species either directly within the easement or to have construction activities result in disturbance to rare species adjacent to the easement, the disturbed nature of the site decreases the potential.

Flora Methodology

Potential at-risk flora known to occur within the general vicinity of the project (10 km square or adjacent grid to ensure a complete plant list as the 10 km grid may not be centered on the study area) are identified in the Atlas of Rare Vascular Plants of Nova Scotia and in NSM and ACCDC data. A search of records from the ACCDC was conducted using a 100 km radius from the project site as described in NSDNR's Draft Guide to Addressing Wildlife Species and Habitats in an EA Registration Document (2005). Data reports are provided in Appendix C.

Field surveys were conducted within the study area with particular attention paid to habitats with a higher potential for containing at-risk species. These habitats included any wetlands, swales and low-lying areas, specific forest stands and road sides/disturbed areas. A spring survey was conducted in June 2005 to identify species that flower in the early portion of the season. A late summer plant survey was conducted in mid-September to identify those species that flower in the late season. The results of both surveys are presented in Appendix B.

Fauna Methodology

Potential at-risk fauna known to occur within the general vicinity of the project are identified based on the Atlas of Breeding Birds (Erskine 1999), NSM and ACCDC data, and habitat. Data reports are provided in Appendix B.

Field surveys were conducted within the study area with particular attention paid to habitats with a higher potential for containing at-risk species. These habitats included any wetlands, swales and low-lying areas, specific forest stands and disturbed areas.

No at-risk flora or fauna were observed during field surveys.

Results:

Magnitude	Not applicable: At risk species not observed on the project site.
Reversibility	Not applicable
Nature	Not applicable
Extent	Not applicable
Duration	Not applicable
Confidence in prediction	High: Project site field truthed for at risk plants and herpetiles, the surrounding area was field truthed for at risk avian species. Species were not observed.

Significance: Not significant. Not at risk species observed.

Residual Impact Statement: No significant impacts are predicted on species at risk based on the findings of the survey and the commitment to implement field identification survey prior to construction in those areas not assessed.

4.5.4 Migratory Birds

Some bird habitat and bird species are protected under the federal *Migratory Bird Convention Act*, or provincially under the *Wildlife Act*. In addition, NSDNR has hunting and trapping regulations, *Wildlife Guidelines and Standards*, and *Wildlife Habitat Management Regulations*; these policies strive to maintain biodiversity through maintenance of habitat such as old-growth forests.

Three bird surveys of the site and surrounding lands were conducted by Dr. David McCorquodale in the spring and early summer of 2005. The purpose of these surveys was to determine what species were using this site and in what manner (i.e. breeding, migration route, foraging etc.) The surveys were divided into point counts, a spring migration survey and a breeding survey. The following is a summary of the findings of these surveys:

Point Counts

On 16 and 22 May 2005 the site was traversed from the old Lingan Colliery to the World War II gun emplacement and along the Nova Scotia Power fence line. In between several forays into the woods of White Spruce, Trembling Aspen and White Birch were made. From this reconnaissance, seven locations for point counts with coverage of all terrestrial habitats on the site were selected. In addition, from three of these locations (Figure 4-2 points A, C and F) scans could be made of virtually all of the surrounding waters.

Spring Migration Surveys

On 22 and 28 May 2005 five-minute point counts were done at each of the seven locations. All birds heard or seen were recorded. In addition all other species seen or heard while walking to and between the seven locations were recorded. Surveys started early in the morning (before 7:00AM) to overlap maximum bird activity. Throughout the surveys attention was paid to any birds flying overland at the height of the wind turbines and whether there were flight paths that would potentially intersect with the locations of the turbines.

Results of Spring Migration Survey

Fewer than 50 passerines were detected during two days of surveys at a time of year when many passerines (flycatchers, warblers, vireos) would be expected to pass through.

The Lingan area is not considered to be an area of high migration numbers. Other sites in the region, such as Schooner Pond, about 15 km east, Petersfield Provincial Park, Tower Road Sewage Lagoon and at other headlands such as Point Aconi, (within 25 km) exhibit higher number of migrants during the spring migration.

There appears to be little movement of ducks and geese between Lingan Bay and the north shore of the proposed site. The waterfowl tend to exit the bay following the channel by the wharf at Lingan and then roost on the ocean beyond the Power Plant. Gulls do fly over the Power Plant and then overland to the ocean on the north shore. Double-crested Cormorants do as well, but much less frequently than gulls. There is little evidence suggesting that these species are susceptible to colliding with turbines (see Kerlinger 2005). Gulls and cormorants should be able to notice the turbines and use alternate routes.

The associated mudflats and Beach are not significant staging areas for shorebirds in the spring, but they are in the autumn migration. This issue will be addressed during an autumn migration survey in fall 2005.

No species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) nor species listed as Red or Yellow in the General Status of Wild Species in Nova Scotia were detected during spring migration surveys. No concentrations of migrant birds were noted or expected.

A fall migratory bird survey will be conducted during the last week of October and the results of this survey will be presented following submission of this document.

Breeding Season Surveys

On 08 and 28 June 2005 five-minute point counts were done at each of the seven locations. All birds heard or seen were recorded. In addition all other species seen or heard while walking to and between the seven locations were recorded. Surveys started early in the morning (before 5:30) to overlap maximum bird activity.

Results of Breeding Bird Survey

An annotated list of breeding birds observed on the site is presented in Appendix A.

The two most common species nesting on the site are Great Cormorant and Black Guillemot (more than 50 pairs each). Next, estimated 10-20 pairs, would be Herring Gull, Song Sparrow, White-throated Sparrow, Yellow Warbler, Common Yellowthroat roughly in decreasing order of abundance. All other species would have fewer than ten, most only one or two pairs, nesting on or within a few hundred metres of the site. The cormorants and guillemots use the cliffs on the headland between Gillis Cove and Laffins Cove for nesting. As a result of the survey, it is estimated that there are over 125 nests in the cormorant colony (Double Crested and Greater Cormorant combined) on the north side of the headland (see Figure 4-2). Black backed gulls, Herring gulls and Double Crested cormorants were observed commuting across the site between the ocean and Lingan Bay. These birds numbered only between 10 and 20 individuals on each of the four mornings that they were observed.

Gulls are potentially at a higher risk than other species because they fly within the height of the blades' rotational path and because of their nesting proximity to the site and higher numbers throughout the year. However, several studies on gull populations situated near wind farms revealed no adverse effect on local gull populations, even though the birds flew though the wind farm frequently (CWS, 2003). These same studies found similar results for cormorant populations that coexisted with the gulls. At Blyth Harbour in the UK, a nine-turbine farm was constructed adjacent to a location used by wintering Double Crested Cormorants. In seven years of mortality surveys, only one cormorant was found killed by the turbines. At another site in Buffalo Ridge, MN, where cormorants regularly flew through a 354-turbine site, no mortalities were observed in six years of surveys. (CWS, 2003)

The size of the site and location suggest that larger raptors such as Red-tailed hawks and Northern Goshawks will not have enough territory to forage. One Merlin was observed, but there was no evidence of nesting on the site.

No species listed by COSEWIC were detected during the breeding season surveys. One species listed as Yellow in the General Status of Wild Species in Nova Scotia, Common Tern, was seen during breeding season surveys.

Consultation

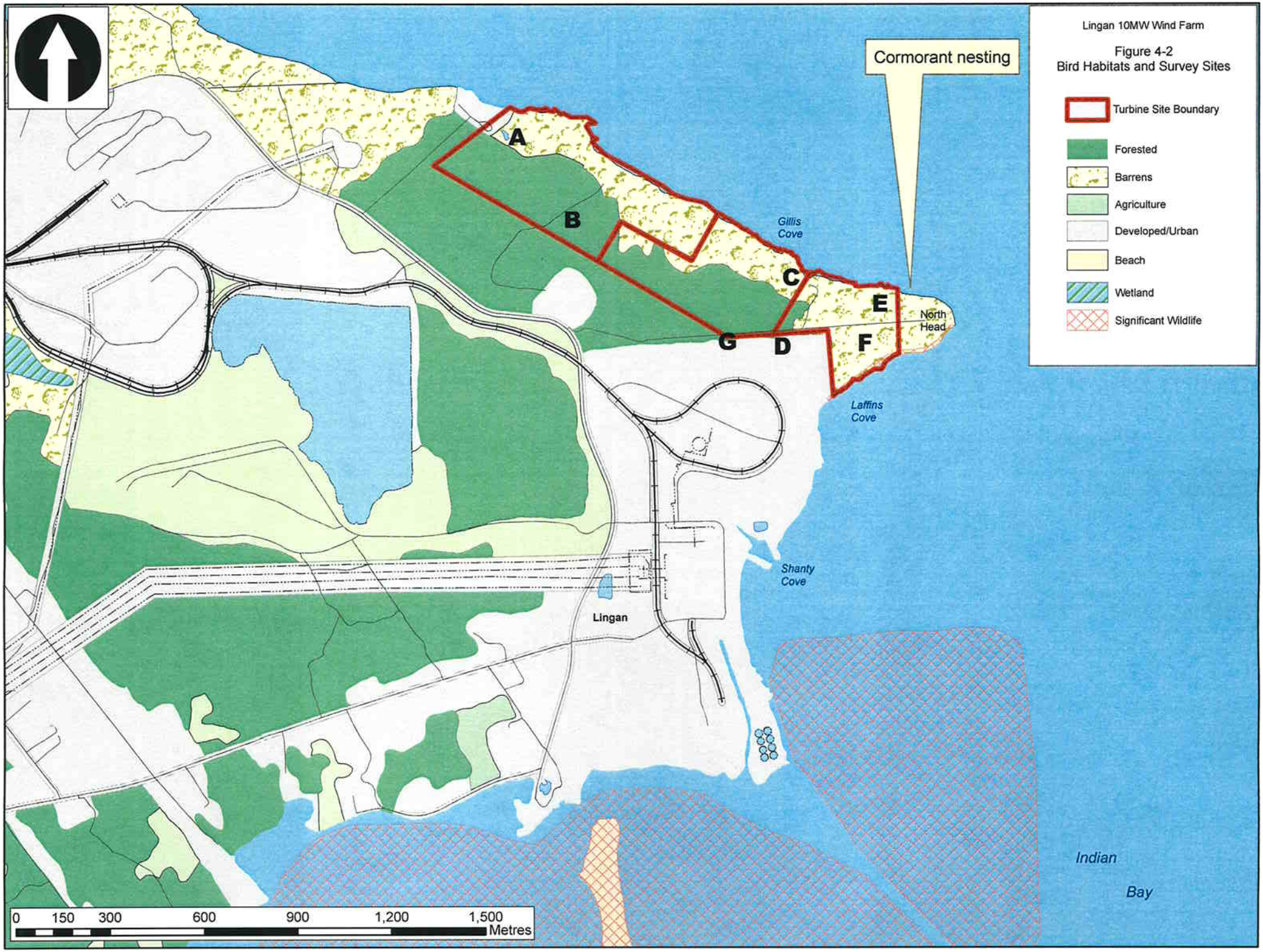
Limited consultations with private individuals and groups near the site have been undertaken. More consultation will be done through the fall migration period. The wildlife biologist with the NS Department of Natural Resources (Terry Power, Coxheath office), Becky Whittam of Bird Studies Canada, Sackville, New Brunswick and coauthor of the draft guidelines for assessing the impact of wind projects on birds and a bird biologist with the Canadian Wildlife Service in Sackville, New Brunswick (Dan Busby) were consulted about the project.

Results:

Magnitude	Small
Reversibility	Reversible: Birds have the ability to recognize turbines as obstacles and avoid them.
Nature	Negative
Extent	Immediate: Limited to the project site
Duration	Long-term: Life of the project (~ 25 yrs)
Confidence in prediction	High: Nesting and migration patterns are well documented in this area by local experts and federal/provincial authorities.

Significance: Not significant given known migration patterns and observed diurnal use by migratory birds.

Residual Impact Statement: No significant impacts are predicted on migratory birds based on the findings of the surveys and the commitment to implement a fall migration survey prior to construction.


Lingan 10MW Wind Farm
Figure 4-2
Bird Habitats and Survey Sites
Turbine Site Boundary
Forested
Barrens
Agriculture
Developed/Urban
Beach
Wetland
Significant Wildlife
Cormorant nesting
A
B
C
D
E
F
G
Gillis Cove
North Head
Laffins Cove
Shanty Cove
Lingan
Indian Bay
0 150 300 600 900 1,200 1,500 Metres

4.5.5 Other Avian Species

Bats

According to NSDNR's General Status of Wild Species in Nova Scotia, six species of bats are found in Nova Scotia and all are ranked as "Yellow" status. Yellow status means the species is sensitive to human activities or natural events. The six species include: Little Brown Bat; Northern Long-eared Bat; Silver Haired Bat; Red Bat; Hoary Bat; and, Eastern Pipistrelle.

The Lingan project site is not in the vicinity of any known bat hibernacula and bat migration has not been noted in the avian surveys. According the records held by the Atlantic Canada Data Conservation Centre, no observations have been noted of bat species.

According to mortality surveys at other wind farms, bats have been killed by turbine blades, but at the same degree as, or lower than, avian mortality (Johnson et al. 2003, Johnson et al. 2003b, Young et al. 2003, Erikson et al. 2003)

Invertebrates

There is very little information of the effects of turbines on large dragonflies and butterflies. A study in northern Germany on 11 wind farms looked for evidence of insect impacts on the turbine blades. The study was established to determine the impact of the turbines on avian food supply. The impact was determined to be negligible (Gipe 1995).

Results:

Magnitude	Small
Reversibility	Reversible: Bats able to detect obstacles through echolocation. Avian insects fly lower than the bottom of the blade path.
Nature	Negative
Extent	Immediate: Limited to the project site
Duration	Long-term: Life of the project (~25 yrs)
Confidence in prediction	Moderate: Literature on impacts of wind farms on bat and invertebrates is limited,

Significance: Not significant based on available data and recorded observations from ACCDC.

Residual Impact Statement: No significant impacts are predicted on bats and avian invertebrates based on the available data for bat habitat and previous studies.

4.5.6 Cultural Resources

Cultural Resource Management Group was contracted to conduct an archaeological screening of the Lingan study area. The screening consisted of background information searches and a non-intrusive site visit. The Nova Scotia Museum has no records of archaeological sites in the vicinity of the study area; however, this may be due to a lack of investigations.

Historically, the Lingan area in general has been the site of Mi'kmaq, French and Irish settlement. No records of Mi'kmaq settlement exist; however, former names of the region (Indian Head and Indian Bay) suggest habitation by First Nations people. The French settled the area prior to 1716, followed by the Irish in the late 1700's.

The Lincoln Mine operated near the site of the present day generating station from 1854 to 1888. No remnants of the former coal mining operation were apparent on the study site during the visual archaeological inspection. Some crib work was observed on the shoreline.

North Head is the site of a former observation post constructed in 1939 as part of the coastal defences for Sydney Harbour. The structure still remains along with evidence of possible out buildings (privy, etc), but is in an advanced state of deterioration.

The cultural resources report is present in full in Appendix C

Results:

Magnitude	Moderate
Reversibility	Irreversible: once features are destroyed they cannot be recovered
Nature	Negative: due to the fragile and unique character of cultural heritage resources, the anticipated construction related impacts are considered negative Positive: the planning and modeling being undertaken to identify cultural heritage resource impacts will serve to advance the understanding of human history and population distribution
Extent	Immediate: confined only to excavated areas
Duration	Short-term: effects will only occur during construction
Confidence in prediction	High

Significance: Not significant given the recommended mitigation measures, absence of evidence of cultural resources, and the relatively small area of disturbance

Residual Impact Statement: Implementation of the pre-construction field verification strategies and construction period monitoring activities will allow Cape Breton Power to carry out appropriate and responsible mitigation strategies to avoid impacts where practical and address accidental cultural heritage resource impacts during construction.

4.5.7 Ambient Noise

Noise is often raised as an issue surrounding wind turbines. Generally there are two types of noise associated with the operation of wind turbine: the noise created by the generator and gearbox inside the nacelle; and the noise created by the blades or rotors passing through the air.

The E-70 turbine is a gearless turbine with a direct drive variable speed generator. These machines have no gearbox or drive train, and consequently no high speed mechanical (or electrical) components. Direct drive turbines are, therefore, quieter than gearbox machines as they do not produce mechanical or tonal noise. Variable speed machines change speed continuously in response to changes in wind speed and, although noise output may be higher at higher wind speeds, it is lower at low wind speeds where the low background levels occur (British Wind Energy Association website, 2005).

The blade of the E-70 has been designed to reduce noise created by turbulence. Turbulences that occur at the blade tips due to overpressure and under pressure are effectively removed from the rotor plane. The entire length of the blade is therefore utilised without any loss of energy caused by turbulences (Enercon, 2004). An upwind orientation of the blades to the tower reduces airflow changes as the blades pass the tower. Some older models had the blades downwind of the tower, which would result in a pulse as the blade passes the tower.

A modern wind turbine, like the E-70 proposed for the Lingan site, emits less noise than ambient noise in a suburban or rural neighbourhood. Sound pressure levels emitted from a turbine is expected to be between 47 and 50db at a distance of 200 m. Sound pressure levels measured in the spring of 2005 in the vicinity of the project site averaged 54db.

Results:

Magnitude	Small: Construction, noise sources will be limited to excavator, trucks and crane operation. Operation, the turbine blades and generator of the E70 are designed to reduce noise during operation
Reversibility	Reversible
Nature	Negative
Extent	Regional: The extent of noise effects is limited to the project site and immediate surroundings.
Duration	Short-term: The potential duration of impacts from nuisance noise is confined to the construction period, and to short durations during infrequent operations events.
Confidence in prediction	High

Significance: Not significant, based on ambient noise levels recorded in May 2005.

Residual Impact Statement: The predicted ambient noise generated by the project will not exceed the background noise of the surrounding area. The turbines only produce sound when the wind is blowing, and due to advances in blade and generator design, the ambient noise of the turbines should be masked by the wind passing through the trees and local structures.

4.5.8 Accidents and Malfunctions

Accidents and malfunctions that can lead to environmental effects may occur during any phase of the project. During pre-construction and construction these events largely involve minor spills of hydraulic oil, fuel, lubricants on the project site. These spills are readily contained and cleaned up following standard spill contingency measures and, when mitigated promptly, do not result in environmental effects.

To minimize the likelihood of a spill, Cape Breton Power will implement environmental awareness training that will provide all staff with information on environmental protection measures to be employed on the project. This training will include handling and disposal of hazardous materials.

In the event of a spill, Cape Breton Power and its contractors will follow the procedures described in a spill contingency plan. In addition, contractors will be required to maintain appropriate spill response cleanup materials during construction.

Following a release, depending upon the circumstances of the event, the spillage or unintentional release of hazardous substances will be reported to Nova Scotia Department of Environment and Labour.

Ice Throw

There is potential for ice to form on the blades of the turbine in this environment. Public injury from ice throw is unlikely for two reasons: 1) the setback required by municipal by-laws ensures that residential properties are sufficient to protect against injury to the public; and 2) since ice reduces rotation, modern turbines are equipped with sensors that will shut down the unit if ice is detected on the blades.

High Wind Conditions

The E-70 wind turbine will cease operation in winds exceeding between 28 m/s and 34 m/s reducing the potential for damage to the turbine caused by excessive wind speed. The tower foundation is circular in design to evenly distribute stress on the tower.

Results:

Magnitude	Small
Reversibility	Reversible: Spills can be contained and cleaned up.
Nature	Negative
Extent	Immediate: Largely contained to the project site, but effects can occur beyond the site if not adequately contained.
Duration	Short Term: If event occurs, contingency measures will be implemented to contain and cleanup spill or release. A shut down due to icing could last until a technician checks the turbine
Confidence in prediction	High: Due to extensive experience in Nova Scotia with this issue

Significance: Not significant provided contingency and emergency plans are implemented in accordance with the EPP.

Residual Impact Statement: No significant residual impacts are anticipated as spills will be contained and cleaned up immediately following their discovery.

5.0 Environmental Impact Summary

The preceding sections provide a detailed project description; outline environmental protection measures that Cape Breton Power will follow, and discuss potential impacts resulting from project activities.

In summary, environmental impacts and residual impacts associated with the project are considered to be *not significant* as environmentally sensitive areas have been avoided and effects generally can be mitigated through environmental protection measures and project design. Further, effects are limited in scope and duration, or are reversible following the completion of construction.

Table 5-1 presents a summary of the identified issues and provides a determination of significance for each.

Table 5-1 Impact Assessment Summary

Issue (Including Mitigation)	Section Reference	Magnitude	Reversibility	Nature	Extent	Duration	Confidence
Air Quality	4.5.1	S	R	POS/NEG	R	ST	H
Terrestrial Habitat	4.5.2	S	R	NEG	I	LT	H
Species at Risk	4.5.3	N/A	N/A	N/A	N/A	N/A	H
Migratory Birds	4.5.4	S	R	NEG	I	LT	H
Other Avian Species	4.5.5	S	R	NEG	I	LT	M
Cultural Resources	4.5.6	S	I	NEG/POS	I	ST/LT	H
Ambient Noise	4.5.7	S	R	NEG	R	ST	H
Accidents and Malfunctions	4.5.9	S	R	NEG	I	ST	H

Keys to Table 4-3

N/A	Not Applicable
POS	Positive
NEG	Negative
IRR	Irreversible
REV	Reversible
I	Immediate
L	Local
R	Regional
ST	Short Term
MT	Medium Term
LT	Long Term
S	Small
M	Moderate
H	High

6.0 Follow-up

6.1 Additional Field Studies

Prior to construction of the project, Cape Breton power will complete field programs not addressed due to season timing of the field surveys. They include:

- Intrusive archaeological surveys which will consist of test pit sampling in the area of the proposed turbine turbines and access roads; and,
- Fall avian migration surveys which will be conducted during the last week of October 2005. The results of this survey will be presented following submission of this document.

6.2 Contingency Plans

Cape Breton Power will prepare environmental Contingency Plans as part of the EPP and its construction specifications. These address and provide direction on response to: discovery of cultural resources; discovery of contaminated materials; hazardous materials handling; and spill response.

6.3 Compliance Monitoring

Compliance monitoring will conform to the Conditions of Approval and the commitments made in the registration.

6.4 Post-Construction Environmental Effects Monitoring

Following construction of the project, a post-construction avian mortality monitoring program will be established to monitor the interaction of avian species with the turbines. If avian mortality is observed, it will be reported along with the ability of the various avian species ability to avoid the turbines.

References

Agriculture and Agri-Foods Canada. Soil Survey Data for Nova Scotia – Cumberland County

Beanland, G. and Duinker, P. 1983. *An Ecological Framework for Environmental Impact Assessment in Canada*. Institute for Resource and Environmental Studies. Dalhousie University, 132 pp.

Canadian Environmental Assessment Act S.C. 1992, c-37

Canadian Migratory Birds Convention Act S.C., 1994 c.22

Canadian Wildlife Service. 2003. Wind Turbines and Birds. A Guidance Document for Environmental Assessment. Draft report.

Davis, D and Browne, S (Eds.) 1996. *The Natural History of Nova Scotia*. Halifax. Nimbus Publishing and The Nova Scotia Museum.

Dangerous Goods Transportation Act. R.S., c. 119, s. 1

Enercon. 2005. E70 200kW Technical Fact Sheet.

Environment Act. 1994-95, c. 1, s. 1.

Environmental Assessment Regulations, N.S. Reg. 44/2003 (February 28, 2003)

Erickson, W., K. Kronner, and B. Gritski. 2003Nine Canyon Wind Power project avian and bat monitoring report. Nine Canyon Tec. Advisory Comm. www.west-inc.com.

Erskine, A.J. 1992. *Atlas of Breeding Birds of the Maritime Provinces*. Nimbus Publishing and The Nova Scotia Museum.

Fisheries Act S.C., 1985 c. F-14

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, and D.A. Shepherd. 2003. Mortality of bats at large-scale wind power development at Buffalo Ridge, Minnesota. AM. Midl. Nat. 150:219-235

Johnson, G.D., W. Erickson, J. White, and R. McKinney. 2003b. Avian and bat mortality during the first year of operation at the Klondike Phase I wind project, Sherman County, Oregon. Northwest Wind Power. www.west-inc.com.

Nova Scotia Department of the Environment. 1995. Wetlands Directive.

Nova Scotia Department of Environment and Labour. Nova Scotia Watersheds Digital Map

Nova Scotia Department of Natural Resources. Forestry Database

Nova Scotia Department of Natural Resources. Geological Map of the Province of Nova Scotia. (ME 2000-1)

Nova Scotia Department of Natural Resources. Restricted and Limited Use Land Database

Nova Scotia Department of Natural Resources. Significant Wildlife Habitats Database

Nova Scotia Department of Natural Resources. Wetlands Database

Occupational Health and Safety Act. 1996, c. 7, s. 1.

Pronych, A. and Wilson, A. 1993. *Rare Vascular Plants Atlas for Nova Scotia*. Nova Scotia Museum curatorial report.

Service Nova Scotia and Municipal Relations. 1:10,000 Digital Topographic Series

Service Nova Scotia and Municipal Relations. Digital Property Series

Special Places Protection Act. R.S., c. 438, s. 1.

Sulfide Bearing Material Disposal Regulations NS Reg. 57/97 (April 11, 95) Nova Scotia.

Young, D.P., Jr., W.P. Erickson, R.E. Good, M.D. Strickland, and G.D. Johnson. 2003. Avianand bat mortality associated with the initial phase of the Foote Creek Rim windpower project, Carbon County, Wyoming. www.west-inc.com

Personal Communications

Busby, Dan. Canadian Wildlife Service.

Power, Terry. NSDNR Regional Biologist.

Whittam, Becky. Bird Studies Canada.

Appendix A
Avian Survey Data

Interim Report:
Bird issues for an environmental assessment of wind energy projects at Lingan, Cape Breton Island, Nova Scotia

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Summary: Bird use of the peninsula at Lingan was assessed by on the ground surveys during the spring migration and breeding season in 2005. This information, combined with published sources and my experience birding in the industrial Cape Breton region for the past 15 years, was used to address questions on the impact of wind turbines on birds at the Lingan site. The assessment is based on the questions in the draft version of 'Wind Turbines and Birds A Guidance Document for Environmental Assessment' prepared by the Canadian Wildlife Service in December 2003. This project is a small project (fewer than 10 turbines) according to the CWS draft guidelines.

No species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) nor species listed as Red or Yellow in the General Status of Wild Species in Nova Scotia were detected during spring surveys. No concentrations of migrant birds were noted or expected.

No species listed by COSEWIC were detected during the breeding season surveys. One species listed as Yellow in the General Status of Wild Species in Nova Scotia, Common Tern, was seen during breeding season surveys. The most significant bird issue during the breeding season is avoidance of the colony of Great Cormorants on the cliff overlooking Laffins Cove.

Methods:

Point Counts: On 16 and 22 May 2005 the site (Figure 1) was traversed from the old Lingan Colliery to the World War II gun emplacement and along the Nova Scotia Power fence line. In between several forays into the woods of White Spruce, Trembling Aspen and White Birch were made. From this reconnaissance seven locations for point counts with coverage of all terrestrial habitats on the site were selected (Figure 1; Table 1). In addition, from three of these locations (Figure 1 points A, C and F) scans could be made of virtually all of the surrounding waters.

Spring Migration Surveys: On 22 and 28 May 2005 five minute point counts were done at each of the seven locations. All birds heard or seen were recorded. In addition all other species seen or heard while walking to and between the seven locations were recorded. Surveys started early in the morning (before 7:00) to overlap maximum bird activity. Throughout the surveys attention was paid to any birds flying overland at the height of the wind turbines and whether there were flight paths that would potentially intersect with the locations of the turbines.

Breeding Season Surveys: On 08 and 28 June 2005 five minute point counts were done at each of the seven locations. All birds heard or seen were recorded. In addition all other species seen or heard while walking to and between the seven locations were recorded. Surveys started early in the morning (before 5:30) to overlap maximum bird activity.

Species of conservation concern: Lists of species of special conservation concern maintained by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC www.speciesatrisk.gc.ca), the Nova Scotia Department of Natural Resources (The General Status Ranks of Wild Species in Nova Scotia www.gov.ns.ca/natr/wildlife/genstatus) and the Atlantic Canada Conservation Data Centre (ACCDC) (www.accdc.com/products/lists) were reviewed and compared with sightings on site and the habitats available. All species listed as threatened of special concern by COSEWIC, those listed as red or Yellow in the General Status Ranks of Wild Species in Nova Scotia and all those ranked as S4 or lower in Nova Scotia by the ACCDC are noted. S5 species are considered 'demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions'. S4 species are considered 'Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g. watch list). (100+ occurrences)'. S3 species are considered 'Uncommon throughout its range in the province, or found only in a restricted range, even if abundant in at some locations. (21 to 100 occurrences)'. S2 and S2 species are rarer than any of these, but none were found on this site.

Consultation: Limited consultations with private individuals and groups near the site have been undertaken. More consultation will be done through the fall migration period. The wildlife biologist with the NS Department of Natural Resources (Terry Power, Coxheath office), Becky Whittam of Bird Studies Canada, Sackville, New Brusnwick and coauthor of the draft guidelines for assessing the impact of wind projects on birds and a bird biologist with the Canadian Wildlife Service, Sackville, New Brunswick (Dan Busby) were consulted about the project. This is an interim report, the final report will include more consultations, a lengthier discussion of the impacts on birds and will be submitted after the fall migration surveys.

Questions from 'Wind Turbines and Birds, A guidance document for environmental assessment':
Below the questions from pages 46-48 of the draft guidelines as of December 2003 are listed.

Breeding Birds:

What avian species breed at the site? What is the relative abundance of species breeding at the site?

What avian species breed in the surrounding area? Are any of the breeding birds found on or off-site considered Species at Risk? Do bird colonies occur in the area? If so how close, and what species? Do raptor nests occur in the area? If so what species? Do breeding birds commute through or near the area and if so in what direction is the movement? Do any species present have aerial courtship displays?

What is the expected amount and type of human presence during the breeding season?

What habitat occurs in the surrounding area? What types of habitat will be lost or altered? How much of each habitat type will be lost or altered?

Migrating Birds:
What is the species composition of birds that migrate through the area? Are any of the migrating birds found on or off-site considered species at risk? What is the approximate number of migrants that use the area? How does this number compare to other nearby sites?

Questions about altitude of migrants not required.

Are there significant staging areas nearby?

If significant numbers of birds stage in the area of the proposed wind project, what activities taking place nearby could increase potential risk of bird collision with turbines and associated structures?

Results:

Birds of spring migration:

An annotated list of the 31 species of birds recorded and the approximate number recorded during surveys on 22 and 28 May 2005 follows. No species listed by COSEWIC as endangered, threatened or of special concern were detected. No species on the Red or Yellow lists from the General Status ranks of Wild Species in Nova Scotia were detected.

Four species that were found are ranked as S4 (widespread and fairly common but of long term concern) or S3 (uncommon throughout province). Great Cormorant is ranked as S4. There is a significant nesting colony along the cliffs on the south side facing Lingan Bay. About 30% of the North American Population in North America nests around Cape Breton Island (McCorquodale et al. 2004). The Lingan colony is an average sized colony and has been reasonably stable in numbers at least over the past 15 years (Bredin et al. 1997).

Another species, Merlin, is ranked as between S3 and S4 as a breeding bird. They regularly breed on coastal headlands between Point Aconi and Schooner Pond. My estimate is that about a dozen pairs nest between Point Aconi and Schooner Pond. The site between the old Lingan Colliery and the Lingan Power Plant is a typical breeding site.

Black Guillemot is ranked as S3. There are at least 50 paris and probably more that nest along the rocky coast at Lingan. Rocky shorelines from Gabarus through to Louisbourg, Scaterie Island, Cape Perce and west to the Bird Islands all support numerous nesting pairs. The Bird Islands probably support a few hundred nesting pairs (McCorquodale et

al. 2004). The recent estimates form Bird Islands (McCorquodale et al. 2004) and the numbers found here would be half the Nova Scotia population estimated by Erskine (1992). This suggests that the population is higher than previously thought, likely because the remoter rocky coastlines of Cape Breton have been relatively poorly surveyed for birds.

Greater Yellowlegs is ranked as S2B and S5M as a migrant. A few breed in bogs on the Cape Breton Highlands Plateau at the extreme southern edge of its breeding range, hence the S2 rank. Undoubtedly the individuals detected at Lingan are part of the much larger population that migrates through. In conclusion there are four species not ranked at the most widespread and abundant ranking by the ACCDC. All of these species are either widespread or locally common on Cape Breton Island.

Annotated list of 31 species of birds recorded during spring migration surveys 22 and 29 May 2005 at Lingan, Nova Scotia. ACCDC rankings for those ranked S3 and S4 are noted. All other species are S5.

Northern Gannet, more than 20 fishing offshore on 22 May, fewer offshore on the 29th.

Great Cormorant, at least 50 nests east of E on the cliffs along Laffins Cove. This area is called the nesting cliffs hereafter. Also 6 roosting at point beyond gun emplacement. ACCDC S4B.

Double-crested Cormorant, up to 20 around nesting cliff, a similar number either roosting along coast on north side or flying along the north coast. There will be a few nests on the edges of the Great Cormorant colony.

American Black Duck, two flying along coast at A on 29 May.

Merlin, one flying towards paved road near A. S3S4B.

Ruffed Grouse, one drumming between road and A on 29 May.

Greater Yellowlegs, one foraging in small pond between A and B and another calling near D on 29 May. S2B, S5M.

Herring Gull, a few hundred both 22 and 29 May. Most were associated with fishing boats offshore. More than 100 roosting either at the end of the point or along north shore. Each day 5-15 sighted flying overland through area where turbines could be erected.

Iceland Gull, six flying or foraging offshore on 22 May.

Great Black-backed Gull, about 100 both 22 and 29 May. Many were associated with fishing boats offshore. More than 40 roosting either at the end of the point or along north shore. Each day a few sighted flying overland through area where turbines could be erected.

Black Guillemot, 78 adults on the 22nd and 75 on the 29th. They were concentrated between C and the tip of the point and off E in Laffins Cove. S3.

Rock Pigeon, 1 flying in to nesting cliff on 22 May. They probably nest on these cliffs.

Belted Kingfisher, two flying over near G on 29 May.

Northern Flicker, heard near B on 22 May and near G on 29 May.

Blue Jay, two heard, one at E, one at F on 29 May.

American Crow, up to five heard and seen during surveys.

Common Raven, one seen at E on 29 May.

Black-capped Chickadee, two calling near B on 22 May, another calling near F on 29 May.

American Robin, only one heard on 22 May and three on 29 May.

European Starling, one flying inn to cliff near E on 22 May. Probably nest in crevices along this cliff. Three seen between D and E on 29 May.

Blue-headed Vireo, one singing between road and A on 29 May.

Yellow-rumped Warbler, two singing on 22 May, near A and G. Eight singing and another 16 seen in a variety of places on 29 May. Many of these were probably late migrants delayed by the weather of the past two weeks.

Palm Warbler, one singing on 22 May near E, six seen between D, F and G on 29 May. These were probably late migrants delayed by the weather over the past couple of weeks.

Savannah Sparrow, two singing each day. Males holding territories in the low heathy vegetation along the coast from A all the way to the tip of the point.

Lincoln's Sparrow, four along track form road to A on 29 May.

Song Sparrow, three singing on 22 May and 11 on 29 May. Males holding territory in the shrubby vegetation all the way from A to the anemometer tower.

White-throated Sparrow, only two singing on 22 May, at least seven on 29 May. Males holding territory along the edges of the spruce woods.

Dark-eyed Junco, two singing at B on 22 May.

Common Grackle, eight flew over low at E on 29 May and six flew over F on 22 May.

Purple Finch, one singing near B on 22 May 2005.

American Goldfinch, about 10 seen or heard each day. Most near D and F.

Questions and answers from the draft guidelines, December 2003, for spring migration:

What is the species composition of birds that migrate through the area?
The small flocks of warblers (Yellow-rumped and Palm) found on 29 May were migrating through as were the Lincoln's Sparrows on 22 May. Certainly the Northern Gannets fishing offshore were migrating north to their nesting colonies on Bonaventure Island, Quebec and Cape St. Marys Newfoundland. The gull concentrations were likely taking advantage of the food provided by waste bait form lobster fishers rather than being migrants

Many (most) of the birds detected in May nest in the area (e.g. Great Cormorant, Black Guillemot, Herring Gull, Merlin, Black-capped Chickadee, Song Sparrow, Savannah Sparrow, American Goldfinch).

In the two days of surveys I did not detect any large concentrations of migrants. Concentrations would be weather related and I suspect that in some years there would be small concentrations of kinglets, warblers, vireos and sparrows. This is similar to virtually all locations along the coast of eastern Cape Breton Island. This location is not known as a place that concentrations are frequent.

Are any of the migrating birds found on or off-site considered species at risk?
No species listed by COSEWIC nor on the red or yellow lists for Nova Scotia were detected. Comments on species ranked S3 and S4 by ACCDC are included in the previous section.

What is the approximate number of migrants that use the area?
Very few (fewer than 50 passerines) were detected during two days of surveys at a time of year when many passerines (flycatchers, warblers, vireos) would be expected to pass through.

How does this number compare to other nearby sites?
I would expect to see more migrants under similar weather conditions at locations such as Schooner Pond, about 15 km east. Similar numbers would be expected in inland locations such as Petersfield Provincial Park, Tower Road Sewage Lagoon and at other headlands such as Point Aconi. All of these locations are within 25 km.

Questions about altitude of migrants not required.

Are there significant staging areas nearby?
Yes. Lingan Bay (2.5-5km away) hosts a few hundred Canada Geese, several hundred Greater Scaup, and dozens of Ring-necked Ducks, Common Goldeneye and Red-breasted Mergansers from late March until early May. As well a hundred or more Double-crested Cormorant and a few hundred gulls (Herring, Great Black-backed, Ring-billed, Bonaparte's) forage over Lingan Bay and roost on the exposed sand flats at low tides.

If significant numbers of birds stage in the area of the proposed wind project, what activities taking place nearby could increase potential risk of bird collision with turbines and associated structures?

There appears to be little movement of ducks and geese between Lingan Bay and the north shore of the proposed site. The waterfowl tend to exit the bay following the channel by the wharf at Lingan and then roost on the ocean beyond the Power Plant. Gulls do fly over the Power Plant and then overland to the ocean on the north shore. Double-crested Cormorants do as well, but much less frequently than gulls. There is little evidence suggesting that these species are susceptible to colliding with turbines (see Kerlinger 2005). Gulls and cormorants should be able to notice the turbines and use alternate routes. The presence of two tall smoke stacks at the Nova Scotia Power Plant, between the staging areas and the open water that gulls and cormorants commute to, suggests that these birds will not have a problem with the shorter wind turbines.

The associated mudflats and Beach are not significant staging areas for shorebirds in the spring, but they are in the autumn migration. This issue will be dealt with in the final report.

Birds of the breeding season:

An annotated list of the 38 bird species recorded and the approximate number recorded during the surveys on 08 and 28 June 2005 follows. No species listed by COSEWIC as endangered, threatened or of special concern were detected. One species, Common Tern listed as yellow in the Nova Scotia general status ranks was detected. Yellow are 'species that are not believed to be at risk of immediate extirpation or extinction, but which may require special attention or protection to prevent them from becoming at risk'. Similarly it is ranked S3 by the ACCDC. There is a small (<10 nests) colony about 2.5 to 3 km away near the parking areas in Dominion Beach Provincial Park. The other three species ranked as S3 or S4 by ACCDC, Great Cormorant, Black Guillemot and Merlin, are considered in the birds of spring migration.

Annotated list of 38 species of birds recorded during breeding season surveys 08 and 28 June 2005 at Lingan, Nova Scotia. ACCDC rankings for those ranked S3 and S4 are noted. All other species are S5.

Great Cormorant, at least 50 nests (probably closer to 100 along whole cliff near E). A few flying in and out of nests. None seen flying over land. S4B.

Double-crested Cormorant, 30 to 50 on the surveys. Most flying to and from nesting cliff near E. Others roosting on headlands along the coast or flying along coast. Each morning a couple flew inland through potential wind turbine sites.

Great Blue Heron, one being chased by gulls near nesting cliff 08 June.

American Black Duck, one in ocean near C on 28 June.

Common Eider, six flying about 100 m offshore from A on 08 June.

White-winged Scoter, three flying more than 100 m offshore from C on 08 June

Merlin, one calling inland from C on 08 June. S3S4B

Herring Gull, more than 100 each day. Concentrations around nesting cliff, around lobster boats offshore and roosting on headlands. Each day 5-10 flew inland through potential wind turbine sites. Many of those roosting or following boats were young birds (1-3 years old).

Iceland Gull, one immature flying along coast between B and C on 08 June.

Great Black-backed Gull, 30-40 each day with concentrations roosting on headlands, flying over nesting cliffs and offshore following lobster boats. The vast majority were young birds (1-3 years old).

Common Tern, 2 flying along coast near C on 08 June and foraging between nesting cliff and power plant on 28 June. A few have nested along lagoon in Dominion Beach Provincial Park. S3B. Yellow.

Black Guillemot, 50-70 seen on water from C and E both days. At this time of year many would be either away foraging or at the nests, suggesting at least 75 -100 pairs nesting along this stretch of coast. They nest in crevices in jumbled rock at bases of cliffs. S3.

Belted Kingfisher, one flying over water between E and power plant.

Alder Flycatcher, 10 singing males on 08 June and five on 28 June. Nest in the scrubby alders between the coast and the spruce woods.

Bank Swallow, more than 70 flying around the upper parts of the cormorant nesting cliff on 08 June. They nest in the softer soil at the tops of such cliffs along this coast. None seen on 28 June, therefore not likely nesting there this year. It is likely they will nest nearby most years.

Blue Jay, one flew over, < 10 m, stop F on 08 June.

American Crow, 10-15 seen and heard both days. Each day a few (2-4) flying through potential sweep of turbine blades. Nest nearby and forage widely over the site, seen at all of the point counts over the two days. The higher numbers compared to spring counts are likely due to recently fledged young.

Common Raven, a pair seen near power plant both days and likely another pair near anemometer tower and gun emplacement 08 June.

Black-capped Chickadee, two seen between F and G on 08 June. Likely nest here.

Veery, one singing between main road and A on 08 June. The alder swale here is similar to nesting habitat in the Alder Point and Frenchvale areas of Cape Breton.

American Robin, up to four singing each morning. Several pairs nest along edge of woods.

Cedar Waxwing, one seen at F on 08 June.

European Starling, one along coast near B on 28 June and another flew low over G the same day. A few likely nest both in cavities at the power plant and in crevices along the cliffs near the power plant.

Blue-headed Vireo, two singing at B on 08 June. A couple of pairs nest in the near B and inland from C.

Red-eyed Vireo, three singing at A and B on 28 June. A few pairs nest in the birch near B and likely G.

Yellow Warbler, 5 to 7 heard singing or seen both days. Likely about 10 pairs nesting, especially in alders and willows.

Magnolia Warbler, four heard singing or seen both days. A few pairs nest near B and the woods between C and G and near F.

Yellow-rumped Warbler, up to 4 heard singing or seen between F and G. A couple of pairs nest here.

American Redstart, a couple of pairs in deciduous shrubs between F and G.

Northern Waterthrush, one singing between road and A on 08 June.

Common Yellowthroat, a half dozen heard singing or seen both days. Nest in alders between coast and spruce woods.

Savannah Sparrow, three singing on heath between A and C.

Song Sparrow, up to 15 heard singing or seen both days. Only not recorded at G.

White-throated Sparrow, 10 recorded on 08 June and six on 28 June. At least one at each point count over the two days.

Common Grackle, four flew over low, <10 m, near B.

Purple Finch, one singing at B on 28 June.

White-winged Crossbill, more than 65 flying low over tops of stunted Spruce near F on 08 June.

American Goldfinch, more than 12 on 08 June along the edge of the woods, only two on 28 June. Several pairs undoubtedly nest here in July.

Questions from Draft Guidelines, December 2003 on breeding birds:

What avian species breed at the site?
All of the species in the above annotated list except Great Blue Heron, Common Eider, White-winged Scoter, Iceland Gull, Common Tern nest within a few hundred metres of the site. White-winged Crossbill would not nest every year and would probably not nest in 2005 because of the non-existent spruce cone crop. Common Terns nest about 2.5-3 km away. Great Blue Herons nest within 10 kms of the site.

What is the relative abundance of species breeding at the site?
The two commonest species nesting on the site are Great Cormorant and Black Guillemot (more than 50 pairs each). Next, estimated 10-20 pairs, would be Herring Gull, Song Sparrow, White-throated Sparrow, Yellow Warbler, Common Yellowthroat roughly in decreasing order of abundance. All other species would have fewer than ten, most only one or two pairs, nesting on or within a few hundred metres of the site.

What avian species breed in the surrounding area?
Are any of the breeding birds found on or off-site considered Species at Risk?
Piping Plover (COSEWIC Endangered) have nested along Dominion Beach. The tip of the beach is about 2 km from the closest part of the site. Efforts to stabilize the beach by embedding old Christmas trees in the sand in the late 1980s and early 1990s were reasonably successful. This reduced sand movement by waves and therefore reduced its quality for Piping Plovers. They have not nested there in the past 15 years (since the late 1980s).

Short-eared Owls (COSEWIC Special Concern) have nested on the more extensive grassy areas behind the dunes at Glace Bay, about 10km east (Erskine 1992). Occasionally Short-eared Owls are seen at Dominion, more frequently in the autumn than the breeding season. The relatively small area of beach grass and the high number of people who walk the beach daily, throughout the year, make this beach less suitable for these owls.

Do bird colonies occur in the area? If so how close, and what species?
Great Cormorant, at least 50 nests, probably closer to 100 nests. About 20 nests of Double-crested Cormorant. This colony is on the site and there are a few Herring Gull nests at the edges of the cormorant colony.

Do raptor nests occur in the area? If so what species?
No nests were found. A Merlin was seen on half the visits and undoubtedly nests in the thicker spruce woods at the south west of the site or across the road near the ash dump from the Lingan Power Plant. The size of the site and location suggest that larger raptors such as Red-tailed hawks and Northern Goshawks will not have enough room for a territory.

Do breeding birds commute through or near the area and if so in what direction is the movement?
Most of the commuting I saw was of young gulls between Lingan Bay and the ocean on the north shore. Each of the four mornings I saw a few (10-20 birds in total) Herring Gulls, Great Black-backed Gulls and Double-crested Cormorants (in decreasing order of abundance) fly across the peninsula at the height that turbine blades would be turning. These birds flew both from Lingan Bay towards the ocean and from the ocean to Lingan Bay.

Do any species present have aerial courtship displays?
None were detected. The two most likely species would be American Woodcock and Wilson's Snipe. It is possible that there are a couple of pairs of woodcock breeding in the alders especially close to the old ventilation shaft of the Lingan Colliery. There was not sufficient habitat for Wilson's Snipe to nest on the site.

What is the expected amount and type of human presence during the breeding season?
There is significant evidence of ATV use of the heathy areas along the coast from the old Lingan Colliery to the World War II gun emplacement. I expect that people occasionally (fewer than 20 per week) walk and drive ATVS along the coast. Significant disruption of breeding birds will only occur if people spend time directly over the nests on the cliffs. Based on where the ATV trails are, this has not been a problem in the past.

Since most of the nesting birds are concentrated along this cliff and that the species involved has a breeding concentration along Cape Breton Island I suggest keeping wind turbines away from this cliff. IF turbines are kept west of the anemometer tower and in line with the Lingan Power Plant, there should be minimal impact on the nesting Great Cormorants. Putting turbines between the cormorant nests and the north shore would be significantly increasing the risk of collisions during extreme winds or fog.

What habitat occurs in the surrounding area? What types of habitat will be lost or altered? How much of each habitat type will be lost or altered?
The area surrounding the site has had significant industrial use (coal mine, power plant and ash dump for power plant) in the past 50 years. Most of the area is forested with a mix of White Spruce, White Birch and Trembling Aspen. Many areas have soil poor enough that tree growth is limited and often restricted to alders.

The wind turbines will remove some breeding habitat.

Details of how much and which types??

References:

Bredin, K.A., Burgess, N.M., McCorquodale, D.B. and Harris, D.L. 1997. Volunteer Surveys of Waterbirds of the Sydney, Nova Scotia Area, including the Sydney Tar Ponds, 1993-1996. Canadian Wildlife Service, Environment Conservation Branch, Technical Report Series Number 273. 40pp.

Erskine, A.J. 1992. Atlas of the Breeding Birds of the Maritime Provinces. Nimbus Publishing and Nova Scotia Museum, Halifax, NS. 270pp.

Kerlinger, P. 2005. Summary of Bird Studies and Collision Rates at Wind Power Projects (revised February 9, 2005). www.easthavenwindfarm.com/flining/feb/ehwf-pk-rebl.pdf (accessed 10 July 2005).

Knapton, R.W. and McCorquodale, D.B. 2001. Seasonal Checklist of the Birds of Cape Breton Island, Nova Scotia. UCCB Special Publication. 21pp.

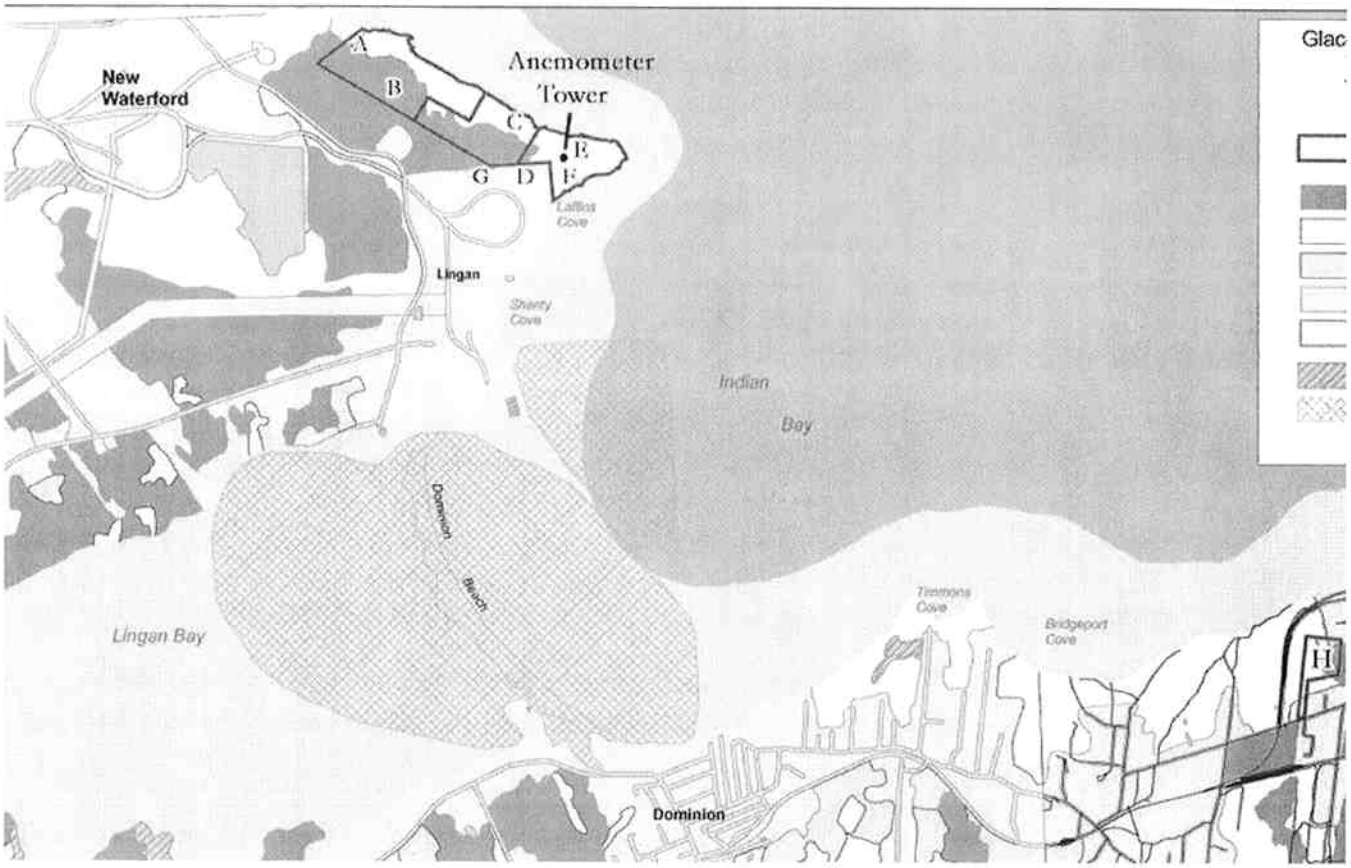
McCorquodale, D.B., Banks, D.B., Kerr, M.I., Knapton, R.W. and Harris, D.L. 2004. Nesting seabirds on the Bird Islands, Cape Breton, Nova Scotia. Proceedings of the Nova Scotia Institute of Science. 42: 241-252.

Table 1: Latitude and longitude (dd° mm.000') of the locations A through G for point counts at the Lingan site. Figure 1 plots A through G on a map.

Point	Description	Latitude	Longitutde
A	End of grassy road just west of ventilation shaft for old Lingan Colliery	46° 14.931	60° 02.850
B	Along cut line in woods	46° 14.795'	60° 02.560'
C	Along coast	46° 14.725'	60° 02.750'
D	Along track to emplacement from anemometer tower	46° 14.555'	60° 01.885'
E	Overlooking power plant and back to cormorant nesting cliff	46° 14.471'	60° 01.921'
F	Near northeast corner of Nova Scotia Power fence	46° 14.556'	60° 02.038'

G	Along Nova Scotia Power fence in mixed woods	46° 14.555'	60° 02.207'

Figure 1: Map showing location of point counts A through G at the Lingan, Cape Breton Island, Nova Scotia site.



Appendix B
Plant and Fauna Survey Data

ACCDC List of Species Recorded within 10km of Project Site				
Scientific Name	**Common Name**	**ACCDC Rank**	**NS Rank**	**Protection Status**
Charadrius melodus	Piping Plover	S1B	Red	Endangered
Dolichonyx oryzivorus	Bobolink	S3B	Yellow	
Sympetrum costiferum	Saffron-Winged Meadowhawk	S3	N/A	
Sympetrum vicinum	Yellow-Legged Meadowhawk	S3	N/A	
Lestes congener	Spotted Spreadwing	S3	Green	
Iva frutescens ssp. oraria	Marsh Elder	S2SE	Undetermined	
Vaccinium ovalifolium	Oval-Leaf Huckleberry	S1	Red	
Carex scirpoidea	Bulrush Sedge	S2	Undetermined	

Cape Breton Power Plant Spring Plant Survey

June 2, 2005
Botanist: Tom Neily

Results: There were no plants observed during this survey listed as S1 or S2 by the Atlantic Canada Conservation Data Centre or as red or yellow by Nova Scotia Department of Natural Resources.

Species List

Lingan Turbine Sites

Scientific Name	Common Name	DNR/ACCDC Status
Fragaria virginiana	Strawberry	Green/S5
Picea glauca	White Spruce	Green/S5
Alnus incana	Speckled Alder	Green/S5
Taraxacum officinale	Dandelion	SE
Spiraea alba	Meadow-sweet	Green/S5
Rubus idaeus	Red Raspberry	Green/S5
Sambucus racemosa	Red-berried Elder	Green/S5
Salix sp	Willow	Not species at risk
Potentilla tridentate	Three-toothed Cinquefoil	Green/S5
Vaccinium vitis-idaea	Foxberry	Green/S5
Empetrum nigrum	Black Crowberry	Green/S5
Arenaria lateriflora	Sandwort	Green/S5
Achillea millefolium	Yarrow	Green/S5
Plantago maritima	Seashore Plantain	Green/S5
Myrica pensylvanica	Bayberry	Green/S5
Juniperus horizontalis	Creeping Juniper	Green/S5
Maianthemum canadense	Wild Lily-of-the-valley	Green/S5
Equisetum fluviatile	Water-horsetail	Green/S5
Rosa sp	Rose	Not a species at risk
Vaccinium macrocarpon	Large Cranberry	Green/S5
Carex sp	Sedge	Not a species at risk

Scientific Name	Common Name	DNR/ACCDC Status
Vaccinium angustifolium	lLowbush Blueberry	Green/S5
Osmunda cinnamomea	Cinnamon Fern	Green/S5
Iris versicolor	Blue Flag	Green/S5
Typha latifolia	Broad-leaved Cat-tail	Green/S5
Lonicera canadensis	Fly-honeysuckle	Green/S5
Kalmia angustifolia	Lambkill	Green/S5
Rubus sp	Brambles	Not a species at risk
Viola sp	Violet	Not a species at risk
Cornus canadensis	Bunchberry	Green/S5
Dennestadia punctiloba	Hay-scented Fern	Green/S5
Ribes glandulosum	Skunk Currant	Green/S5
Viburnum nudum	Wild Raisin	Green/S5
Phegopteris connectilis	Northern Beech Fern	Green/S5
Anthyrium felix-femina	Northern Lady Fern	Green/S5
Dryopteris cristata	Crested Shield Fern	Green/S5
Chrysosplenium americanum	Golden Saxifrage	Green/S5
Ledum groenlandicum	Labrador-tea	Green/S5
Carex nigra	Sedge	Green/S5
Rumex sp	Dock	Not a species at risk
Eriophorum vaginatum	Hare's Tail	Green/S5
Aralia nudicaulis	Wild Sarsaparilla	Green/S5
Trientalis borealis	Starflower	Green/S5
Pteridium aquilinum	Bracken	Green/S5
Betula papyrifera	Paper Birch	Green/S5
Populus tremuloides	Trembling Aspen	Green/S5
Lycopodium obscurum	Ground Cedar	Green/S5
Ranunculus repens	Creeping Buttercup	Green/S5
Luzula acuminata	Wood-rush	Green/S5
Acer rubrum	Red Maple	Green/S5
Thelyptris palustris	Marsh Fern	Green/S5

Scientific Name	Common Name	DNR/ACCDC Status
Prunus serotina	Chokecherry	Green/S5
Amelanchier sp	Serviceberry	Green/S5
Gaylussacia baccata	Huckleberry	Green/S5
Rhododendron canadense	Rhodora	Green/S5
Larix laricina	Larch	Green/S5

Cape Breton Power Late Summer Plant Survey

Location: Lingan, Cape Breton County

Date: September 14, 2005

Botanist: Tom Neily

Results: There were no plants observed during this survey listed as rare by Nova Scotia Natural Resources or Atlantic Canada Conservation Data Centre.

Species Lists

Lingan Turbines Sites

Binomial	Common Name	DNR/ACCDC Rank
Solidago canadensis	Canada Goldenrod	Green/S5
Solidago rugosa	Rough Goldenrod	Green/S5
Aster novae-belgii	New York Aster	Green/S5
Aster umbellatus	Tall White Aster	Green/S5
Leontodon autumnalis	Fall Dandelion	SE
Anaphalis margaritacea	Pearly Everlasting	Green/S5
Linaria vulgaris	Butter-and-eggs	SE
Solidago puberula	Goldenrod	Green/S5
Euphrasia officinalis	European Eyebright	SE
Euthamnia graminifolia	Narrow-leaved Goldenrod	Green/S5
Achillea millefolium	Yarrow	Green/S5
Plantago maritima	Seashore Plantain	Green/S5
Arenaria lateriflora	Sandwort	Green/S5
Eupatorium maculatum	Joe-pye-weed	Green/S5
Polygonum sagittatum	Tear-thumb	Green/S5
Scirpus cyperinus	Bulrush	Green/S5
Rubus pubescens	Dwarf Raspberry	Green/S5
Aster nemoralis	Bog-aster	Green/S5
Triadenum virginiana	Marsh St. John's-wort	Green/S5

Binomial	Common Name	DNR/ACCDC Rank
Scirpus caespitosus	Deergrass	Green/S5
Aster lateriflorus	Aster	Green/S5
Carex nigra	Sedge	Green/S5
Lonicera caerulea	Mountain Fly-honeysuckle	Green/S5
Phalaris arundinacea	Reed Canary-grass	Green/S5
Agrostis capillaris	Brown Top	SE
Ammophila breviligulata	Marram	Green/S5
Vicia cracca	Common Vetch	SE
Potentilla palustris	Cinquefoil	Green/S5
Spergularia marina	Sand-spurrey	Green/S5
Senecio vulgaris	Common Groundsel	SE
Trifolium campestre	Low Hop Clover	SE
Angelica lucida	Seaside-angelica	Green/S4S5
Danthonia spicata	Poverty Grass	Green/S5
Oenothera biennis	Evening-primrose	Green/S5
Juncus canadensis	Rush	Green/S5
Epilobium angustifolium	Fireweed	Green/S5
Sonchus arvensis	Perennial Sow-thistle	SE

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A Report On the Amphibian and Reptile Faunas
At Three Proposed Wind Powered Generating Sites
In Cape Breton County, Cape Breton Island, Nova Scotia.

Prepared by John Gilhen
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The three proposed wind powered generating sites are situated on the Sydney Coal Fields [Theme Region 531, Sydney Coal Fields: 500, Carboniferous Lowlands (Davis and Browne 1997)], each of the three sites are in a separate coastal watershed. The first site is at Gillis Cove, between Davys Head and North Head, east of Lingan, Cape Breton County [New Waterford Watershed 1FJ-38], the second site is at Dominion [Dominion Watershed: 1FJ-36] and the third site is at Port Caledonia [Donkin Watershed: 1FJ-32].

The Gillis Cove Site is the most extensive as a series of seven wind powered generators are proposed for this site. There is only one proposed for both Dominion and Port Caledonia. However, all three sites have two things in common: These are coastal areas which have been subjected to much anthropogenic disturbance, and, there are no breeding populations of endangered, threatened or vulnerable species of amphibians or reptiles.

The endangered Blanding's Turtle, *Emdoidea blandingii*, and threatened Northern Ribbon Snake, *Thamnophis sauritus septentrionalis*, are climatic relics (Bleakney 1958 and Gilhen 1984), and the Nova Scotia populations of both species are presently known from only two watersheds [Mersey River and Medway River including Pleasant River, a tributary] in the south central mainland, which is the warmest region in the Maritimes (Bleakney 1958).

Breeding populations of the vulnerable Wood Turtle, *Glyptemys insculpta*, on Cape Breton Island are known from only two watersheds, River Inhabitants and River Denys, in southwestern Richmond-Inverness counties (Gräf, Gilhen and Adams 2003).

There are a number of new localities for the vulnerable Four-toed Salamander, *Hemidactylium scutatum*, on the mainland but none are known from the three proposed wind powered generating sites on Cape Breton Island.

FIELD NOTES

Date: 30 June 2005
Locality: Gillis Cove Proposed Wind Powered Generating Site
Habitat and Species:

Tom Neily and I walked down a straight road, covered in grasses, weeds and other old field vegetation, which bisects an alder thicket, and we arrived at the coastal barren between Davys Head and North Head (Lingan area), Cape Breton County, at about 0815 hours. I can't think of a better site for wind powered generators as the area looks and feels wind swept.

The bases for the seven wind powered generators will rest on a coastal barren which has been bisected and scared by ATV trails. There are a number of small wet areas which probably dry up for the most part in summer. There is some sphagnum, a small growth of cattails and iris growing in most of these wet sites. The vegetation throughout the barren itself is a real mix, having the classic horizontal Juniper while a variety of ferns, such as cinnamon fern and interrupted fern thrive next to patches of the small marsh fern. There is a shallow gully, near what I think would be the base for number 3, which has standing water but it is very dark tannic brown.

The small wetlands within this barren represents marginal frog habitat. In other areas on the mainland of Nova Scotia I have seen the Eastern American Toad, *Bufo a. americanus*, Northern Spring Peeper, *Pseudacris c. crucifer*, and the Green Frog, *Rana clamitans melanota*, breed in pools of fresh water on coastal barrens, but there is no evidence of amphibian spring breeding activity here this day. If these frogs are present somewhere on this barren the Maritime Garter Snake, *Thamnophis sirtalis pallidula*, would also be present. The Maritime (Eastern) Smooth Green Snake, *Liochlorophis vernalis borealis* (feeding mostly on moth larvae during the day), and the Northern Redbelly Snake, *Storeria o. occipitomaculata* (feeding mostly on small slugs at night), may be present along the roadside leading down to the barren, and possibly at the edge of the barren and scrub woodland. No doubt the Eastern Redback Salamander, *Plethodon cinereus*, is also present in the scrub woodland.

Locality: Proposed Wind Powered Generating Site At Dominion
Habitat and Species:

We drove down a gravel road and parked by a miners memorial. Here we looked out over a very desolate landscape which probably had buildings standing on it years ago. This area has been subjected to much anthropogenic abuse for many years. If any amphibian or reptile species occupied this area historically they must have been extirpated many years ago. I turned over some rocks and boards on and next to dump sites but saw no amphibian or reptile life. We walked over to the general area where the base of the wind powered generator would be located. There was a cattail gully on one side but it has been scooped out for the most part. We did not see any amphibian or reptile activity in the remaining small wet area here this day.

Locality: Proposed Wind Powered Generating Site At Port Caledonia
Habitat and Species:

We walked down a gated grassy road to a new rough road which leads to a cleared area, and base location of the proposed wind powered generator site. The site is in woodland of mostly

white spuce. Tom tells me white spruce is a pioneer species, and this area at one time was probably a pasture or field. There is a small sphagnum area adjacent to this cleared site which looks like marginal Four-toed Salamander habitat, but we saw no evidence of breeding activity. The same common species of amphibians and reptiles mentioned for the Gillis Cove site would most likely be present along the roadside and in adjacent woods here, but I only found two Eastern Redback Salamanders (redback phase) in the woods this day.

This site is in scrub woodland. From this site we walked along a rough path recently cut through the woods to the coastal barren. There is some litter in the woods and the barren is scared by ATV trails.

Literature Consulted

Bleakney, J. S. 1958. A zoogeographical study of the amphibians and reptiles of eastern Canada. Nat. Mus. Canada Bull. 155: 199 pages.

Davis, D. S. and **S. Browne.** 1997. Natural History of Nova Scotia. Volume 2, Theme Regions, Nova Scotia Museum, Halifax. 304 pages.

Gilhen, J. 1984. Amphibians and reptiles of Nova Scotia. Nova Scotia Museum, Halifax. 162 pages.

Gilhen, J. and **B. Grantmyre.** 1973. The Wood Turtle, *Clemmys insculpta* (LeConte): An addition to the herpetofauna of Cape Breton Island, Nova Scotia. Canadian Field-Naturalist 87: 308 - 310.

Gilhen, J., T. Herman and **N. Meister.** 1994. Wood Turtles face uncertain future. Conservation. 18: 5 - 7.

Gräf, A., J. Gilhen and **J. Adams.** 2003. The Wood Turtle, *Glyptemys insculpta*, at River Denys: A second Population for Cape Breton Island, Nova Scotia. Canadian Field-Naturalist. 117 (3): 415 - 418.

Grantmyre, B and **J. Gilhen.** 2004. Natural history notes on the Wood Turtle, *Glyptemys insculpta*, population at River Inhabitants, Cape Breton Island, Nova Scotia: Based on the Field Notes of Brenda Grantmyre from 1971 to 1976. Nova Scotia Museum. Manuscript report, 68 pages.

Litzgus, J. D. and **R. J. Brooks.** 1996. Status of the Wood Turtle, *Clemmys insculpta*, in Canada. Status assigned by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Canadian Wildlife Federation, Kanata, Ontario.

MacGregor, M. K. and **M. F. Elderkin.** 2003. Protecting and conserving Wood Turtles: A stewardship plan for Nova Scotia. N. S. Dept. Natural Resources, Kentville. 23 pages.

Appendix C
Cultural Heritage Impact Assessment

CAPE BRETON POWER LIMITED

GLACE BAY / LINGAN WIND POWER PROJECT
ARCHAEOLOGICAL SCREENING
CAPE BRETON REGIONAL MUNICIPALITY

ARCHAEOLOGICAL SCREENING REPORT

Submitted to:
Cape Breton Power Limited
and the
Special Places Program - Heritage Division

Prepared by:
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6040 Almon Street
Halifax, Nova Scotia
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Consulting Archaeologist: W. Bruce Stewart
Report Preparation: Mike Sanders & W. Bruce Stewart

Heritage Research Permit Number A2005NS76

CRM Group Project Number: 2005-0014

OCTOBER 2005

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ARCHAEOLOGICAL SCREENING

1.0 INTRODUCTION

In July of 2005, Cultural Resource Management (CRM) Group was retained by Dillon Consulting Limited on behalf of Cape Breton Power Limited to conduct archaeological screening for the Glace Bay / Lingan Wind Power Project. CRM Group performed the archaeological screening as part of the overall environmental screening for the construction of three wind turbine facilities, in the communities of Lingan, Bridgeport and Port Caledonia in Cape Breton Regional Municipality (CBRM). The goal for CRM Group was to evaluate archaeological potential within each of the three proposed sites by conducting archival research and on-site visual assessment.

The archaeological screening was conducted according to the terms of Heritage Research Permit A2005NS76 (Category "C"), issued by the Heritage Division - Nova Scotia Museum (HD-NSM) to W. Bruce Stewart, CRM Group President and Senior Consultant. This report describes the screening, presents its results and offers resource management recommendations.

2.0 STUDY AREAS

The three turbine sites for the Glace Bay / Lingan Wind Power Project are all situated in elevated coastal positions in the vicinity of Lingan and Glace Bay (***Figure 1***).

Lingan Wind Farm

Lingan Wind Farm consists of a 47.7 hectare site beside Gillis Cove, north of the existing Lingan Generating Station (***Figure 1***). The site extends from Davys Head to North Head, and from the shore of Gillis Cove southward approximately halfway to Hinchey Avenue. It is composed of four properties (PIDs 15501489, 15510407, 15501505 and 15501513).

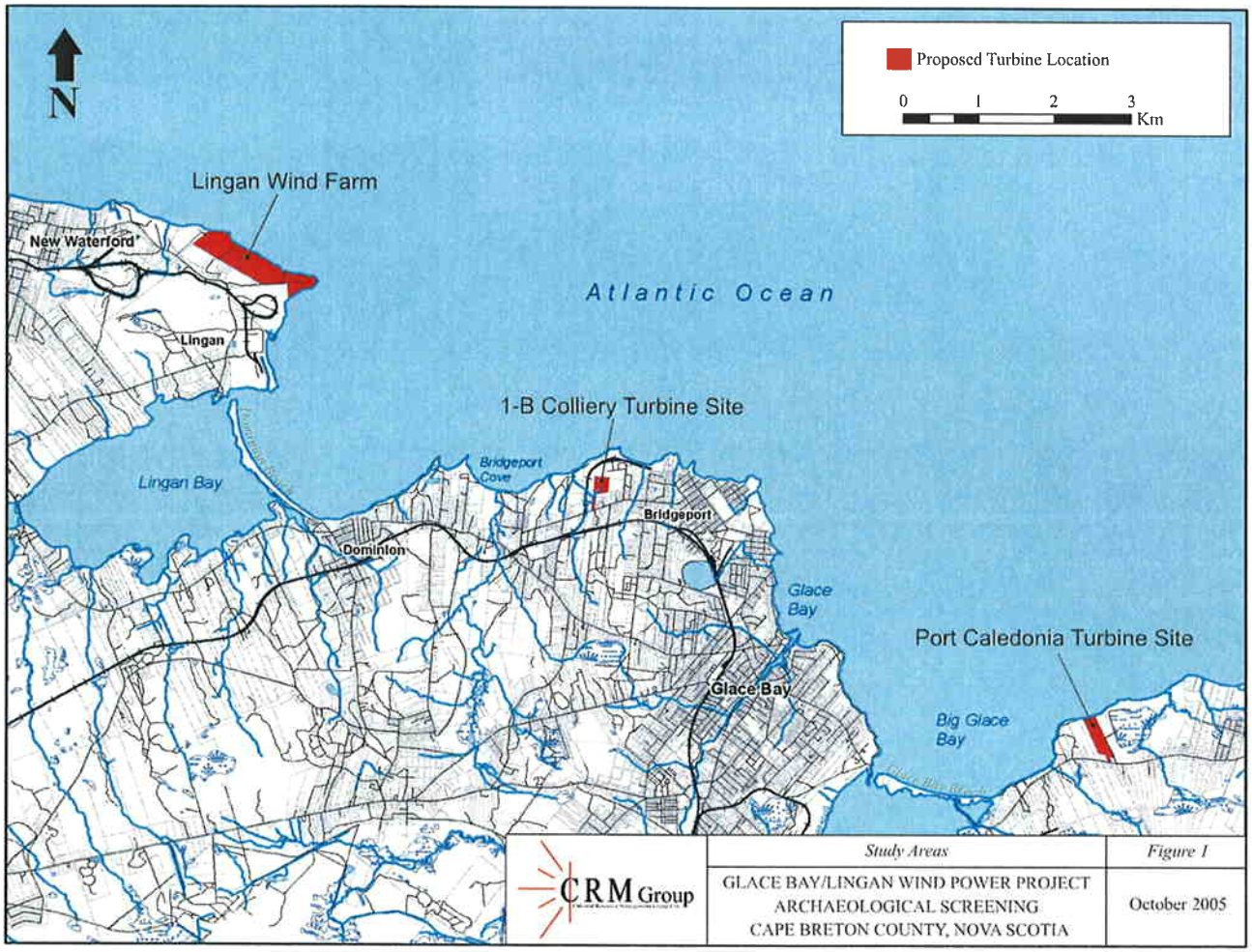
Current plans indicate that, by the fall of 2006, seven 2MW wind turbines will be erected on the site. Identified as Turbines 1 through 7 extending from west to east, these turbines will be situated in a line down the centre of the site, extending from Davys Head to North Head (***Figure 2***).

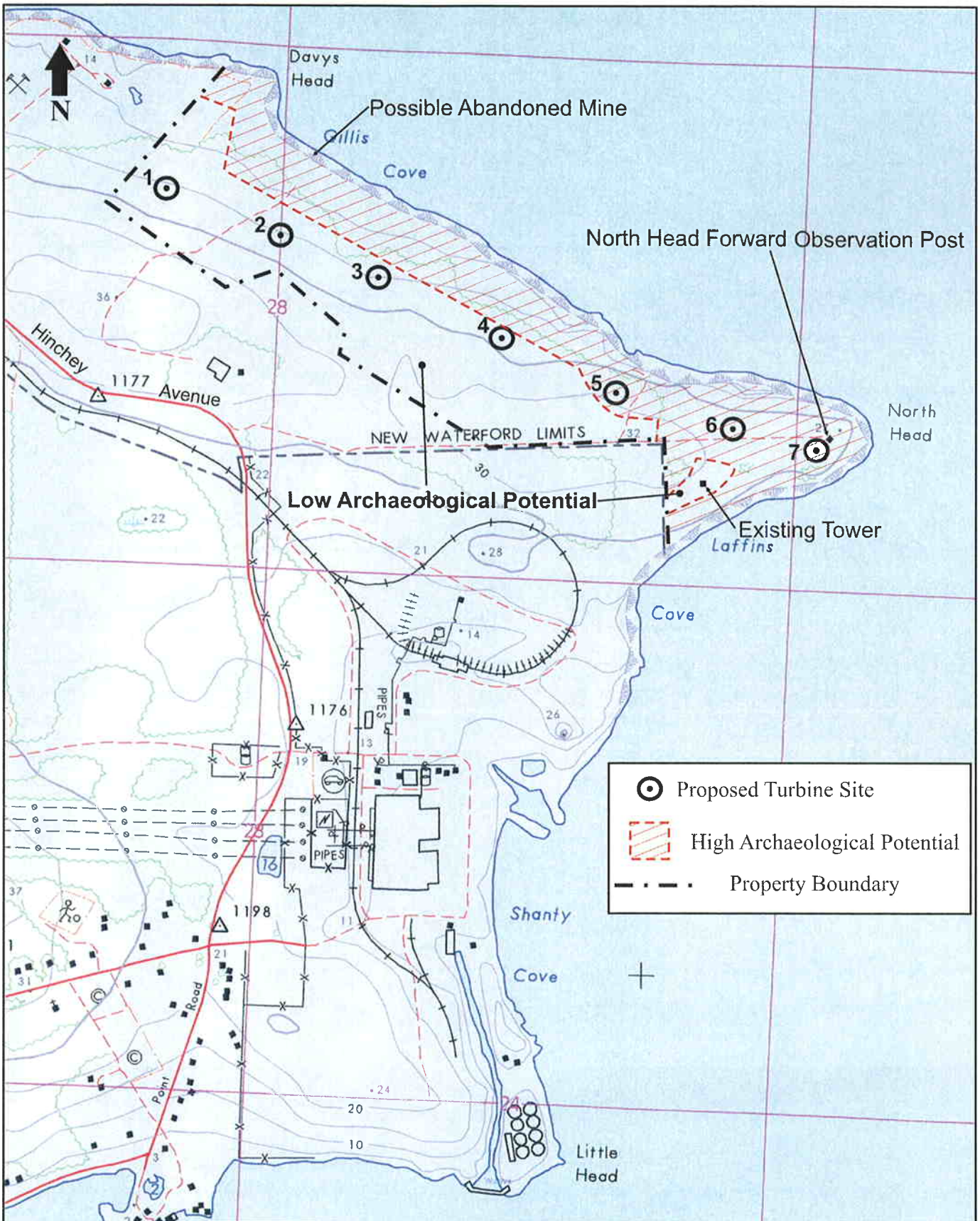
1-B Colliery Turbine Site

The 1-B Colliery Turbine Site is located immediately southwest of the abandoned 1-B Colliery at O'Neils Point, in Bridgeport (***Figure 1***). The site consists of a 4.8 hectare property (PID 15448335) on which a single 800KW turbine will be built. The property extends northward from Connaught Avenue, ending approximately 300 metres south of the shore. When subjected to reconnaissance on September 8, 2005, the facility's turbine access road had already been constructed, extending westward from 1B Road. The concrete turbine base had also already been built (***Figure 3***).

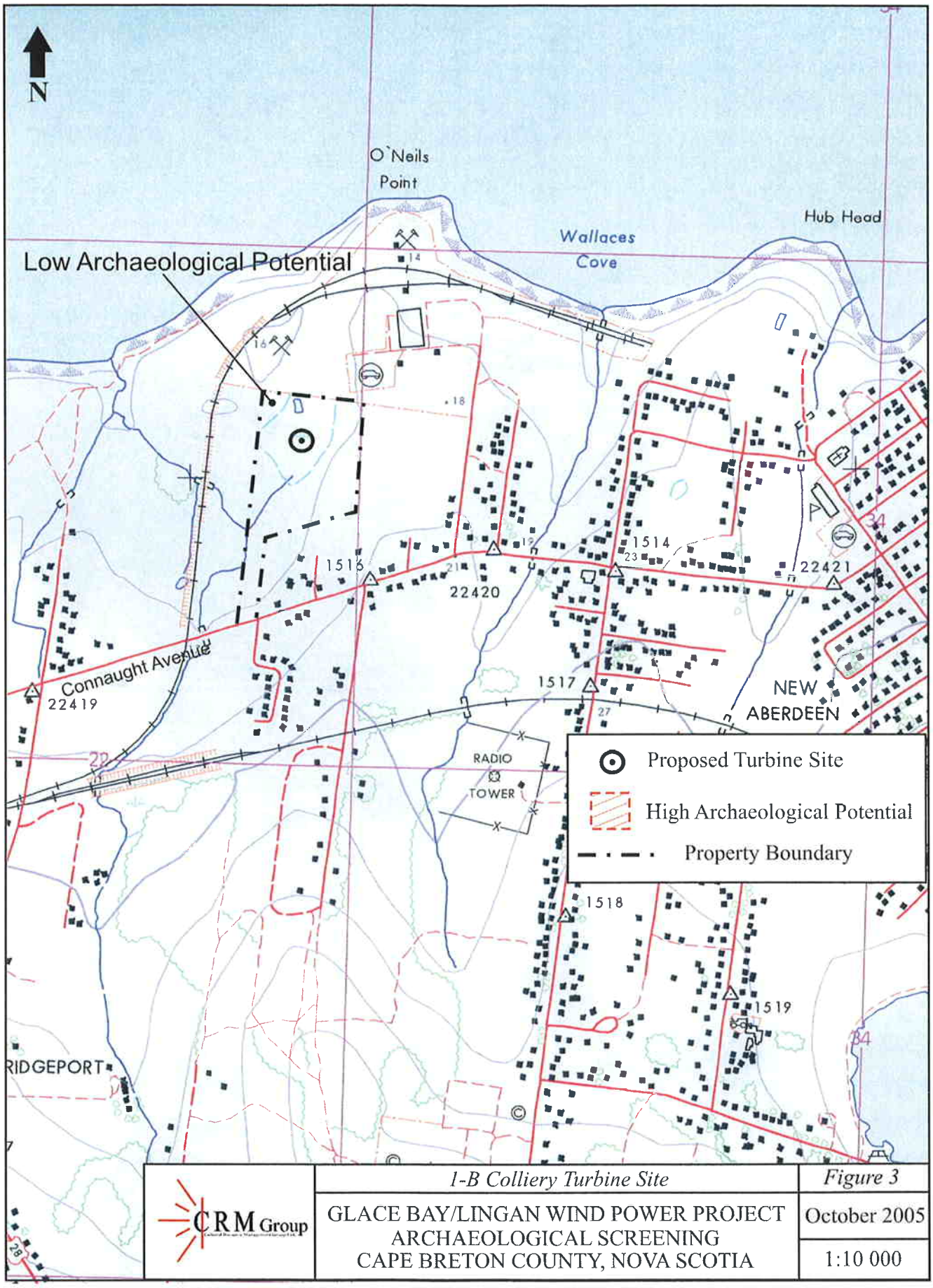
Port Caledonia Turbine Site

The Port Caledonia Turbine Site is a 9.2 hectare property (PID 15448335) located on the east side of Whelan Point in Port Caledonia (***Figure 1***). The property, which is the proposed location of a single 800 KW turbine, extends from the Marconi Trail (Highway 6 or Mines Road No. 6) northward to the shoreline. When the site was subjected to reconnaissance on September 8, 2005, the turbine access road had already been constructed, extending westward from a service road leading to five nearby communication towers. The concrete turbine base had also already been completed (***Figure 4***).

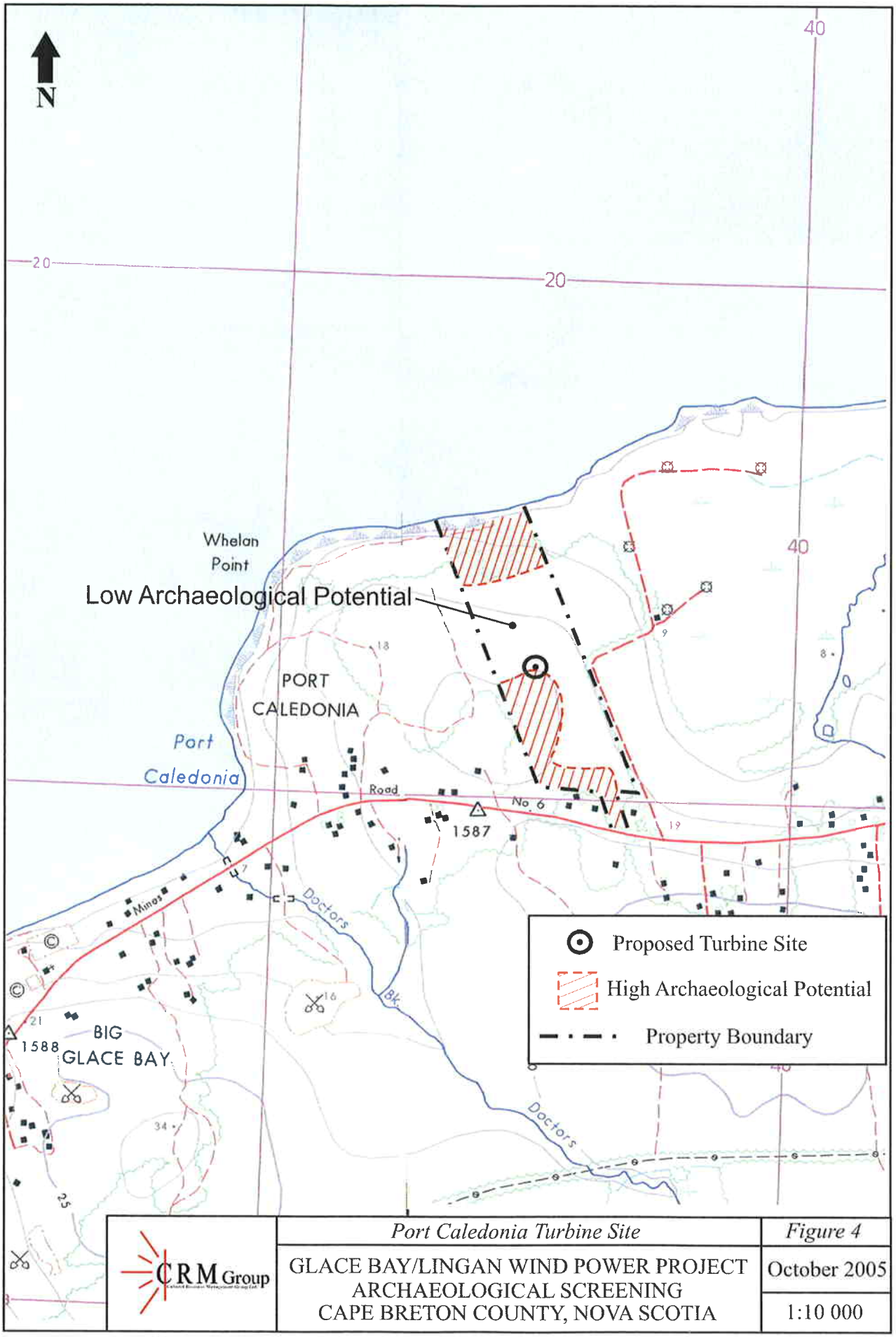

N
Proposed Turbine Location
0 1 2 3
Km
Lingan Wind Farm
New Waterford
Lingan
Atlantic Ocean
1-B Colliery Turbine Site
Bridgeport Cove
Lingan Bay
Bridgeport
Dominion
Glace Bay
Port Caledonia Turbine Site
Glace Bay
Big Glace Bay
CRM Group
Study Areas
Figure 1
GLACE BAY/LINGAN WIND POWER PROJECT
ARCHAEOLOGICAL SCREENING
CAPE BRETON COUNTY, NOVA SCOTIA
October 2005



CRM Group	*Lingan Wind Farm*	*Figure 2*
	GLACE BAY/LINGAN WIND POWER PROJECT ARCHAEOLOGICAL SCREENING CAPE BRETON COUNTY, NOVA SCOTIA	October 2005 1:10 000



CRM Group	*1-B Colliery Turbine Site*	*Figure 3*
	GLACE BAY/LINGAN WIND POWER PROJECT ARCHAEOLOGICAL SCREENING CAPE BRETON COUNTY, NOVA SCOTIA	October 2005 1:10 000



CRM Group	*Port Caledonia Turbine Site*	*Figure 4*
	GLACE BAY/LINGAN WIND POWER PROJECT ARCHAEOLOGICAL SCREENING CAPE BRETON COUNTY, NOVA SCOTIA	October 2005 1:10 000

3.0 METHODOLOGY

The archival research component of the archaeological screening was designed to explore the land use history of the study areas and their environs, providing the information necessary to evaluate the properties' archaeological potential. To achieve this goal, CRM Group utilized the resources of Cape Breton University's Beaton Institute (BI) in Sydney, the Parks Canada archives at the Fortress of Louisbourg and several provincial record facilities in Halifax.

Research at the BI, the Department of Natural Resources Library and the Public Archives of Nova Scotia (PANS) identified many relevant historic maps. Others were found in the collection of the Fortress of Louisbourg Archives. Investigation at the Provincial Crown Lands Record Centre (PCLRC) exposed land grant records for the subject properties. Research at BI and PANS yielded historic documents and written histories that proved useful. Records of previous archaeological discoveries in the Glace Bay / Lingan area were sought using the Maritime Archaeological Resource Inventory, maintained by the HD-NSM. Modern maps (1:10 000 and 1:50 000 topographic) and aerial photographs (1999) were obtained at the Provincial Land Information Centre.

Fieldwork consisted of a brief visual inspection of each study area, conducted on September 8 and 9 by CRM Group archaeologists Mike Sanders and Jonathan Kyte. These limited pedestrian surveys utilized existing roads and trails, but also involved walking transects through wooded areas following compass headings. The ground searches did not involve sub-surface testing. The researchers were watchful for topographic or vegetative anomalies that might indicate the presence of buried archaeological resources. The process and the results were documented in field notes and photographs.

4.0 RESULTS

4.1 Background Research

An examination of HD-NSM records indicated that there were no recorded archaeological sites in the vicinity of Glace Bay or Lingan. It was determined, however, that none of the study areas had previously been subjected to archaeological investigation.

Lingan Wind Farm

Early Mi'kmaw habitation in the general Lingan area is suggested by the fact that North Head was once known as Indian Head (Wyld 1845) and Lingan Bay was once known as Harvre de l'Indienne or Indian Bay. The name Lingan is a corruption of l'Indienne (PANS 1967). The Lingan area is known as Milisek in the Mi'kmaw language (PANS 1967).

The Lingan area was settled by the French prior to 1716 (PANS 1967), but research at the Public Archives of Nova Scotia, the Fortress of Louisbourg Archives and the Beaton Institute revealed no maps depicting the precise location of the French settlement. North Head, however, is identified as Cap Charbon (Coal Cape) on a 1751 map of the area (Anonymous 1751). The community at L'Indienne was destroyed in 1748 when several of the inhabitants took the British Oath of Allegiance, against the wishes of their neighbours (PANS 1967). No settlement is depicted in the Lingan area on identified maps dating to the 1750s (Anonymous 1751; Anonymous 1750s).

The Lingan area was repopulated in the late 1700s by Irish settlers. By 1788 there were 13 residents at "L'Indian" (PANS 1967). The precise location of their residences has not been determined.

The label "Coal" is applied to North Head on maps dating to 1794 (Miller) and c. 1828 (Wyld), indicating a continued interest in this local resource. The General Mining Association began mining coal at Lingan in 1854. Known as the Lingan or Lincoln Mine, this operation was situated south of the study area, in the vicinity of the present Lingan Generating Station (Church 1877; McKenzie 1883; Robb & Fletcher 1898). The facility operated until 1886 (PANS 1967).

Although Hinchey Avenue, a short distance southwest of the study area, was established sometime before 1831 (Johnston 1831), none of the identified detailed nineteenth century maps of the area depict any cultural features within the study area (Johnston 1831; Hendry 1862; Church 1877; Robb & Fletcher 1898).

The study area remained Crown land until 1908, when it was part of a 100 acre lot granted to John T. Laffin - a Lingan ship captain (PCLRC Grant Book 75, page 179). Gillis Cove is believed to have derived its name from a family that occupied an early twentieth century farm on the site of Bruce Fraser's residence, located on the north side of Hinchey Avenue, but outside of the study area (Fraser 2005).

1-B Colliery Turbine Site

Although the 1B Road study area lies near the bay known historically as the "Harvre de l'Indienne, research revealed no record of Mi'kmaq habitation specific to O'Neils Point.

While the British held Louisbourg between the years of 1745 and 1749, they operated a coal mine at Burnt Head, approximately 1.0 kilometre east of the study area. Several dwellings were built in association with the colliery, but it is unlikely that any of those dwellings would have been located as far west as the study area at O'Neils Point. In the spring of 1748, Fort William - a fortified blockhouse - was built at Burnt Head for the protection of the mining operation. Despite this precaution, several of the homes were destroyed in a Mi'kmaq attack that came in July of that year. The French assumed control of the fort and the mine in 1749 and the colliery remained active until 1752, when the mine was set ablaze by mutineers, resulting in the destruction of the fort as well. The fire in the mine continued to burn until 1764 (Holland & Goldfrap 1767; Dawson 1988: 66; PANS 1967; website of the Cape Breton Miners Museum).

Bridgeport Cove, immediately west of the study area, was known as Dead Man's Cove throughout the 19th century (Anonymous n.d. a; MacKenzie 1883; Robb & Fletcher 1898). This name possibly reflects the existence of an early cemetery on or near "Deadman Point" (now Timmons Point), at the opposite end of the cove, 1.7 kilometres west of the study area (Church 1877).

By the early 1800s, the right-of-way for the present Connaught Avenue, had already been established (Anonymous early 1800s). In the late 1820s or early 1830s, new coal mines were established east of the study area, in the vicinity of New Aberdeen and Table Head (Johnston 1831; MacKay 1834). Names of mines in that area ultimately included the Glace Bay Mines, the Stirling Mines, the Roost Works and the Hub Mine (Church 1877; McKenzie 1883; Robb & Fletcher 1898).

The study area, itself, remained Crown land until 1864, when it was part of a 135 acre lot granted to John O'Neil - a Bridgeport farmer (PCLRC Grant Book 32, page 160). By the 1870s, the Bridgeport Mines were established about 1.0 kilometre southwest of the study area (Church 1877).

None of the identified detailed nineteenth century maps of the area depict any cultural features on or near the study area at O'Neils Point (Johnston 1831; MacKay 1834; Wyld 1845; Hendry 1862; Church 1877; McKenzie 1883; Robb & Fletcher 1898). Development of the 1B Colliery, which impacted the study area, did not begin until 1924,

Port Caledonia Turbine Site

Historic Mi'kmaq settlement near the study area is suggested by the label "Indian Brook" which was applied to Doctors Brook on a c. 1829 map (Anonymous c. 1829). The mouth of this brook lies approximately 600 metres west of the study area, on the far side of Whelan

Point.

Bordens Cove, which is located approximately 4.0 kilometres east of the study area, is identified as Baye au Charbon on a map of the coast made in 1744 (Bellin 1744). Translating as Coal Bay in English, this name indicates that the local coal outcrops were well known to the French prior to the capture of the Fortress of Louisbourg by New England forces in 1745.

By the late 1820s, Mines Road (now Highway 6) was established in its present alignment, serving as part of a long coastal road linked to Sydney. A map drawn in 1829 or shortly thereafter depicts several residences along the road in the Port Caledonia area (Anonymous c. 1829). One is on a Whelan Point lot which encompasses the study area. The lot is labelled "James English's Ticket". This identifier suggests that, perhaps as the result of a draw among Loyalists in the mid 1780s, James English was the first to receive the property. The house, itself, is labelled "Samuel Boutilier", indicating the name owner at the time the map was drawn.

Comparison with modern property maps suggests that Samuel Boutilier's house was located near the summit of the rise at the southwest edge of the study area. It is unclear whether the house site would have been inside or outside of the study area boundary.

By 1877, a coal mine known as the Clyde Mine was established approximately 300 metres west of the study area, on the west side of Whelan Point. Its entrance, named the "Ontario Slope", is depicted on Ambrose Church's 1877 map of Cape Breton County (Church 1877). The map also indicates that the mine had a railway that led westward to the Port Caledonia Shipping Station and Glace Bay, away from the study area. Residences of "J. Boutilier", "P. McAuley" and a second "J. Boutilier" are depicted standing on the north side of Highway 6 in the vicinity of the south end of the study area.

4.2 Field Investigations

Lingan Wind Farm

Field reconnaissance on September 9 revealed that the majority of the Lingan Wind Farm site is relatively flat, dry and densely wooded. Although the site lies immediately adjacent to the coast, it consists of an elevated plateau that is physically separated from the actual shore by a steep escarpment. The escarpment is actively eroding along the full length of the study area. Seasonal exposure to harsh environmental conditions has kept the ground surface at the outer edge of the plateau quite clear of trees and bushes (***Plate 1***). This naturally denuded zone (generally 50 to 100 metres in width) could have attracted settlement in the past, given its favourable ground conditions and exceptional view. However, access directly to or from the water would always have been difficult.

PLATE 1: **North edge of Lingan Wind Farm site, looking southeast from Davys Head to North Head.**

PLATE 2: **North Head Forward Observation Post. Facing south.**

Reconnaissance along the length of the plateau "clearing" revealed no exposed archaeological features, artifact exposures or suspicious topographic or vegetative anomalies. Despite this fact, the surface of the plateau within 100 metres of the escarpment and across the width of North Head is still ascribed high archaeological potential.

An abandoned concrete building lies within the study area near the tip of North Head (***Plate 2***). Signage on the grounds of the Fort Petrie Museum in Victoria Mines identifies this structure as the North Head Forward Observation Post. This facility was built c. 1939 and served as a key element of the Sydney Harbour Coastal Defences during the Second World War (1939 to 1945). The presence of a small (2 metre diameter) circular pit a short distance (4.5 metres) to the southeast of this building suggests that there may have been outbuildings, such as a privy, associated with the post. The dirt road that runs east / west between the observation post and the Lingan Beach Road is also thought to be a Second World War military feature (Fraser 2005). Reconnaissance on either side of the road revealed no archaeological features.

A tall metal tower was recently erected within the study area. It is situated to the west of the abandoned observation post and south of the military road, near Laffins Cove. Grubbing performed in advance of its construction stripped the topsoil from around its base, outwards to a distance of up to 50 metres. This impact area is now considered to have low archaeological potential. No artifacts were observed in any of the soil exposures.

The broad wooded area along the southwest edge of the study area is considered to have low archaeological potential, being relatively distant from the shore and any historic roads. A farm existed near this area during the early 1900s, but it was on the site of Bruce Fraser's residence, southwest of the study area limits.

The study area is underlain by a coal seam, which is plainly visible in the face of the escarpment. Timber cribwork protrudes from this exposed seam near the head of Gillis Cove. This wooden structure is believed to represent shoring at the mouth of an abandoned mine. The good condition of the shoring suggests that the mine is recent and not an archaeological feature.

1-B Colliery Turbine Site

CRM Group conducted field reconnaissance at the 1-B Colliery Turbine Site on September 8, 2005. Reconnaissance revealed the study area to be generally level and open, reflecting the natural topography of O'Neils Point and the artificial levelling it sustained during the twentieth century operation of the 1-B Colliery. The southern end of the site is quite marshy, consisting of a small bog surrounded by a dense growth of alders (***Plate 3***). The central portion of the site, though dry, has been stripped of topsoil. Here, a recent growth of cranberry plants provides incomplete cover over bare subsoil. Modern maps indicate that the northern end of the site was marshy prior to recent infilling for the construction of the turbine base and its access road (***Plate 4***).

PLATE 3: **Wet area at south end of 1-B Colliery Turbine Site. Facing south toward Connaught Avenue.**

PLATE 4: **New turbine base and access road at the 1-B Colliery site in Bridgeport. Facing northeast.**

No archaeological features were encountered during the survey. The only cultural material found in the abundant soil exposures was domestic refuse and industrial building materials dating to the second half of the twentieth century.

On the basis of these observations, the entire study area was ascribed low archaeological potential.

Port Caledonia Turbine Site

Like the Lingan Wind Farm site, the Port Caledonia Turbine Site consists of an elevated plateau that is separated from the Atlantic shoreline by a steep escarpment. Reconnaissance on September 8 revealed that the north end of the site, along the top edge of the escarpment, is relatively flat and clear (***Plate 5***). Tree growth in this margin appears to have been naturally suppressed by wind and salt spray. Despite its exposure to the elements and its lack of direct marine access, the plateau margin, within 100 metres of the escarpment, is ascribed high archaeological potential. Attributes such as its strategic view and its proximity to coal exposures along the escarpment may have attracted past settlement.

The remainder of the study area is densely wooded, with an undulating surface that is primarily dry. The majority of this was ascribed low archaeological potential, as it exhibits no sign of cultural modification or suspicious topographic or vegetative anomalies. However, elevated areas along the southwest edge of the study area display artificial levelling indicative of historic farming and pits indicative of unauthorized or "bootleg" mining. The mine pits are probably modern, but the horticultural landscape is likely associated with a farm established by Samuel Boutilier by the late 1820s. Boutilier's residence, depicted on a map dating to c. 1829 (Anonymous c. 1829), appears to have been located on high ground near the southwest corner of the study area. Based on the combined results of background research and reconnaissance, the elevated ground at the southwest edge of the study area is ascribed high archaeological potential (***Figure 4***). This area includes the turbine site, itself, and the site of a modern log cabin that lies in ruin a short distance to the west (***Plate 6***).

PLATE 5: **North end of Port Caledonia Turbine Site, looking west toward Whelan Point and Glace Bay.**

PLATE 6: **Remains of a modern log cabin near the Port Caledonia turbine base. Facing south.**

5.0 CONCLUSIONS AND RECOMMENDATIONS

On the basis of the archaeological screening program, which combined archival research and limited field reconnaissance, archaeological potential was evaluated across each of the three wind farm sites proposed for the Glace Bay / Lingan Wind Power Project. High archaeological potential was ascribed to the following areas:

Lingan Wind Farm

- within 100 metres of the coastal escarpment
- across the top of North Head, except for the area grubbed for the installation of the existing tower

Port Caledonia Turbine Site

- within 100 metres of the coastal escarpment
- across the elevated areas at the southwestern edge of the study area

The remainder of the proposed wind farm land, including all of the 1-B Colliery Turbine Site, is considered to have low archaeological potential.

Based on these results, CRM Group offers the following management recommendation:

1. It is recommended that the 1-B Colliery Turbine Site as defined in this report (Figure 3) be cleared of any further archaeological investigation prior to development.

2. It is recommended that the areas of low archaeological potential in the Lingan Wind Farm Site (Figure 2) and the Port Caledonia Turbine Site (Figure 4) be cleared of any further archaeological investigation prior to development.

3. It is recommended that, within the areas of high archaeological potential ascribed to the Lingan Wind Farm Site (Figure 2) and the Port Caledonia Turbine Site (Figure 4), archaeological assessment involving subsurface testing precede any ground impacts. This assessment could be limited to the proposed impact area(s), but should precede any grubbing for access road construction, staging area preparation, turbine construction, etc.

4. It is recommended that the North Head Forward Observation Post be recognized as a significant built heritage feature that should be avoided by construction impacts. It is further recommended that consideration be

given to the situation of the turbines so that the visual isolation of the post is maintained.

5. In the event that archaeological deposits or human remains are encountered during construction, all work in the associated area(s) should be halted and immediate contact made with the Special Places Program - Heritage Division (David Christianson: 424-6461).

6.0 REFERENCES CITED

PANS = Public Archives of Nova Scotia
BI = Beaton Institute
PCLRC = Provincial Crown Lands Record Centre

Anonymous
1751 *Plan of l'Isle Royalle, 1751.* Manuscript. Dawson 1988:144.

n.d. a *A Chart of the South East Part of l'Isle Royal, or Cape Bretton taken from the best Surveys, and the Observations of the most able Pilots.* [c. 1750s] Manuscript. In Dawson 1998:64.

n.d. b Untitled early 1800s plan depicting land grants on the west side of Big Glace Bay. PCLRC Cape Breton County Portfolio, Plan 50.

c. 1829 Untitled plan of road and land grants from Big Glace Bay to Morien Bay. PCLRC Cape Breton County Portfolio, Plan 26.

Church, Ambrose F.
1877 *Topographical Township Map of Cape Breton County, Nova Scotia.* A.F. Church & Co.: Halifax.

Dawson, Joan
1988 T*he Mapmaker's Eye: Nova Scotia through Early Maps.* Nimbus Publishing Limited and the Nova Scotia Museum: Halifax.

Fraser, Bruce
2005 Personal communication to Mike Sanders on September 9 during a meeting on-site. Mr. Fraser was the owner of the residence immediately adjacent to the study area.

Hendry, W.A.
1862 *MacKinlay's Map of the Province of Nova Scotia, Including the Island of Cape Breton. Compiled from Actual and Recent Surveys.* H.W. MacKinlay: Halifax.

Holland, Samuel and Goldfrap, John George
1767 *A Plan of the Sea Coast from Gage Point to Cumberland Cape . . . With the Coal Mines in that Extent.* In Dawson 1988:66-67.

Johnston, John L.
1831 Untitled map of Cape Breton. PANS Map 3.6.4.1831.

MacKay, William
1834 *Map of the Province of Nova Scotia, Including the Island of Cape Breton, Compiled from Actual and Recent Surveys, and Under the Authority of the Provincial Legislature.*

McKenzie, Hugh
1883 *Map of Cape Breton from the Admiralty Chart and from Surveys Made by Hugh Fletcher, Wm. Fletcher, BA, H. Gisborne and Jno. McMillan.* Geological Survey of Canada.

Miller, James
1794 *Cape Breton.* Manuscript map. In Dawson 1988:68, 69.

Public Archives of Nova Scotia (PANS)
1967 *Place-Names and Places of Nova Scotia.* Nova Scotia Series, III. The Public Archives of Nova Scotia: Halifax. Republished in 1976 by Mika Publishing Company: Belleville, Ontario.

Robb, C. and Fletcher, H.
1898 *Province of Nova Scotia, Cape Breton County, Glace Bay Sheet, No. 135.* Geological Survey of Canada.

Wyld, James Hardy
c. 1828 *Map of the Harbours of Sydney and Bridport and the Position of the General Mining Company's Coal Mines for McGregor's British North America.* [BI Map 721]

1845 *A Map of the Provinces of New Brunswick and Nova Scotia, Describing all the New Settlements, Townships, etc. Including also the Islands of Cape Breton and Prince Edward.* Manuscript.