PEI-NB Cable Interconnection Upgrade Project – VOLUME 1 Project Description

Job No. 121811475

Prepared for:
Maritime Electric Company, Limited

Prepared by:
Stantec Consulting Ltd.
165 Maple Hills Avenue
Charlottetown PE C1C 1N9

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Executive Summary

PEI Energy Corporation (PEIEC), with Maritime Electric Company, Limited (MECL) acting as the construction agent, is proposing to complete a cable interconnection upgrade within the Northumberland Strait, between the provinces of Prince Edward Island (PEI) and New Brunswick (NB). The intent of the proposed PEI-NB Cable Interconnection Project ("the Project") is to meet the growing demand for electricity on PEI and supplement aging infrastructure.

Project activities will be carried out over a 16 month period in three distinct geographic regions; PEI, NB and in the Northumberland Strait. Project activities within the Northumberland Strait include the laying of two submarine cables between landfall locations in Cape Tormentine, NB, and Borden-Carleton, PEI. Project activities in PEI consist of the expansion of the existing substation in Borden-Carleton and construction of a cable landfall site. Project activities in NB consist of upgrades to the existing substation in Memramcook, construction of a landfall site and cable termination site in Cape Tormentine and the installation of overhead transmission lines between the cable termination site in Cape Tormentine and the substation in Memramcook.

To better facilitate review, this document is divided into four volumes as follows:

- Volume 1 (this volume) is the introductory chapter, outlining Project specifics and EIA methodology.
- Volume 2 addresses Project activities and potential environmental effects within the land-based environment in PEI.
- Volume 3 addresses Project activities and potential environmental effects within the land-based environment in NB.
- Volume 4 addresses Project activities and potential environmental effects within the marine-based environment in the Northumberland Strait.

This document, in its entirety, is intended to fulfill requirements for an environmental impact assessment (EIA) for three distinct regulatory regions. Land-based Project activities within PEI (Volume 2) are pursuant to section 9(1) of the PEI *Environmental Protection Act* (PEI *EPA* 2012). Land-based Project activities within NB (Volume 3) are pursuant to schedule A of the NB *Environmental Impact Assessment Regulations* (NB *EIAR* 2013) under the NB *Clean Environment Act* (NB *CEA* 2014). As the submerged land within the Northumberland Strait is federal Crown land, it is subject to requirements under section 67 of the *Canadian Environmental Assessment Act, 2012* (*CEAA 2012)*.

The EIA process is intended to support and better define the Project through early consideration of potential environmental effects as well as mitigation measures. The EIA process considers issues and concerns identified through engagement with Aboriginal groups, stakeholders, the public and regulatory agencies. Project-related engagement activities have been ongoing since the summer of 2014, with public consultation and Aboriginal engagement focused on the EIA commencing in summer 2015.

Valued components (VCs) are Project-associated environmental attributes that have been identified by Aboriginal persons, regulatory agencies, scientists, key stakeholders and/or the public to be of particular interest or value. The EIA process identifies and assesses potential adverse environmental effects of the Project on the identified VCs.

VCs evaluated in this EIA include:

- Atmospheric Environment
- Groundwater Resources
- Freshwater Environment
- Terrestrial Environment
- Marine Environment
- Land Use
- Commercial, Recreational and Aboriginal Fisheries
- Socioeconomic Environment
- Heritage Resources
- Other Marine Users
- Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

The assessment methods include an evaluation of the potential environmental effects for each VC that may arise from Project components and activities as well as from effects of the environment on the Project and accidental events. The evaluation of potential cumulative effects considers whether there is potential for the residual environmental effects of the Project to interact cumulatively with the residual environmental effects of other past, present, or future (i.e., certain and reasonably foreseeable) physical activities in the vicinity of the Project.

Project activities and components assessed in the PEI and NB volumes include potential effects from site preparation for land based transmission lines, physical construction of land based transmission lines, landfall construction, upgrading of electrical substation, inspection and energizing of transmission lines, cleanup and re-vegetation of transmission corridor, emissions, and wastes, transportation, employment and expenditure, energy transmission, vegetation management, infrastructure inspection, maintenance and repair, access road maintenance, decommissioning and reclamation. Project activities and components assessed in the marine volume include potential effects from site preparation, installation of the submarine cables, inspection and energizing of the submarine cables, emissions and wastes, marine transportation, energy transmission (presence of the Project), infrastructure inspection and maintenance, transportation and decommissioning. These activities reflect the scope of the Project and represent physical activities that may occur throughout the life of the Project forming the basis of the effects assessment.

Mitigation is proposed to reduce or eliminate adverse environmental effects. Most potential Project effects will be addressed by standard mitigation measures and best management practices outlined in the relevant Environmental Protection Plans (EPPs). With the implementation of the proposed mitigation measures, adverse residual environmental effects of routine Project activities and components are predicted to be not significant for all VCs.

The assessment considers potential environmental effects for each VC that may arise through Accidents, Malfunctions, or Unplanned Events. For land-based Project activities, the scenarios considered include fire, hazardous material spill, vehicle accident, wildlife encounter, erosion prevention and/or sediment control failure, major loss of electricity and discovery of a heritage resource. For marine-based Project activities, these scenarios include fire, hazardous material spill and vessel accident. Prevention, mitigation and response measures are outlined to reduce the probability of an upset scenario occurring, and to limit adverse environmental effects in the unlikely event of occurrence.

In summary, the Project is not likely to result in significant adverse residual environmental effects, including cumulative environmental effects, provided that the proposed mitigation is implemented.

Abbreviations

CEAA	*Canadian Environmental Assessment Act*
CRA	Commercial, Recreational or Aboriginal
DFO	Fisheries and Oceans Canada
DP	Dynamic Positioning
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMP	Environmental Management Plan
EPA	Energy Purchase Agreement
ft	Feet
GHG	Greenhouse Gas
HDPE	High-density polyethylene
H-Frame	Horizontal Frame
km	Kilometre
kV	Kilovolt
LAA	Local Assessment Area
LiDAR	Light Detection and Ranging
MBCA	*Migratory Birds Convention Act*
MECL	Maritime Electric Company, Limited
mG	Milligauss
MHPE	Medium- density Polyethylene
MW	Megawatt
NB	New Brunswick
NB *CEA*	New Brunswick *Clean Environment Act*
NB Power	New Brunswick Power
NBDELG	New Brunswick Department of Environment and Local Government
NPP	Navigation Protection Program
PDA	Project Development Area
PEI *EPA*	Prince Edward Island *Environmental Protection Act*
PEIDCLE	Prince Edward Island Department of Community, Land and Environment
PEIEC	Prince Edward Island Energy Corporation
PWGSC	Public Works and Government Services Canada
RAA	Regional Assessment Area

RoW	Right-of-way
SAR	Species at Risk
SCDI	Strait Crossing Development Inc.
SOCC	Species of Conservation Concern
TROV	Trenching Remotely Operated
VC	Valued Component

1.0 INTRODUCTION

Prince Edward Island Energy Corporation (PEIEC), with Maritime Electric Company, Limited (MECL) serving as construction agent, proposes to upgrade the electrical power interconnection between PEI and NB.

PEIEC is proposing to develop a new high voltage electrical cable interconnection across the Northumberland Strait, between PEI and NB. Two parallel high voltage submarine cables (138 kV) capable of carrying up to 180 MW are proposed as the main power conduit; approximately 57 km of new land-based right-of-way (RoW) is also needed for construction and operation of an overhead transmission line in NB (see Figure 1.1).

1.1 OVERVIEW OF THE PROJECT

PEIEC (the project proponent) proposes to develop an electrical power transmission system between PEI and NB. The PEI-NB Cable Interconnection Upgrade Project (the "Project") includes construction and operation of a high voltage alternating current transmission system with the following primary components:

- two 180 megawatt, 138 kilovolt submarine cables
- two landfall sites (where the submarine cable trenches are brought ashore)
- two termination sites (for converting submarine cables to overhead transmission lines or substation)
- three-phase, 138 kilovolt transmission lines within NB
- expansion of the existing MECL substation in Borden-Carleton, PEI
- upgrading of the New Brunswick Power Corporation (NB Power) substation in Memramcook, NB

The Project will span three geographic regions (Figure 1.1) including:

- Prince Edward Island – a landfall site and termination site will be located adjacent to the expanded MECL substation in Borden-Carleton.
- The Northumberland Strait – two high voltage alternating current submarine cables will span approximately 16.5 km from Cape Tormentine to Borden-Carleton.
- New Brunswick – a landfall site and termination site will be constructed in Cape Tormentine as well as approximately 57 km of overhead transmission lines within new and existing easements to the existing NB Power substation in Memramcook.

1.2 PROPONENT INFORMATION

Key proponent information for this environmental assessment includes the following:

Project Title:	PEI-NB Cable Interconnection Project
Prince Edward Island Energy Corporation Chief Executive Officer:	Ms. Kim Horrelt
Project Proponent and Principal Contact Person for this report:	Prince Edward Island Energy Corporation Mr. Mark Victor, P.Eng. Senior Engineer P.O. Box 2000, 11 Kent Street Charlottetown, PE C1A 7N8 Tel: (902) 368-6098 Fax: (902) 894-0290 Email: mevictor@gov.pe.ca
Proponent's Construction Agent and Principal Contact Person for this report:	Maritime Electric Company, Limited Mr. Ron LeBlanc, P.Eng. Manager, Production and Energy Supply Tel: (902) 629-3610 Fax: (902) 629-3630 Email: leblanc@maritimeelectric.com
Environmental Consultant and Principal Contact Person for this report:	Stantec Consulting Ltd. Mr. Dale Conroy, M.Sc. Senior Associate, Environmental Services 165 Maple Hills Avenue Charlottetown, PE C1C 1N9 Tel: (902) 566-2866 Fax: (902) 566-2004 Email: dale.conroy@stantec.com

PEIEC was established as a Provincial Crown Corporation in December 1978. PEIEC is responsible for pursuing and promoting the development of energy systems and the generation, production, transmission and distribution of energy, in all its forms, on an economic and efficient basis for PEI. The affairs of PEIEC are overseen by a board of directors appointed by the Lieutenant Governor in Council.

The PEIEC mandate is:

- to develop and promote the development of energy systems and the generation, production, transmission, and distribution of energy in all its forms on an economic and efficient basis
- to provide financial assistance for the development, installation, and use of energy systems
- to coordinate all government programs in the establishment and application of energy systems in the Province

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Sources: Base Data - Natural Resources (2011). Project Data from Stantec or provided by NB Power / MECL. Imagery - ArcGIS Map Service World Imagery, PEI Government (2010), Natural Resources (2011).

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Stantec

121811475 - PEI-NB Marine Cable Interconnection - Maritime Electric Company Limited

General Project Overview

Figure 1.1

Specific to electricity supply, PEIEC has developed and operates three wind farms in the Province with a collective capacity of 73.5 MW, and it oversees the management and operation of the existing cable interconnection through an interconnection lease agreement with MECL.

MECL is an indirect, wholly owned subsidiary of Fortis Inc. and operates under the provisions of PEI's *Electric Power Act* and the *Renewable Energy Act*. The company owns and operates a fully integrated system providing for the generation, transmission and distribution of electricity to approximately 77,000 customers throughout PEI. MECL's head office is in Charlottetown, and its generating facilities are located in Charlottetown and Borden-Carleton. MECL has contractual entitlement to energy from the Point Lepreau Generating Station in NB and purchases energy from the mainland power grid through two existing submarine cables under the Northumberland Strait.

The proposed Project will consist of two 180 MW submarine cables, with high voltage alternating current, and overland transmission and related components that will connect PEI with the electrical system of NB. MECL is construction agent of the Project and will design, engineer, construct, commission, operate and maintain the Project within PEI and the Northumberland Strait. The New Brunswick Power Corporation (NB Power) will design, engineer, construct, commission, operate and maintain the land-based components in NB.

1.3 NEED FOR THE PROJECT

MECL owns and operates generating facilities located in Charlottetown and Borden-Carleton. Typically, less than 1% of the annual electricity consumed in PEI is produced from on-Island, oil-fired generation. Approximately 15% of the electric energy is supplied by the Point Lepreau Nuclear Generating Station in NB and an additional 25% is from the purchase of Island-generated wind energy. The remainder of the power consumed in PEI is supplied by NB Power through an Energy Purchase Agreement (EPA). The electricity sourced through the EPA comes from a variety of sources within NB and the Northeastern United States. Both the Point Lepreau and EPA electricity is transferred to PEI via two existing submarine cables under the Northumberland Strait. In 1977, two 100 MW cables were installed to meet the peak electrical demand of 95 MW and to allow for growth. PEIEC is proposing to install two new 180 MW submarine cables in order to meet the need of PEI's future peak electrical demand. Currently, the peak electrical demand is 260 MW and growing; the most recent peak load forecast is estimated to be 354 MW in 2022 (PEIEC 2014). The existing cables are 38 years old and prudent planning must consider their eventual end-of-life.

The growing demand for electricity on PEI and the access to uninterrupted, cost-effective electricity is critical to an acceptable standard of living and sound provincial economy. The capacity limitations of the existing cables are beginning to increase the energy supply cost for Island utilities; without an upgrade to the PEI-NB interconnection system, additional on-Island generation will be required. In addition to supplementing aging infrastructure and increasing supply capacity to PEI, the Project will improve the reliability of electrical power supply to the Island. The existing cables will continue to operate until the end of their service life, and will serve mostly as a backup once the upgrade is complete.

1.4 ENVIRONMENTAL PLANNING AND MANAGEMENT

Both MECL and NB Power employ company-specific Environmental Protection Plans (EPPs) and Health and Safety Policies which will be used as reference during land-based work in their respective regions. The Project-related work on PEI will be conducted according to MECL's Health, Safety, and Environmental Policy, which follows a series of best work practices, employee training, waste management, preventative maintenance, environmental performance audits, and regulatory compliance. MECL will follow their approved EPP for High Powered Transmission Construction in PEI for the Project prior to the initiation of construction activities in PEI. The Project-related work in NB will be conducted according to the NB Power Transmission Environmental Management System, which is consistent with the ISO 14001 Environmental Management Standard, and NB Power's Corporate Sustainable Development Policy**.** NB Power will follow their EPP for NB Power Corporation Transmission Facilities prior to the initiation of construction activities in NB. A Project-specific EPP will be created to address marine activities and any identified Accidents, Malfunctions, and Unplanned Events that are not addressed in the company-specific EPPs.

Environmental protection procedures and measures will be observed and employed throughout the life of the Project. MECL will be responsible to ensure installation, maintenance, inspection and monitoring of environmental protection control measures during operation of all PEI infrastructure, including the submarine cables. NB Power will be responsible to ensure installation, maintenance, inspection and monitoring of environmental protection control measures during operation of the NB infrastructure.

1.5 PURPOSE AND ORGANIZATION OF THE DOCUMENT

The intent of this document is to provide the results of the environmental impact assessment (EIA) carried out to satisfy the regulatory requirements of the Project under three jurisdictions:

- Section 9(1) of the PEI *Environmental Protection Act* (PEI *EPA* 2012)
- Schedule A of the NB *Environmental Impact Assessment Regulation* (NB *EIAR* 2013) under the NB *Clean Environment Act* (NB *CEA* 2014)
- Section 5 of the *Canadian Environmental Assessment Act, 2012* (*CEAA 2012*)

The EIA document is presented as four volumes to facilitate regulatory review within each geographic Project location. These include:

- Volume 1 (this volume) provides a description of the overall Project and an overview of EIA approach and method
- Volume 2 provides a description of the land-based Project activities and potential environmental effects within PEI
- Volume 3 provides a description of the land-based Project activities and potential environmental effects within NB
- Volume 4 is a description of the marine-based Project activities and potential environmental effects within the Northumberland Strait

1.6 PROPERTY OWNERSHIP

The Project will develop lands within PEI and NB and includes the submerged lands of the Northumberland Strait. The total Project area covers an area of approximately 568.7 ha. The provincial governments of NB and PEI have jurisdiction over the intertidal zones in both provinces; MECL will apply for provincial easements in the foreshore zones. The submerged lands of the Northumberland Strait below the foreshore zone are federal crown land under management of Public Works and Government Services Canada (PWGSC). A government authorization for installation and operation of the submarine cables on the seabed of the Northumberland Strait is required and will include input from both provincial governments in NB and PEI, as well as PWGSC.

MECL currently owns the land required for Project infrastructure in PEI. Land easements will be required for the transmission line corridor in NB. The corridor runs largely along an existing transmission line RoW between Melrose and Memramcook, Westmorland County, NB. The corridor between Melrose and Bayfield, NB, follows an existing, unused easement of approximately 12 km.

1.7 FUNDING

Fifty million ($50M) in funding has been granted through federal funding made available by Infrastructure Canada's Green Infrastructure Fund. The remainder of the Project will be financed by the PEI Government.

1.8 REGULATORY FRAMEWORK

1.8.1 Provincial Jurisdiction

Based on the PEI *EPA* and the NB *Environmental Impact Assessment Regulation* (NB EIA Regulation), under the NB *Clean Environment Act* (NB *CEA*), an environmental impact assessment is required to be conducted in both provinces. A scoping document outlining the Project activities and proposed scope of the EIA for the Project activities was submitted to the Prince Edward Island Department of Communities, Land and Environment (PEIDCLE) on November 18, 2014 and the New Brunswick Department of Environment and Local Government (NBDELG) on January 6, 2015.

1.8.1.1 Prince Edward Island

The framework for environmental impact assessments being carried out in PEI is set out in Section 9 of the PEI *EPA*.

The interpretation of the Act is provided in section 1 of the Act. The term "undertaking" is interpreted to include any project which: (i) may cause the emission or discharge of any contaminant into the environment; (ii) have an effect on any unique, rare, or endangered feature of the environment; (iii) have a significant effect on the environment or necessitate further development which is likely to have a significant effect on the environment; or (iv) cause public concern because of its real or perceived effect or potential effect on the environment.

The construction and operation of a high voltage power transmission line is considered to be an undertaking.

Section 9(1) of the Act states that "no person shall initiate any undertaking unless that person first files a written proposal with the Department and obtains from the Minister written approval to proceed with the proposed undertaking."

Section 9(2) of the Act states that the Minister, in considering a proposal submitted pursuant to Section 9(1), may require the proponent to carry out an EIA and to submit an environmental impact statement (EIS); and to notify the public of the proposed undertaking and to provide opportunity for the public to comment.

Based on the requirement of the Act, an EIA is required for the Project in PEI and must be submitted to the Minister for approval. The PEI Environmental Impact Assessment Guidelines (PEIDELJ 2010) has been used to guide this part of the EIA.

A Watercourse, Wetland and Buffer Zone Activity Permit will also be required in PEI following the EIA review to enable the Project to be carried out.

1.8.1.2 New Brunswick

The Project is an "undertaking" pursuant to Schedule A of the New Brunswick *Environmental Impact Assessment Regulation—Clean Environment Act*, ("EIA Regulation") which includes:

> *"(d) all electric power transmission lines exceeding sixty-nine thousand volts in capacity or five kilometres in length."*

The EIA Regulation requires that the proposed construction, operation, modification, extension, abandonment, demolition or rehabilitation of undertakings listed in Schedule A of the EIA Regulation must be registered. Following registration, the Minister of NBDELG will determine if the Project can proceed under certain conditions ("determination review"), or if a more detailed EIA ("comprehensive review") is required. Should a Comprehensive Review be required, an extensive review and assessment process with public consultation requirements would be required. The EIA report that is submitted as the EIA Registration is planned to be sufficiently comprehensive so that a comprehensive review would not be required. A Guide to Environmental Impact Assessment in New Brunswick (NBDELG 2012) will be used as a reference guideline.

Specific permits or approvals (e.g., Watercourse and Wetland Alteration Permits) are likely to be required in NB following the EIA review to enable the Project to proceed.

1.8.2 Federal Jurisdiction

Canadian Environmental Assessment Act, 2012

The federal requirements for conducting an environmental assessment are described in the *Canadian Environmental Assessment Act*, 2012 (*CEAA 2012*) and the Regulations Designating Physical Activities

(SOR/2012-147). The Act and the regulations identify the physical activities that are "designated projects" subject to *CEAA 2012*, and may require environmental assessment by the Canadian Environmental Assessment Agency (the CEA Agency) or by the Canadian Nuclear Safety Commission (CNSC) or by the National Energy Board (NEB).

A new transmission line may be considered a designated project and be subject to requirements as described in *CEAA 2012* depending on the length of the transmission line and the magnitude of the voltage. As per the Regulations Designating Physical Activities under *CEAA 2012,* transmission lines that are more than 75 km of length within new RoW and have a voltage of more than 345 kV are considered designated projects. As the new electrical transmission line is to be less than 75 km in length on a new RoW and is limited to 138 kV of voltage, this Project is not considered a designated project under the Regulations Designating Physical Activities and an environmental assessment under *CEAA 2012* is not required.

Section 67 of *CEAA 2012* sets the framework for the environmental review of projects being carried out on federal land that are not considered designated projects under the Regulations Designating Physical Activities. As the seabed of the Northumberland Strait is federal crown land it is subject to requirements under section 67 of *CEAA 2012*. Section 67 states "*an authority must not carry out a project on federal lands, or exercise any power or perform any duty or function conferred on it under any Act of Parliament other than this Act that could permit a project to be carried out, in whole or in part, on federal lands, unless:*

(a) The authority determines that the carrying out of the project is not likely to cause significant adverse environmental effects; or
(b) The authority determines that the carrying out of the project is likely to cause significant adverse environmental effects and the Governor in Council decides that those effects are justified in the circumstances under subsection 69(3)."

An environmental review under section 67 of *CEAA 2012* is therefore being carried out within the context of this EIA particularly focused on the Northumberland Strait portion of the Project (Volume 4)

Navigation Protection Act

According to the Navigation Protection Program (NPP), this Project may be classed as a designated works under the *Navigation Protection Act.* A self-assessment of the Project against the provisions of the Minor Works Orders for Submarine Cables – Power and Telecommunication and the Aerial Cables– Power and Telecommunication indicates the Project will be excluded from authorization under the NPP provided the following conditions are met for submarine cables:

"7. (1) Submarine cables that are only for power or telecommunication purposes are established as a class of works for the purposes of subsection 5.1(1) of the Act if
(a) the works lie on or under the bed of the navigable water;
(b) the works do not extend vertically above the bed of the navigable water more than

(i) in the case of a navigable water of less than 15 m in depth, when measured from the ordinary high-water mark, 5% of the depth of the water when measured from the ordinary high-water mark, or
(ii) in any other case, 1 m;

(c) the works are not across the entrance to any port, including any marina;
(d) the works are not in a dredged channel or area with maintained depth; and
(e) the works are not in an area that is identified as an anchorage area on a Canadian Hydrographic Service or National Oceanic and Atmospheric Administration chart."

And provided the following conditions are met for aerial cables:

"6. (1) Aerial cables that are over or across a navigable water and that are only for power or telecommunication purposes, and the associated structures and equipment, are established as a class of works for the purposes of subsection 5.1(1) of the Act if

(a) the width of the navigable water at the site of the crossing is less than 30 m when measured from the ordinary high-water mark on one side of the navigable water to the ordinary high-water mark on the other side;
(b) the works are not over or across a lake or tidal waters;
(c) the works are not over or across a canal that is accessible to the public;
(d) the works do not include towers or poles within the area between the ordinary high-water marks on each side of the navigable water; and
(e) the works meet the requirements of section 5.3.3.2 of Overhead Systems, CAN/CSAC22.3 No. 1-10, as amended from time to time."

Fisheries Act

Section 35(1) of the federal *Fisheries Act* states "No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal (CRA) fishery, or to fish that support such a fishery". Marine-based activities for the Project have the potential to result in serious harm to fish, although a determination will be required from Fisheries and Oceans Canada (DFO).

Section 36(3) states "subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water".

Deleterious substances are defined by the *Fisheries Act* as: a) any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water, or (b) any water that contains a substance in such quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water.

Disposal at Sea

Ocean disposal permits will be obtained (if necessary) from Environment Canada under the Disposal at Sea provisions of the *Canadian Environmental Protection Act* if any marine construction activities are determined to require disposal of approved waste materials at sea (e.g., trenching for the submarine cables).

Migratory Birds Convention Act

The *Migratory Birds Convention Act* (*MBCA*) protects and conserves migratory bird populations, individuals, and their nests within all lands in Canada.

Enabled under the *MBCA*, section 6 of the Migratory Birds Regulations states that without the authorization of a permit, the disturbance, destruction, or taking of a nest, egg, nest shelter, eider duck shelter, or duck box of a migratory bird, or possession of a migratory bird, carcass, skin, nest, or egg of a migratory bird are prohibited.

As there are no authorizations to allow construction-related effects on migratory birds and their nests, best management practices and guidelines are used to facilitate compliance with the *MBCA*.

Species at Risk Act

The federal *Species at Risk Act (SARA)* is administered by Environment Canada with the intent to protect species from extirpation or extinction as a result of human activity. The purpose of provisions under *SARA* are to prevent species of conservation concern (SOCC) from becoming threatened or endangered and to allow for recovery of species who are considered threatened, endangered or extirpated.

Section 32(1) states "*no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species*".

Section 33 states "*no person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada*".

2.0 PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The Project will take place in three distinct geographic regions, with Project locations in PEI, NB and along and within the Northumberland Strait. The Project location within PEI includes a cable landfall site and MECL substation located along the southwestern shore of PEI in Borden-Carleton, approximately 1 km east of the Confederation Bridge. The Project location within NB includes a cable landfall site along the northeastern shore of NB in Cape Tormentine, located approximately 3 km east of the Confederation Bridge. A transmission line will extend between Cape Tormentine and Memramcook approximately 57 km southwest of the landfall site through new and existing easements. The Project location within the Northumberland Strait is approximately 16.5 km in length, extending between landfall sites in Borden-Carleton and Cape Tormentine.

Three assessment areas are used to facilitate the assessment process. The Project Development Area (PDA) is the immediate area of physical disturbance associated with construction and operation of the Project. The Local Assessment Area (LAA) is defined as the maximum area where Project-specific environmental effects can be predicted and measured with a reasonable degree of accuracy and confidence. The Regional Assessment Area (RAA) is defined as the area within which Project-related environmental effects may overlap or accumulate with the environmental effects of other projects or activities that have been or will be carried out.

The PDA for NB is 225.6 ha in area and includes the existing substation in Memramcook where upgrades to the existing substation will occur within the substation footprint; a 40 km long, 30 m wide transmission line RoW from Memramcook to Melrose and a 17 km long, 60 m wide transmission line RoW from Melrose to Cape Tormentine; a cable termination site; and a 10 m easement around cable lines from high water to the cable termination site.

The PDA for the Northumberland Strait is a 220 m wide corridor extending approximately 16.5 km between Borden-Carleton and Cape Tormentine. This includes the 10 m wide disturbance area for each submarine cable and the 200 m separation distance between the two cable trenches. The actual area of physical disturbance during construction is approximately 33 ha.

The PDA for PEI is 1.1 ha in area and includes 5 m around each of the cables, the cable storage building, the substation expansion (including the cable termination site and substation control building) and a fence line around the expanded substation. The PDA also includes a short span of overhead transmission line that will connect the substation to the existing transmission line grid.

Delineation of LAA and RAA are specific to the valued components (VCs) being assessed and will be included in each respective volume of the EIA document.

2.2 DESCRIPTION OF MAJOR PROJECT INFRASTRUCTURE

This section includes further description of the major Project components.

2.2.1 Transmission Lines

Transmission lines constructed as part of the Project will be designed and built to the same standard as existing high voltage transmission lines in NB and PEI.

Transmission lines in NB will be built as per NB Power specifications, which are constructed in accordance with CSA Standard C22.3 Design Criteria for Overhead Systems, and will include wood pole H-Frame structures installed to a height of 75 ft (approximately 23 m). The span between H-Frame structures is expected to be 200 m. Approximately 57 km of land-based transmission line corridor construction will be required within NB, originating in Memramcook and terminating in Cape Tormentine. Energy transmission will occur through 138 kV three phase overhead transmission lines. The proposed transmission lines will tie into NB Power's existing substation in Memramcook and the termination site in Cape Tormentine.

Approximately 40 km of the 57 km of transmission line corridor in NB will be new build construction adjacent to existing twinned transmission lines between Memramcook and Melrose. The remaining 17 km of transmission line corridor between Melrose and Cape Tormentine will be new build construction within a combination of new and existing easements on which there is no existing transmission line. This 17 km section of transmission line will be twinned (i.e., duplicate lines running in parallel).

A short span of transmission line is needed to connect the substation in Borden-Carleton, PEI, to the existing transmission line. This is considered part of substation upgrades and is addressed in this volume under Section 2.4.1.5.

2.2.2 Cable Termination Sites

Cable termination sites at Cape Tormentine, NB and Borden-Carleton, PEI, are required to transition from cable to overhead transmission. The termination site on the NB side of the Northumberland Strait will be located approximately 200 m from the shore in Cape Tormentine and is required to transition from submarine cable to overhead transmission line.

The cable termination site on the PEI side of the Northumberland Strait will be on land approximately 300 m from shore within the expanded substation in Borden-Carleton and is required to transition from submarine cable to substation. Both termination sites will consist of a riser pole, ground grid, overhead switches and perimeter fencing.

The termination site in Cape Tormentine will have the appearance of a small substation. A climate-controlled metering building will be constructed at this location to house weather sensitive equipment. The building will be located inside the fence at the termination site and will cover a footprint of approximately 18 m^2 (3.5 m x 5 m).

2.2.3 Cable Landfall Sites

The submarine cables will make landfall at Cape Tormentine, NB and within Borden-Carleton, PEI. MECL currently owns the property chosen for the landfall site in PEI. The Cape Tormentine Community Development Corporation currently owns the property chosen for the landfall site in NB. The specific landfall sites will be selected during the engineering and design process. There may be a concrete box structure constructed to facilitate landfall in Cape Tormentine.

The trenches will continue from the seafloor through the intertidal zone and onto land and will be up to 2 m in depth. In Cape Tormentine, the cables will remain buried in one single trench from the cable landfall site to the termination site. In Borden-Carleton, the cable trenches diverge to a point of approximately 10 m apart at the cable landfall site and continue within two separate trenches to opposite sides of the upgraded substation.

Up to 200 m of trenching will be required at Cape Tormentine to connect the cable to the riser station at the termination site. Part of the proposed route may include trenching through a paved section of Route 955.

More trenching is required at Borden-Carleton with 300 m of trenches required to connect the two trenches to the termination site within the expanded substation.

2.2.4 Twin Submarine Cables

Two submarine cables transmitting 360 MW combined at 138 kV each will be installed under the seabed of the Northumberland Strait. Each cable will be solid dielectric, three-core cable with galvanized steel armour and a medium- or high-density polyethylene (MHPE or HDPE) jacket. Transmission of electricity is through three copper conductors sheathed in lead in the cable interior. Oil is not used as an insulator in the chosen cable design. The cable is insulated with cross-linked polyethylene (XLPE) which is made from high density polyethylene and contains cross-linked bonds in the polymer structure creating a highly durable material.

The two cables will be installed under the seabed in separate trenches, up to 200 m apart. The cables will be buried, where possible, to protect the cables from interactions with commercial fishing gear, anchors, ice scour and erosion. If burial is not possible, concrete mattresses or similar protection methods will be used for cable protection. The method of excavation within the marine environment will include trenching with excavators in water depths up to 2 m, and a trenching remotely operated vehicle (TROV) with a saw cutter for the remaining sections. There will be no fishing exclusion zones around the cables. Once the cables have been installed, it is anticipated that navigation charts will be updated.

2.2.5 Substation Upgrades

As a result of the additional electrical power transmitted between Memramcook and Borden-Carleton, upgrades and expansions are required to the Memramcook, NB substation and Borden-Carleton, PEI substation.

The Memramcook, NB substation upgrade will be designed and built by NB Power in accordance with applicable national standards. The upgrade will consist of the addition of one new 138 kV line termination point and requires a single circuit breaker, disconnect switches, instrument transformers, protection and control and telecommunications equipment to comply with current standards. The upgraded substation will cover an approximate area of 1,300 m^2 (30 m x 43.3 m) and be enclosed by a fence.

The upgrades to the Borden-Carleton substation will include expansion of the substation into a breaker-and-a-half scheme (i.e., one spare breaker for every two circuits). Weather sensitive equipment will be housed in a substation control building to be built on site. The climate-controlled building will cover a footprint of approximately 125 m^2 in area (18 m x 7 m) and will house the station service for the substation as well back-up batteries and a generator. The substation will be designed so that it can be expanded to accommodate potential future transmission, generation or cable connections.

To allow for on-site storage of four 250 m spools of spare cable, a climate-controlled cable storage building will be constructed adjacent to the existing storage building in Borden-Carleton. The building will be one-story and cover a footprint of approximately 400 m^2 in area (20 m x 20 m). Access will be through a main access door and the building will be built with a removable roof for crane access to the spools. As the building will be temperature-controlled, an on-site back-up diesel generator will be installed to maintain power to the building in the event of a power disruption.

The substation expansion and building construction will be completed within lands owned by MECL.

2.3 PROJECT ALTERNATIVES

2.3.1 Alternatives to the Project

The generation of power within PEI is considered as an alternative to importing electricity from NB. PEI currently has several commercial-scale wind power operations which supply power; however, current energy demand on PEI is estimated at 260 MW and growing, and wind power may not be present when an energy demand is greater than 200 MW, which is the capacity of the existing cables. Using existing PEI infrastructure, power supply in excess of 200 MW during low-wind conditions would be supplied by oil-fired generators. Oil-fired generators are expensive to operate and are not considered an economically feasible alternative to the Project. Construction of large-scale power generation facilities within PEI is not considered economically feasible when compared to the cost of importing electricity from off-Island, and is therefore not included as an alternative to the Project.

2.3.2 Alternative Project Methods

Several alternative routes have been considered for the proposed transmission cable between PEI and NB. The consideration of a non-submerged cable route was made possible with the construction of the Confederation Bridge in 1997; this option was not possible when the existing submarine cables were installed. The following alternative routes were considered and include both submerged and non-submerged options.

Non-submerged options are as follows:

- routing of cable(s) through utility corridor (utilidor) along the interior of the Confederation Bridge, or
- routing of cable(s) along the exterior of the Confederation Bridge

Submerged options are as follows:

- burial of single submarine cable versus dual cables
- burial of submarine cable(s) immediately adjacent to existing cables, or
- alternate landing locations in Wood Islands or West Point, PEI

Project weighting factors identified by MECL include year-round accessibility for repair, lower capital cost of transmission capacity, lower operating cost and lower risk of physical damage by external factors. The non-submerged option of routing the cable along the interior of the Confederation Bridge was considered the most desirable of all potential proposed 'utilidor' alternatives; however, after conducting a feasibility study, this option was ruled out.

When assessing the non-submerged option of attaching the cable to the exterior of the Confederation Bridge, this proposed alternative was found to be the same cost as a submarine cable installation, but an assessment of positive attributes completed by MECL found the submarine installation option to be most desirable.

Upon choosing a submerged cable design, several alternative options were considered. A dual cable installation was chosen to satisfy future energy requirements, as a single cable would not have the transmission capacity to provide sufficient power to PEI once the existing cables reach the end of their useful service life. Burial of the submarine cables adjacent to the existing cables would reduce the environmental effects as it is a previously disturbed area with existing infrastructure, but this proposed alternative does not protect against the disruption of power service in the event of an accidental anchor drag, fishing-related cable damage or equipment failure at the landing sites.

Alternate cable installation and landing locations in both Wood Islands and West Point, PEI, were considered. Both cable path length, substrate type and ice scour protection are factors in choosing new cable and landing locations. A minimum path length and soft substrate (i.e., sand/silt) for cable burial are desirable as the cable is expected to be laid in a continuous manner with no section joints and buried to protect against fishing gear, anchor drag and ice scour. The spanning location of the Confederation Bridge follows the shortest distance between PEI and NB within the Northumberland Strait. The current route was chosen as the majority of the substrate is made up of sand and silt with smaller amounts of clay and gravel.

For the purpose of ensuring redundancy, new landing sites have been chosen in NB and PEI. This is to ensure against damage or loss of all four submarine cables should an unexpected event occur at a landing site. Based on the age of existing transmission line infrastructure from Memramcook to Melrose and the need for redundancy, new transmission line will be constructed between Melrose and Memramcook to accommodate the installation of the new submarine cables. The new transmission line from Melrose to Bayfield will follow an existing easement purchased in the 1960's by NB Power. Two options were originally considered for the transmission line route from Bayfield to Cape Tormentine. The preferred route was selected based on constructability, accessibility and environmental constraints.

2.4 DESCRIPTION OF PROJECT PHASES AND ACTIVITIES

A general overview of the Project activities to be undertaken is presented in this section. The description includes activities during construction, operation, and decommissioning and abandonment phases (Table 2.1). These key Project phases and activities are representative of the activities that have the potential to interact with the environment.

Table 2.1 Description of Project Phases, Activities and Physical Works

Project Phase	Activity Category	Project Activities and Physical Works
Land-Based Infrastructure - Prince Edward Island And New Brunswick		
Construction	Site Preparation for Land-Based Transmission Lines in NB	The Project-related activities associated with preparing the RoW, access roads, and staging areas for physical construction, including: • clearing • grubbing (if necessary) • construction of temporary water crossing (where necessary)
	Physical Construction of Land-Based Transmission Lines in NB	The physical construction of the land-based transmission lines associated with the Project, including: • assembly of structures and installation of structures • stringing of conductors, including overhead ground wires • installation of guy wires and anchors (where necessary)
	Landfall Construction (similar in both NB and PEI)	The physical construction of the submarine cable landfall includes: • trenching • installation of cables • construction of termination site in NB (riser pole, revenue metering, control building, ground grid, fence, and overhead switches) • installation of shoreline protection
	Upgrading of Electrical Substation (NB)	Upgrades at the electrical substation in NB include: • installation of protection and controls • installation of telecommunications equipment • connection of transmission lines
	Expansion of Electrical Substation (PEI)	The expansion of the electrical substation includes: • site preparation (grubbing/grading/leveling) • installation of electrical components • construction of termination site • connection of transmission line
	Inspection and Energizing of the Transmission Lines	• inspection of infrastructure • energizing of Project

Table 2.1 Description of Project Phases, Activities and Physical Works

Project Phase	Activity Category	Project Activities and Physical Works
	Clean-Up and Re-vegetation of the Transmission Corridor	• removal of temporary infrastructure • stabilization and reconstruction of disturbed areas
	Emissions and Wastes	Emissions and wastes arising from construction activities, including: • release of air contaminants to the atmosphere (e.g., combustion gases from vehicles and heavy equipment, and the generation of airborne dust, (i.e., fugitive dust from roadways and construction activities)) • sound emissions (e.g., from construction activities or from vehicle/equipment movements) • vibration • surface runoff • solid waste disposal
	Transportation	The activities associated with the transportation of goods, materials, and personnel to and from the Project site during construction, including: • transportation of equipment, supplies and materials • transportation of personnel to and from the Project site
	Employment and Expenditure	The activities associated with Project-related employment and expenditures associated with construction of the Project, including: • purchase of equipment, supplies, and materials • employment and incomes
Operation	Energy Transmission	• transmission of electricity
	Vegetation Management	• mechanical and/or chemical vegetation management
	Infrastructure Inspection, Maintenance and Repair (Transmission Lines and Substations)	• periodic inspection and preventative maintenance of infrastructure
	Access Road Maintenance	• vegetation management • regrading or resurfacing of access roads as necessary
	Emissions and Wastes	Emissions and wastes arising from maintenance activities, including: • release of air contaminants to the atmosphere (e.g., fugitive dust from on-site vehicle movements, combustion gas emissions from vehicles and heavy equipment) • sound emissions (e.g., equipment operation, and vehicle movements) • electromagnetic fields from transmission of power in lines and cables • surface runoff • solid waste disposal

Table 2.1 Description of Project Phases, Activities and Physical Works

Project Phase	Activity Category	Project Activities and Physical Works
	Transportation	The activities associated with the transportation of goods, materials, and personnel to and from the Project site during operation, including: • transportation of materials and personnel for vegetation maintenance • transportation of materials and personnel for inspection, maintenance, and repair of infrastructure
	Employment and Expenditure	The activities associated with Project-related employment and expenditures associated with operation of the Project, including: • purchase of equipment, supplies and materials for maintenance • employment and incomes
Decommissioning and Abandonment	Decommissioning	The activities associated with the decommissioning of Project components and facilities at the end of their service life, including: • decommissioning and removal of equipment • removal of buildings and structures
	Reclamation	The activities associated with RoW reclamation, re-vegetation and clean-up at the end of their service life.
	Emissions and Wastes	Emissions and wastes arising from decommissioning and abandonment, including: • fugitive dust and combustion gases during decommissioning activities • sound emissions from decommissioning activities
	Employment and Expenditure	The activities associated with Project-related employment and expenditures associated with decommissioning and abandonment, including: • purchase of equipment, supplies and materials • employment and incomes
Marine-Based Infrastructure - Northumberland Strait		
Construction	Site Preparation for Submarine Cable	• trenching for landing approach (near shore)
	Installation of the Submarine Cable	• trenching for cable installation • laying of cable • infilling of cable trench in the near-shore • alternate protection
	Inspection and Energizing of the Submarine Cable	• inspection of infrastructure • energizing of Project

Table 2.1 Description of Project Phases, Activities and Physical Works

Project Phase	Activity Category	Project Activities and Physical Works
	Emissions and Wastes	Emissions and wastes arising from construction activities, including: • release of air contaminants to the atmosphere (e.g., emissions from marine vessels and equipment) • sound and vibration emissions (i.e., atmospheric and underwater sound from construction activities) • solid waste disposal (e.g., construction materials, spoils, and/or rocks) • ballast water discharge
	Marine Transportation	• movement of marine vessels
Operation	Energy Transmission	• transmission of electric power
	Infrastructure Inspection, Maintenance and Repair	• periodic inspection and preventative maintenance of infrastructure
	Emissions and Wastes	Emissions and wastes arising from operation activities, including: • electromagnetic fields • solid waste disposal
Decommissioning and Abandonment	Decommissioning	The activities associated with the decommissioning of Project components and facilities at the end of their service life, including: • decommissioning and abandonment of submarine cables • reclamation as necessary
	Emissions and Wastes	Emissions and wastes arising from decommissioning, including: • combustion gas emissions • sound emissions • solid waste disposal
	Marine Transportation	The activities associated with the transportation of goods, materials, and personnel during decommissioning and abandonment, including: • transportation of equipment, supplies and materials • transportation of personnel

2.4.1 Land-Based Infrastructure Construction - PEI and NB

Land-based construction activities will begin immediately following government approval of the EIA and the receipt of all necessary permits and authorizations. The following is a brief description of land-based construction activities that are typical for construction of high voltage transmission lines. These activities will be managed by MECL and NB Power in accordance with each company's Environmental Protection Plan (EPP).

2.4.1.1 Site Preparation for Land-based Transmission Lines

Site preparation for overhead transmission lines in NB will be required for the entire 57 km of overhead transmission line corridor in NB. The following Project works are required to prepare the land for installation of the overhead transmission infrastructure:

- upgrades of temporary and/or permanent access roads
- clearing of the transmission line corridor
- grubbing of areas for pole placement (if necessary)
- construction of temporary watercourse crossings (if necessary)
- removal and stockpiling of topsoil and overburden
- grading and leveling in advance of installation of the overhead transmission infrastructure

Erosion and sedimentation control practices will be implemented with all physical works to reduce erosion of exposed areas and sedimentation of surface water. Dust control measures will be taken, where necessary, during site preparation to minimize the potential environmental effects of fugitive dust to offsite locations.

2.4.1.1.1 Overhead Transmission Line Corridor Clearing

Vegetation clearing will be conducted for the transmission line corridor within NB and, where necessary, for access roads, staging areas, and substation upgrades.

Access will be required in some locations to allow transportation of construction equipment, materials, and personnel. Existing access points and roads will be used where possible.

Staging areas will be used for temporary placement of construction materials (e.g., poles, conductors and hardware) in the vicinity of the construction area. Staging areas will be situated to avoid environmentally sensitive areas, such as rare plants, wetlands, watercourses, and their buffers. They will be easily accessible, located to reduce potential traffic hazards, and will be located away from developed areas in order to reduce noise and dust concerns. Sites requiring little or no modification, such as forestry landings or harvested fields, will be used for temporary staging areas, where possible. If staging areas are to be located on private property, agreements will be signed with the individual landowners. Security fencing may be placed around the site. Following construction, staging area sites will be returned to their pre-construction condition.

The majority of clearing activities will be conducted with harvesting equipment; however, within 30 m of a watercourse or wetland, clearing will be conducted by hand. Hand clearing may also be required in areas of medium to high archaeological potential. To prevent disturbance of migratory birds and their nests, the timing of clearing will be planned for outside of the breeding bird season for most species (April 1 to August 31) to the extent possible.

Cleared merchantable timber will become the property of the contractor and any remaining cleared vegetation will be stockpiled and/or chipped on site.

2.4.1.1.2 Overhead Transmission Line Corridor Grubbing (if required)

Grubbing will include the removal and disposal of stumps and roots that remain after clearing, where necessary. Grubbing will be conducted using a root rake or similar equipment that is able to remove the roots and stumps of cleared vegetation and leaves the topsoil for salvage. The grubbing will be limited to the footprints of the overhead transmission line structures. Grubbing may be required at the location of the transmission line termination sites, depending on foundation requirements. If grubbing is required, archaeological surveys will be required in medium and high potential areas.

2.4.1.1.3 Construction of Temporary Watercourse and Wetland Crossings (if required)

Access along the overhead transmission line corridor may be interrupted by watercourses and wetlands. Crossing of watercourses or wetlands is required if no other existing means of access is available. To cross watercourses or wetlands, temporary structures will be constructed to eliminate fording. The methods for the construction of temporary watercourse or wetland crossings will depend on the crossing width and length of the span required, hydrology, environmental sensitivities, and engineering considerations. The following includes a list of options for crossing watercourses and wetlands:

- use of existing structures, where feasible
- use of temporary structures where existing/permanent crossings are not available (e.g., temporary bridges, brush mats, swamp mats). Temporary structures, if needed, will be designed and installed in accordance with applicable provincial and federal guidelines. Structures will be removed when construction is complete and any disturbance caused as a result of the structures will be quickly rehabilitated to original conditions.

2.4.1.2 Construction of Land-based Transmission Lines

Transmission lines constructed as part of the Project will be designed and built to the same standards as existing high voltage transmission lines in NB.

Transmission lines in NB will be built as per the CSA Standard C22.3 Design Criteria for Overhead Systems and will consist of wood pole H-Frame structures installed to a height of 75 ft (approximately 23 m). The span between H-Frame structures is expected to be 200 m. Approximately 57 km of land-based transmission line corridor construction will be required within NB, originating in Memramcook and terminating in Cape Tormentine.

A short span of transmission line is needed to connect the substation in Borden-Carleton, PEI, to the existing transmission line. This is addressed in this volume under Section 2.4.1.5.

2.4.1.2.1 Assembly and Installation of Structures

The assembly of structures includes transportation of materials to the site, excavation of the pole location, pole placement, and backfilling of excavated material.

Installation of transmission line structures will require an excavation of two holes approximately 1 m in diameter and approximately 2.5 to 3 m deep. Based on these dimensions, there will be 4.0 to 4.8 cubic metres (m^3) of excavated material for each structure. An excavator will be used to excavate the majority of the pole locations. The assembly of structures will take place on-site at structure locations. The disturbance area around the structure site for construction equipment operation, structure assembly, and structure installation activities will be limited to the corridor. Compacted native soil disturbed during the auguring process will be used to fill the sides of the excavations. Should additional backfill material be required for the new structures, it will be obtained from a provincially approved local source.

Precise structure locations have yet to be determined; they will be based on a number of physical and environmental surveys. Structure locations will avoid watercourses, wetlands, and any other environmentally sensitive areas where possible.

2.4.1.2.2 Installation of Guy Wires and Anchors

Although specific information regarding anchor requirements for guy wires at angle structures has yet to be determined, Helix anchors, rock anchors and/or log anchors may be used depending on structure location.

It is anticipated that Helix (screw type) anchors will be used predominantly for the Project. Helix anchors are best suited for soil conditions having limited load bearing characteristics and/or in wet areas. This type of anchor is comprised of a steel shaft and helices that are screwed into the ground to a calculated depth. The helices transfer the stress of the load evenly across the soil. These anchors are easier to install, require little to no site preparation, do not result in excavated material, and can be withdrawn and reused.

Rock anchors will be required in areas where bedrock is present and screw type anchors are not feasible. Wedge style anchors and grouted rock anchors are typical rock anchor configurations. Grouted rock anchors are best suited for areas of fractured bedrock and will most likely be used. Bedrock is drilled to a specific depth and the grouted rock anchor is installed and backfilled with grout to the surface, preventing the anchor from pulling back through the bedrock while under tension.

Log anchors may be used as required. Log anchors will be installed in soft areas (e.g., wetlands, bogs) or at structure locations under high tension. Log anchors consist of a 1.2 to 1.8 m section of pole that is typically buried lengthwise 2.4 m underground. Tension cables are attached to anchor rods through logs and structures; the excavation is then backfilled and the soil compacted.

2.4.1.3 Landfall Construction (NB and PEI)

The submarine cable will make landfall at Cape Tormentine, NB and within Borden-Carleton, PEI. The specific landfall sites will be selected during the engineering and design process. Trenching is required in the backshore area as the submarine cables will remain buried on land until the cables reach the landfall termination sites in both PEI and NB. In Cape Tormentine, the cables will converge from two separate trenches in the marine environment and be buried in a single trench on land. Cables will converge to a single trench when approaching the landfall site in Borden-Carleton but will diverge after landfall and approach the substation in two separate trenches.

2.4.1.3.1 Trenching

Excavation requirements for trenching are dependent on geotechnical conditions within the identified landing sites. Trenches on land will be excavated to a depth of 2 m.

In NB, there will be up to 200 m of excavation from the high-water mark to the landfall termination site. The shoreline consists of a sandy beach area with a gradual embankment, resulting in an elevation difference of 1 m from beach to land. No bedrock was identified on-site; the trench will be excavated 2 m into the overburden. If the cable route crosses Route 955 in Cape Tormentine, trenching in this area will involve removal and reinstatement of paved areas.

In PEI, there will be approximately 300 m of excavation from the high-water mark to the landfall termination site. The shoreline here consists predominantly of bedrock outcrops with a steep embankment, resulting in a vertical elevation difference of 2.5 m from beach to land. The backshore area of the proposed cable route cuts through former agricultural land. With the presence of bedrock, specialized excavation equipment (e.g., ripper tooth or hydraulic rock breaker) may be required to excavate to a depth of 2 m below grade.

2.4.1.3.2 Installation of Cable

At the landfall site in Cape Tormentine the two cables will be installed in a single trench with a minimum separation of 5 m. In Borden-Carleton, the cables will land about 10 m apart and continue to the substation in separate, 2 m wide trenches. The land-based trenches will be partially filled with thermal sand and warning tape and boards will be installed above the cable. Warning tape and boards serve as indication that a power cable is present below if excavation is required in the area

At the landfall site in Cape Tormentine the two cables will be installed in a single trench with a minimum separation of 5 m. The cables will converge to a single trench with a minimum cable separation of 5 m when approaching landfall in Borden-Carleton but will diverge to two separate trenches on land. The land-based trenches will be partially filled with thermal sand and warning tape and boards will be installed above the cable. Warning tape and boards serve as indication that a power cable is present below if excavation is required in the area.

2.4.1.3.3 Installation of Shoreline Protection

The embankment at the landing sites in NB and PEI is susceptible to erosion from ice and wave action. Efforts will be focused on protecting the cable from becoming exposed due to shoreline erosion.

Coastal erosion assessments were carried out in 2015 at both landing sites. These assessments included a site visit and a review of historical aerial photography for the area. Both landing sites are susceptible to erosion; however, the landing site in PEI had a greater rate of soil erosion than the site in NB.

The design of the shoreline protection will be part of the geotechnical work for the landfall construction and details from the coastal erosion assessments will be used to inform the design.

2.4.1.3.4 Termination Site Construction (NB)

Cable termination sites at Cape Tormentine, NB and Borden-Carleton, PEI, will be required to transition from cable to overhead transmission. The termination site in Borden-Carleton is located within the expanded substation and is addressed in Section 2.4.1.5.

The termination site in Cape Tormentine will be located approximately 200 m from the shore and will consist of a riser pole, overhead termination structures, ground grid, fence, and overhead switches.

A climate-controlled metering building will be constructed inside the fence of the cable termination site to house weather-sensitive equipment. Building and termination site foundation designs will depend on the results of geotechnical studies and environmental conditions.

2.4.1.4 Upgrading of Electrical Substation (NB)

As a result of the additional electrical power transmitted between Memramcook and Borden-Carleton, upgrades are required to the Memramcook, NB substation. The new upgrade will be designed and built by NB Power. Ground disturbance will be required for the foundations of the circuit breakers, switches and instrument transformers and the installation of the ground grid. No additional land clearing is required to complete the expansion.

2.4.1.4.1 Connection of Transmission Lines

Upon completion of the upgrades to the substation, the overhead transmission lines originating from Cape Tormentine will be connected to the substation breakers. This connection will occur within the footprint of the existing substation and complete the connection to the grid for the transmission of electric power.

2.4.1.5 Expansion of Electrical Substation (PEI)

The expansion of the Borden-Carleton substation will include reconfiguring and expanding the substation and the construction of a cable storage building, substation control building and termination site. As the termination site for the submarine cable will be located within the substation, it will be considered part of the substation expansion for the purpose of this assessment. A short span of transmission line is required to connect the substation to the existing transmission line grid in Borden-Carleton. As this span is limited in length to one or two single wooden poles, it is also considered part of the substation expansion for the purpose of this assessment. The substation will be designed so that it can be further expanded to accommodate potential future transmission, generation or cable connections.

2.4.1.5.1 Site Preparation (grubbing/grading/leveling)

The lands surrounding the current electrical substation are owned by MECL, the expansion of the electrical substation and building construction will occur entirely within these lands. Grubbing is not expected to occur as ground vegetation is limited. Extensive grading is not anticipated for the expansion and construction work. The footprint of the cable storage building will cover an area of approximately 400 m^2 and the footprint of the substation control building will cover an area of approximately 125 m^2. Limited ground disturbance may be required for the construction of the foundations for the circuit breakers, the installation of the ground grid and perimeter fencing. No land clearing is required to complete the work.

2.4.1.5.2 Installation of Electrical Components

Substation upgrades will include configuring the substation into a breaker-and-a-half scheme. This will require nine circuit breakers, high voltage bus structures, transformers, switchgear, a ground grid, and perimeter fencing.

Concrete footings will be required for structures within the expanded substation, including circuit breakers and incoming high voltage bus structures. Concrete pads will be required for any buildings installed. A fence is planned to be installed around the substation perimeter, with fence poles requiring footings as well. These upgrades will require approximately 9,600 m^2 of land.

2.4.1.5.3 Connection of Transmission Lines

To facilitate the connection of the substation in Borden-Carleton to the existing grid in PEI, a short span of transmission line will be constructed. This span is single-pole construction and consists of one to two poles spanning a distance of approximately150 m from the substation to the existing transmission line.

2.4.1.6 Inspection and Energizing of the Project

Following the installation of Project components, line inspections will be conducted by MECL and NB Power staff from the ground and potentially from the air to ensure the line is ready for service. Any deficiencies discovered during these patrols will be corrected prior to energizing (commissioning) the cables and transmission lines.

2.4.1.7 Clean-up and Re-vegetation

In areas where soil disturbance due to construction may cause erosion, measures will be taken to stabilize the affected area. Such measures may include trimming and back blading, mulching, seeding, and fabric placement. Erosion control used during construction will be maintained until such time as the disturbed ground has been adequately stabilized with vegetation.

2.4.1.8 Emissions and Wastes

2.4.1.8.1 Air Contaminants

Releases of air contaminants to the atmosphere will consist mainly of combustion gases from the operation of on-site construction equipment and large trucks used to deliver equipment to the site. There may be some fugitive dust generated as a result of excavation activities. The predominant source of greenhouse gases (GHGs) will be from fuel combustion in heavy equipment and trucks. Nominal quantities of GHGs will be released from clearing. During construction, air contaminants may be released from the following activities:

- fuel combustion in heavy equipment during clearing and site preparation (e.g., excavators, dozers)
- fuel combustion in passenger vehicles moving to and from the site, as well as on-site
- fuel combustion in trucks transporting equipment and material
- dust from site preparation activities (e.g., land clearing and grading)
- dust from vehicle and equipment movements on unpaved roads
- dust from loading and unloading of overburden and topsoil
- dust from stockpiling of overburden and topsoil

Topsoil and overburden stockpiled during construction will be seeded and re-vegetated periodically. The generation of airborne dust from these sources is therefore considered to be nominal. Topsoil and overburden are transferred by trucks to stockpiles. While material handling may generate dust, it is assumed that the material is wet and that minimal dust is generated.

The emissions will remain largely confined to the Project area and the immediately adjacent areas, as these activities will be transient (i.e., carried out to install one part of the line, then moving on to another area) and will be of short duration.

2.4.1.8.2 Sound and Vibration Emissions

Sounds emissions and vibration will result from the operation of heavy equipment and from transportation vehicles on Project access roads. Similar to air contaminants, noise will remain largely confined to the corridor and the immediately adjacent areas, and will be transient.

2.4.1.8.3 Surface Runoff

Site run-off from precipitation events will be carefully managed. Watercourse and wetland alteration mitigation measures (e.g., erosion and sedimentation control measures) will be employed during construction, and ground disturbance will be limited outside the required construction zones. Management of site run-off will employ best practices such as containment ditches, and silt curtains to avoid or mitigate potential environmental effects to watercourses.

2.4.1.8.4 Solid Waste Disposal

There will be disposal of some general construction wastes such as wood, steel, cardboard or other packaging, and other construction wastes. These materials will be disposed at approved construction and demolition disposal sites. Merchantable timber from site clearing will be sold, and remaining brush will be stockpiled. No burning of waste will be carried out during construction. Soil and overburden will be stockpiled for future use in reclamation activities. MECL and NB Power, or its contractors, will re-use or recycle waste materials where possible, and dispose of other wastes at approved facilities.

Any liquid hazardous materials (e.g., waste oils and lubricants) generated by contractors on-site will be collected and disposed of using approved hazardous materials collectors.

2.4.1.9 Transportation

Construction and trucking activities will vary from month to month during construction, depending on what components are being constructed and the stage of construction. Road traffic generated during construction will be comprised of:

- trucks (transportation of construction equipment and materials, and various services)
- passenger vehicles (construction workers' automobiles, SUVs, vans and pick-ups)
- buses (construction workers)

2.4.1.10 Employment and Expenditure

The construction workforce will be accommodated in nearby lodgings within NB and PEI, Project camps will not be constructed for the Project. A variety of management, accounting and payroll, engineering and construction personnel will be required during construction. These workers may be employed by NB or PEI- based construction or engineering firms. Specialists from within Canada or abroad may be employed to advise or construct unique aspects of the Project.

2.4.2 Land-Based Infrastructure Operation – PEI and NB

During the operation of the land-based infrastructure (overhead lines, substations and buildings), routine activities will be performed to ensure reliability of the network. Activities expected during operation include energy transmission, vegetation management, infrastructure inspection, maintenance and repair, access road maintenance and transportation of people or materials. These activities have the potential to produce emissions, solid waste, and employment and expenditures. These activities are described in the following sections.

2.4.2.1 Energy Transmission

Following construction, the transmission lines will be energized and will begin transmitting electricity. Energy transmission will occur through 138 kV three phase overhead transmission lines from the substation in Memramcook to the landing site in Cape Tormentine. On PEI the electric energy will be transferred from the substation in Borden-Carleton to the MECL grid via overhead transmission lines.

The transmission lines will be operated continually for the life of the Project. Routine inspections and maintenance will ensure minimal interruptions to this activity.

2.4.2.2 Vegetation Management

NB Power and MECL will be responsible for maintaining the RoW for vegetation control and to permit suitable access to the transmission lines during emergencies and for regularly scheduled inspections and maintenance. Routine inspections will be conducted to facilitate the safe and reliable operation of the transmission lines, and to minimize the risk of potential hazards such as fires or electrocution caused when trees grow too close to energized transmission lines. NB Power and MECL will restrict the growth of trees and brush along the lines through their vegetation management program to avoid interruptions to electric service caused by overgrown or fallen vegetation. The clearances were developed from the Canadian Electrical Code for safe and reliable operation of high-voltage lines. Manual, mechanical, and chemical methods will be used to control vegetation along the RoW. The frequency of vegetation management depends upon the growth rate, but is normally carried out every five to seven years.

2.4.2.3 Infrastructure Inspection, Maintenance, and Repair

NB Power and MECL will conduct the required maintenance of the transmission lines so that it operates in a safe and reliable manner according to the Canadian Electrical Code. Regular ground and aerial line inspections will be performed by maintenance staff.

Maintenance inspections will be completed to check for the deterioration of conductors, poles, hardware and insulators, and identify maintenance requirements. These inspections will assist in identifying potential for weakened support structures and foundations, as well as changes in terrain that may affect structure stability. Aerial inspections and/or ground patrols will be performed periodically. Ground patrols will be performed using existing adjacent road access and will therefore avoid fording of watercourses or disturbance to wetlands. Additional inspections may be carried out in the event of an emergency (e.g., ice or wind storm). Inspection results will be provided to NB Power and MECL operational personnel who are responsible for planning and scheduling maintenance work.

2.4.2.4 Access Road Maintenance

Access roads will use existing adjacent road access where possible. New access roads will avoid sensitive areas (e.g., wetlands, water crossings) where possible. General access road maintenance activities will be carried out by third parties during the summer months, with the assistance of NB Power or MECL and may include:

- bridge or culvert maintenance
- litter pick-up
- road repairs
- snow removal and ice control
- traffic sign installation and repairs
- traffic signal maintenance
- vegetation control

2.4.2.5 Emissions and Wastes

During operation, the Project has the potential for the release of solid waste, air contaminants and noise during inspection, maintenance and repair. Electromagnetic fields will be generated during the transmission of energy. Surface runoff may occur within the transmission corridor, substations and termination sites.

2.4.2.5.1 Air Contaminants

During operation, air contaminants may be released from the following activities:

- fuel combustion in mobile equipment
- fuel combustion in on-site back-up power generators
- fuel combustion in passenger vehicles
- dust from the movement of vehicles and equipment on unpaved roads

An on-site diesel generator will be used as a back-up power supply for the cable storage building to ensure required interior temperatures are maintained during unplanned power outages. It is assumed that the use of back-up power generation will be infrequent and of a short duration.

The emissions will remain largely confined to the Project area and the immediately adjacent areas, as these activities will be transient (i.e., carried out to install one part of the line, then moving on to another area) and will be of short duration.

2.4.2.5.2 Sound Emissions

Sound emissions and vibration will result from the operation of heavy equipment and from transportation vehicles on Project access roads. Similar to air contaminants, noise will remain largely confined to the corridor and the immediately adjacent areas, and will be transient.

2.4.2.5.3 Surface Runoff

Surface runoff will be managed through the grading of the RoW and the use of best-management-practices such as erosion and sedimentation controls. An erosion and sedimentation plan will be incorporated into the Project EPP.

Management of site run-off will employ best practices, such as containment ditches, to avoid or mitigate potential environmental effects to watercourses.

2.4.2.5.4 Electromagnetic Fields

The transmission of energy through overhead lines is anticipated to result in the generation of electromagnetic fields (EMFs). The strength of the EMF is dependent on the distance from the source and the amount of power being transferred through the cable. Within North America EMF is generally measured in units of milligauss (mG). Typical EMF levels range from 30 - 35 mG directly under a 138 kV transmission line (BC Hydro nd). EMF levels drop to 0.5 to 2 mG at a distance of 25 m. Health Canada has not established national guidelines on EMF exposure levels based on the lack of sufficient scientific evidence to conclude that exposure cause health problems for the public (Health Canada 2009). The construction of the overhead lines will be in accordance with good utility practice and CSA Standard C22.3 for Overhead Systems (CSA 2015).

2.4.2.5.5 Solid Waste Disposal

There will be disposal of some general operational wastes such as wood, steel, cardboard or other packaging. These materials will be disposed of at approved disposal sites. No burning of waste will be carried out during operation. Soil and overburden will be stockpiled for future use in reclamation activities. MECL and NB Power, or its contractors, will re-use or recycle waste materials where possible, and dispose of other wastes at approved facilities.

Any liquid hazardous materials (e.g., waste oils and lubricants) generated by contractors on-site will be collected and disposed of using approved hazardous materials collectors.

2.4.2.6 Transportation

Once commissioning activities are completed, the Project operation and the traffic generated will be low and fairly uniform.

Road traffic generated during the operation phase of the Project will be comprised of:

- passenger vehicles (NB Power and MECL pick-ups)
- support vehicles for transport of equipment, and various services for transmission line inspection, maintenance and repair, and vegetation management

2.4.2.7 Employment and Expenditure

The operation workforce will be limited and originate from within NB and PEI; Project camps will not be required for the operation of the Project. A variety of management, accounting and payroll, engineering and construction personnel will be required during operation. These workers may be employed by NB or PEI based construction or engineering firms, NB Power or MECL. Specialists from within Canada or abroad may be employed to advise or construct unique aspects of the Project during operation.

2.4.3 Land-Based Infrastructure Decommissioning and Abandonment – PEI and NB

During the decommissioning and abandonment of land-based infrastructure, expected activities consist of either on-site demolition or removal and disposal, recycling or selling of Project infrastructure. These activities are described in the following sections.

2.4.3.1 Decommissioning

Transmission lines are designed, operated, and maintained to provide safe and efficient service over the long-term. If lines need to be decommissioned, the conductors are removed, structures dismantled, and the corridor left to re-vegetate naturally.

While decommissioning or abandonment of the Project is not currently envisioned, the Project will at some point be decommissioned or rebuilt at the end of its useful service life, in accordance with the applicable standards and regulations current at that time. A decommissioning and abandonment plan to be developed for the Project, at the end of its service life, will specify the procedures that will be followed with respect to the decommissioning, removal, and disposal of site infrastructure and for site remediation based on the requirements current at that time. The decommissioning and abandonment plan will also contain measures to achieve targeted environmental goals.

Most of the site infrastructure will be decommissioned and removed. Removable assets will be removed and sold or disposed of prior to or concurrent with their dismantling.

Access roads, power supplies, water management structures, and other utilities, will be decommissioned unless required for care and maintenance of the site during closure and post-closure. On-site power supplies and utility poles no longer needed will be decommissioned and removed from the site to approved off-site facilities. The main electrical transmission lines supplying power to the site will be retained until the site is fully reclaimed. At this point, the lines may be decommissioned and reclaimed.

Above-ground structures will be removed, sold or recycled to an approved off-site facility. All below-ground structures will remain in place and reclaimed as part of the site reclamation.

Following removal of the assets, foundations will be broken or blasted down to or below ground level, where possible, and then backfilled to create natural-looking landforms. Other surplus materials (e.g., sheet metal, insulation, roofing material, and other waste industrial construction materials) will be recycled or disposed of at an approved off-site facility. Chemicals, waste products, and potentially hazardous materials will be disposed of according to local requirements.

During the decommissioning work, an investigation will be conducted to determine the presence, if any, of contamination from accidental spills and long-term use of hazardous materials. Any incidents identified will be remediated according to practices approved by NBDELG or PEIDCLE.

2.4.3.2 Reclamation

Reclamation will involve the restoration of the Project site to as near natural conditions as feasible. In general, disturbed areas of the site will be graded and shaped. Slopes will be graded to merge naturally into adjacent undisturbed areas. Grading may include decommissioning ditches and other water management structures that are no longer needed, or enhancing them to provide natural swales for channelling surface water into nearby watercourses. Former building sites, foundations and laydown areas will be capped with overburden.

2.4.3.3 Emissions and Wastes

The quantities of emissions and wastes during decommissioning and abandonment are expected to be low. Emissions of air contaminants and noise may occur during decommissioning and abandonment activities from the movement of heavy equipment and vehicles on-site as demolition occurs and as materials are hauled to and from the Project site, as well as from reshaping of the landscape. These are not expected to be substantive. There are no known solid waste materials expected from the decommissioning and abandonment phase beyond disposal of decommissioning materials as described above.

2.4.3.4 Transportation

Transportation needs during decommissioning and abandonment will be modest and will vary depending on the activity being carried out at the time. Although specific details of the decommissioning phase and associated transportation requirements are not fully defined at this time, it is expected Project activities and requirements during this phase will be similar to or less than those during the construction phase.

2.4.3.5 Employment and Expenditure

Employment and expenditure during decommissioning and abandonment will be modest and will vary depending on the activity being carried out at the time. Decommissioning will require limited contractor and Project personnel to dismantle all equipment and facilities associated with the Project. Reclamation will see limited contractor and Project personnel to restore areas of the site to near pre-Project conditions. Expenditure associated with these activities will be relatively limited in comparison to that occurring annually during operation.

2.4.4 Marine-Based Infrastructure Construction - Northumberland Strait

Marine-based construction activities will begin following government approval of the EIA and the receipt of all necessary permits and authorizations. The following is a brief description of marine-based construction activities that is currently proposed for the installation of submarine cable. These activities will be managed by MECL and NB Power (if necessary) in accordance with their company-specific EPPs.

2.4.4.1 Trenching for Landing Approach

The landing approach extends from a water depth of 12 m to the high-water mark in the intertidal zone. As ice scour is of concern in this area, trench depth requirements increase from 1 m to 2 m. Trenching in the shallower or near-shore areas (up to 12 m depth) will be done using specialized marine excavators and barge-mounted cranes; otherwise, trenching is done using a trenching ROV (TROV) with a saw cutter.

2.4.4.2 Trenching for Cable Installation

The two cables will be installed in separate trenches, up to 200 m apart. The trenches will be excavated up to 1 m below grade where water depth exceeds 12 m and 2 m below grade in shallower or near-shore areas. The cable location in the near shore environment will be pre-trenched several months prior to cable installation and the trenches will be cleared of any in-filled sediment prior to laying of the cable. The method of excavation within near shore environment will involve trenching with specialized marine excavators and cranes from a barge in water depths up to 12 m, where possible, and a TROV for the remaining marine sections. The trenches will range in width from less than 1 m to 5 m. The area of disturbance from the TROV is expected to be limited to a 10 m wide corridor, centred on each cable.

If trenching is not feasible due to bedrock, concrete mattresses or alternate protection measures will be used to protect the cable.

Fishing exclusion zones around the cables are not planned. It is anticipated that once the cables have been installed, navigation charts will be updated to show cable locations and resulting notices sent out to mariners.

2.4.4.3 Laying of Cable

Laying of the cable will be done using a cable-laying vessel. The vessel will be capable of accommodating the installation crew and have sufficient deck space for the cable. Linear cable tensioners will be used to provide the specified amount of tension on the cable. The cable will be placed on the marine bed on top of the planned trench location. Once both cables are placed on the marine bed, the TROV will be submerged from a separate vessel. The TROV will be moved into the correct position and trenching and laying of the cable in the trench will be completed simultaneously. To ensure the cable is laid in the correct location within the corridor a dynamic positioning (DP) system will be used during the laying of cable. In the near shore environment, cables will be laid directly into the pre-excavated trenches.

2.4.4.4 Infilling of Cable Trench

The land-based cable trench will be infilled with the originally excavated material immediately after cable installation. Trench infilling will extend from land into the near-shore environment to a water depth of up to 2 m, where possible. In waters deeper than 2 m, the trench will be left to infill naturally over time.

2.4.4.5 Ice Scour Protection

Ice scour protection is necessary for shallow, near-shore sections of cable (i.e., waters less than approximately 12 m depth). Protection will consist of cable burial beneath the influence of ice scour. The cable is to be buried at a trench depth of 2 m, extending from the foreshore to a water depth of 12 m.

2.4.4.6 Inspection and Energizing

Physical inspection of submerged infrastructure will be completed using an underwater dive team or ROV. Energizing of the cable will take place only after physical and electrical inspections have been completed.

2.4.4.7 Emissions and Wastes

2.4.4.7.1 Air Contaminants

Releases of air contaminants to the atmosphere will consist mainly of combustion gases from the operation of marine construction vessels and smaller vessels used to deliver equipment to the site. The predominant source of greenhouse gases (GHGs) will be from fuel combustion in marine vessels, generators and trenching equipment.

The emissions will remain largely confined to the Project area and the immediately adjacent areas, as these activities will be transient (i.e., carried out to install one part of the line, then moving on to another area) and will be of short duration.

2.4.4.7.2 Sound and Vibration Emissions

Sound emissions and vibration will result from the operation of the cable laying vessel during trenching, cable laying and trench infilling and from the smaller vessels transporting equipment to site.

Sound and vibration emissions will remain largely confined to the Project area and the immediately adjacent areas, and will be of short duration.

2.4.4.7.3 Solid Waste Disposal

There will be disposal of some general construction wastes such as wood, steel, cardboard or other packaging, and other construction wastes. These materials generated during cable installation will be returned to shore for proper disposal.

2.4.4.7.4 Ballast Water Discharge

Ballast waters from marine vessels will be managed in accordance with Canada's *Ballast Water Control and Management Regulations*.

2.4.4.8 Marine Transportation

The Northumberland Strait is predominantly used by commercial fishers with additional uses including coastal recreation, marine transportation, submarine power and communication cables and road transportation via the Confederation Bridge. The Bridge provides year round access between PEI and NB. At the closest point, the proposed cable comes within 500 m of the bridge. The cable passes near the port of Borden-Carleton in PEI, and the old Northumberland Ferry Terminal in Cape Tormentine, NB. Project vessels will transit the Northumberland Strait during the construction period which is scheduled for the ice free months. The Project-related vessels will abide by the guidelines, restrictions and navigation channels described within the *Guidelines for Navigation Under the Confederation Bridge* (Transport Canada 2009) and Northumberland Strait Traffic. Vessels over 20 m are required to maintain contact on marine very high frequency (VHF) Channel 12 (Vessel Traffic Regulating) and Channel 16 (Distress, Safety and Calling of Marine Vessels).

2.4.5 Marine-Based Infrastructure Operation - Northumberland Strait

Routine operation activities for the submarine cable are described in the following sections.

2.4.5.1 Energy Transmission, Infrastructure Inspection and Maintenance

Following construction, the submarine cable will be energized and will begin transmitting electricity.

Inspections of the cable will be performed periodically to maintain cable integrity and reliability. The frequency of maintenance requirements will be determined following installation and commissioning. These inspections will also identify any areas that require additional protection from scouring. Video inspections are typically performed by a diving contractor. Multi-beam and side-scan sonar surveys may be conducted, as required.

2.4.5.2 Emissions and Wastes

2.4.5.2.1 Electromagnetic Fields

Submarine cables have the potential to produce electromagnetic fields (EMFs) during energy transmission. The strength of the EMF depends on the distance from the source and the amount of power being transferred through the cable. Within North America, EMF is generally measured in units of milligauss (mG). Natural sources of EMF include the earth's geomagnetic field which ranges from 300 to 700 mG (Normandeau 2011). The amount of EMF released from similarly sized cables buried 1 m below the seabed ranged from 78.5 mG directly above the seabed to 2.2 mG, at a distance of 10 horizontal metres from the cable, respectively (Normandeau 2011).

2.4.5.2.2 Solid Waste Disposal

There will be disposal of some general inspection wastes such as food scraps, cardboard or other packaging. These materials generated during cable inspection will be returned to shore for proper disposal.

2.4.6 Marine-Based Infrastructure Decommissioning and Abandonment - Northumberland Strait

During the decommissioning and abandonment of the submarine cable, expected activities consist of either removal and disposal, or abandonment of the submarine cables in place. These activities are described in the following sections.

2.4.6.1 Decommissioning

The life of the Project is projected to be 40 years, at which time it may be decommissioned; however, it may operate for an indefinite time with ongoing repair and refurbishment. If decommissioning activities are determined to be necessary, they will be completed in accordance with the applicable regulations at that time. Regulations will dictate either the abandonment or removal of the submarine cable, with abandonment being the most likely option at that time.

2.4.6.2 Emissions and Wastes

Emissions and wastes during decommissioning and abandonment are expected to be comparable to those that will occur during construction of the Project. Emissions of air contaminants and noise may occur during decommissioning and abandonment activities from the movement of vessels and associated machinery as work is conducted and as materials are moved to and from the Project area. There are no known solid waste materials expected from the decommissioning and abandonment beyond the submarine cable, as discussed above.

2.4.6.3 Marine Transportation

Transportation needs during decommissioning and abandonment will vary depending on the activity being carried out at the time. Although specific details of the decommissioning phase and associated transportation requirements are not fully defined at this time, it is expected Project activities and requirements during this phase will be similar to or less than those during the construction phase.

2.5 PROJECT SCHEDULE

Construction of the Project is expected to begin in early 2016, following receipt of all necessary permits, approvals and authorizations. A 16 month construction period is anticipated, with an expected operation date of all infrastructure by June 2017. Key timelines are outlined in Table 2.2 below.

Table 2.2 Key Project Timelines

Project Activity	Starting Date
Land-Based Construction – PEI	
Pre-trenching (including landfall site construction)	September-October 2016
Substation upgrade (including buildings and termination site)	July-September 2016
Commissioning of land-based Project components in PEI	December 2016
Land-Based Construction – New Brunswick	
Clearing of RoW from Melrose to Cape Tormentine and access road upgrades	March-April 2016
Melrose to Cape Tormentine transmission line construction	May-September 2016
Pre-trenching (including landfall site construction)	September-October 2016
Termination site construction	July-September 2016
Substation upgrades	Fall 2016

Table 2.2 Key Project Timelines

Project Activity	Starting Date
Clearing of RoW from Memramcook to Melrose	September-December 2016
Melrose to Memramcook transmission line construction	December 2016-May 2017
Commissioning of land-based Project components in NB (excluding transmission line from Memramcook to Melrose)	December 2016
Commissioning of transmission line from Memramcook to Melrose	June 2017
Marine-Based Construction – Northumberland Strait	
Near-shore pre-trenching in PEI and NB	May-July 2016
Clearing of infill from near-shore pre-trenching in PEI and NB	October 2016
Laying of submarine cables	October-November 2016
Energizing and commissioning of the cable interconnection	December 2016
Project commissioning	June 2017

Operation of the Project will begin immediately following construction. The useful service life of the Project, with applicable maintenance, is 40 years or more with ongoing refurbishment and repair.

2.6 ACCIDENTS, MALFUNCTIONS, AND UNPLANNED EVENTS

Accidents, Malfunctions, and Unplanned Events are upset events, conditions or occurrences that take place outside of routine planned Project activities. These could occur at any point during the Project due to a variety of factors, including but not limited to, abnormal operating conditions, wear and tear, human error or equipment failure. While unpredictable, many Accidents, Malfunctions, and Unplanned Events may be prevented or managed through good planning, design, equipment selection, hazard analysis and corrective action, emergency response planning, and mitigation.

Accidents, Malfunctions, and Unplanned Events specific to the Project have been outlined for this assessment based on the experience and professional judgment of the Study Team. Selection criterion focuses on credible events that have a reasonable probability of occurring during Project activities and may result in significant environmental effects in relation to identified VCs. Occupational health and safety implications of the identified events are not considered in the assessment, and will be addressed under NB Power and MECL's respective health and safety policies and EPPs. An assessment of specific Accidents, Malfunctions, and Unplanned Events and potential interactions with VCs will be included for each relevant VC.

2.6.1 Identification of Accidents, Malfunctions, and Unplanned Events

The following Accidents, Malfunctions, and Unplanned Events have been selected for consideration in this assessment and are described in greater detail in the following sections:

Fire: Includes a fire in a Project component or facility during construction and operation. The focus is on the consequence and not the mechanism by which it occurs.

Hazardous Material Spill: Spills of fuel, petroleum products, and/or other chemicals used on-site or in Project components during construction and operation.

Vehicle/Vessel Accident: Project-related vehicle accidents that could occur on road transportation networks or within marine environment during construction and operation.

Wildlife Encounter: Includes human interaction with wildlife and wildlife interaction with Project components that could occur during construction and operation.

Erosion Prevention and/or Sediment Control Failure: Temporary failure or loss of effectiveness of erosion prevention and/or sediment control measures that may result in erosion and/or the accidental release of sediment into the environment during construction. The focus is on the consequence and not the mechanism by which it occurs.

Major Loss of Electricity: Includes a major loss of electricity due to failure or loss of transmission line or cable during operation. The focus is on the consequence and not the mechanism by which it occurs.

Discovery of a Heritage Resource: The discovery of a previously undiscovered heritage or archaeological resource that could occur during construction and to a lesser extent during operation.

2.6.1.1 Land-Based Activities

2.6.1.1.1 Fire

A fire during construction or operation of land-based Project activities could affect the operation of Project infrastructure and the use of heavy equipment and support vehicles. Fire may also impact Project infrastructure, including substations, termination sites, and transmission line infrastructure, and could result in infrastructure damage and a temporary loss of electricity.

2.6.1.1.2 Hazardous Material Spill

The use of heavy equipment and support vehicles during construction and operation of land-based Project activities could result in a hazardous material spill. A hazardous material spill could occur due to equipment malfunction, wear and tear, line rupture, error in material transfer or vehicle accidents when using hydraulic equipment and gasoline and/or diesel powered vehicles on-site. If a hazardous material loss was of a significant volume it could affect aspects of the surrounding environment, including wildlife species and groundwater and freshwater sources.

2.6.1.1.3 Vehicle Accident

Vehicles and heavy equipment will be used during land-based Project activities. Excavators, large trucks, cranes, and vegetation removal equipment are expected to be used during construction. Operation requires removal of vegetation, transmission line repair and transport of crew. Vehicle accidents occurring during Project activities could result in the damage to or loss of equipment or infrastructure, and have the potential to cause the injury or mortality of a wildlife species.

2.6.1.1.4 Wildlife Encounter

As some land-based Project activities will be conducted within wildlife habitat, wildlife encounters are possible. Human interaction with wildlife during Project activities could include the use of construction or vegetation management equipment within wildlife habitat. Wildlife interaction with the Project during operation could result in injury or mortality of bird species and temporary power disruption.

2.6.1.1.5 Erosion Prevention and/or Sediment Control Failure

Erosion prevention and sediment control measures will be implemented during land-based Project activities that involve the opening of ground. Should a temporary failure occur, it may result in an increase of erosion and/or sediment export from the area. If a pathway exists for sediment-laden water to reach a wetland, stream or other water body, there is potential for sediment to impact the Freshwater Environment.

2.6.1.1.6 Major Loss of Electricity

A major loss of electricity constitutes the failure of or damage to transmission line that could result in the loss of electricity for an extended period of time. Regardless of the mechanism by which it occurs, a major loss of electricity would result in service disruption to PEI and would require infrastructure repair and the use of alternate energy sources for the duration of the event.

2.6.1.1.7 Discovery of a Heritage Resource

The discovery of a heritage resource could occur during the construction of land-based Project activities and could result in a temporary disruption of work. As minimal land disruption is expected during operation, the probability of discovering a heritage resource is generally limited to the construction phase.

2.6.1.2 Marine-Based Activities

2.6.1.2.1 Fire

A fire during any phase of marine-based Project activities could affect the use of support vessels and other equipment. Large vessels and trenching equipment will be used during construction, and operation activities within the Northumberland Strait and fire could result in the loss of equipment and support vessels.

2.6.1.2.2 Hazardous Material Spill

The use of trenching equipment during construction and support vessels during both construction and operation of marine-based Project activities could result in a hazardous material spill due to equipment malfunction, wear and tear, line rupture, error in material transfer or vessel accidents. The newly installed cables are solid dielectric cables with no oil present in the cable interior; therefore, damage to the cables, if incurred, would not result in the release of oil.

2.6.1.2.3 Vessel Accident

Vessels will be used during both construction and operation of marine-based Project activities. Vessel accidents during Project activities could result in loss of equipment or a release of hazardous materials to the surrounding environment. If a vessel were to strike a marine species it could result in the injury or mortality of the marine species.

3.0 EIA METHODS, CONSULTATION AND ENGAGEMENT, AND SCOPING

3.1 EIA METHODS

An overview of the methods for conducting this EIA is provided in this section. The EIA has been completed using the methodological framework developed by Stantec to meet the requirements of federal and provincial jurisdictions in Canada (including Section 9(1) of the PEI *EPA*, Schedule A of the NB *EIA Regulation,* and Section 5 of *CEAA 2012*). These methods are based on a structured approach that:

- focuses on issues of greatest concern
- considers the issues raised by the public and stakeholders
- integrates engineering design and programs for mitigation and follow-up into a comprehensive environmental planning process

The EIA focuses on specific environmental components (called valued components or VCs) that are of particular value or interest to regulatory agencies, the public, and other stakeholders. VCs are broad components of the biophysical and human environments that, if altered by the Project, may be of concern to regulatory agencies, Aboriginal persons, resource managers, scientists, and/or the general public. It is noted that "environment" is defined to include not only biological systems (air, land, and water) but also human conditions that are affected by changes in the biological environment.

The Project-related environmental effects are assessed using a standard framework for each VC, with tables and matrices used to facilitate and support the evaluation. Residual Project-related environmental effects (i.e., those environmental effects that remain after the planned mitigation measures have been applied) are characterized for each individual VC using specific analysis criteria (i.e., magnitude, geographic extent, duration, frequency, reversibility, and context). The significance of residual Project-related environmental effects is then determined based on pre-defined standards or thresholds (i.e., significance rating criteria).

Cumulative environmental effects consider the residual environmental effects of the Project with the residual environmental effects of other physical activities (i.e., where there is overlap between the residual effects of other physical activities and those of the Project). An overlap of residual effects may occur and the potential for this is assessed to determine if they could be significant. As the Project is not a designated project under *CEAA 2012* and a cumulative effects assessment is not required under provincial EIA Regulation, the cumulative effects assessment will be conducted at a high-level for each Project location.

The environmental effects assessment methodology involves the following generalized steps.

- Scope of Assessment – This involves the scoping of the overall assessment, including the selection of VCs; description of measurable parameters; description of temporal, spatial, and administrative/technical boundaries; definition of the parameters that are used to characterize the Project-related environmental effects; and identification of the standards or thresholds that are used to determine the significance of environmental effects. This step relies upon the scoping undertaken by regulatory authorities; consideration of the input of the public, stakeholders, and First Nations (as applicable); and the professional judgment of the Study Team.
- Existing Conditions – Establishment of existing (baseline) environmental conditions for the VC. In many cases existing conditions expressly and/or implicitly include those environmental effects that may be or may have been caused by other past or present projects or activities that have been or are being carried out.
- Assessment of Project-Related Environmental Effects – Project-related environmental effects are assessed. The assessment includes descriptions of how an environmental effect will occur, the mitigation and environmental protection measures proposed to reduce or eliminate the environmental effect, and the characterization of the residual environmental effects of the Project. The focus is on residual environmental effects (i.e., the environmental effects that remain after planned mitigation has been applied). All phases of the Project are assessed (i.e., construction, operation), as are Accidents, Malfunctions, and Unplanned Events. The evaluation also considers the Effects of the Environment on the Project. For each VC, a determination of significance is then made, based on the identified significance criteria.
- Assessment of Cumulative Environmental Effects – Cumulative environmental effects are identified in consideration of other past, present or future physical activities, for all phases of the Project (i.e., construction, operation). The cumulative environmental effects of the Project in combination with other past, present, or future projects or activities that have been or will be carried out are then evaluated. This assessment will be conducted at a high-level for each Project location.
- Determination of Significance – The significance of residual Project-related and cumulative environmental effects is then determined, in consideration of the significance criteria that have been established for each VC.
- Recommendations for Follow-up – Monitoring and follow-up to verify the environmental effects predictions or to assess the effectiveness of the planned mitigation are recommended, where applicable.

3.2 CONSULTATION AND ENGAGEMENT

The consultation and engagement plan and summary of initial results in support of this EIA is described in the following sections. Consultation and engagement will take place at various points during the EIA process. As some activities will take place after registration and submission of the EIA, these results will be updated as needed.

Issues concerning the Northumberland Strait will be addressed within the consultation and engagement programs for each provincial jurisdiction.

3.2.1 Public

Details of public consultation requirements, approach and key issues raised are outlined by region in the following sections. Upon completion of public consultation requirements, a summary report of findings will be compiled.

3.2.1.1 Approach

3.2.1.1.1 Prince Edward Island

Requirements for public consultation are outlined in the PEI Environmental Impact Assessment Guidelines (PEIDELJ 2010) and apply to EIA processes undertaken in PEI, with the exception of those projects on an exclusion list. There are two levels of public consultation. The required level of public consultation is Level II, as determined by the environmental assessment coordinator.

A Level II public consultation applies to projects that may be of interest to the public and have a potential for environmental consequences. Requirements for a Level II public consultation are as follows:

- a minimum of one public information session held in the vicinity of the proposed Project area

Specific details and timeframes for public consultation activities are provided in the guidelines.

The majority of public consultation activities in PEI will take place after the registration and submission of the EIA.

3.2.1.1.2 New Brunswick

A Guide to Environmental Impact Assessment in New Brunswick (NBDELG 2012) outlines the requirements for public consultation for EIA processes undertaken in NB. For all Projects within NB, the following requirements apply:

- a notice of registration to be posted on the NBDELG website
- a copy of the registration document deposited at the NBDELG office for public review and made available to any member of the public at request

As this Project is large in scale, the following additional requirements are required:

- a public notice placed in a minimum of one local and/or provincially circulated daily newspaper
- a copy of the registration document made available at two public locations in the vicinity of the proposed Project area
- a minimum of one public information session held in the vicinity of the proposed Project area

Specific details and timeframes for public consultation activities are provided in the guidelines.

3.2.1.2 Activities and Key Issues Raised to Date

3.2.1.2.1 Prince Edward Island

Details of public consultation activities and key issues raised in PEI are shown in Table 3.1. This section outlines activities completed up to the submission of the EIA document.

Table 3.1 Summary of Public Consultation in PEI and Key Issues Raised to Date

Public Consultation	Information Provided/Key Issues Raised
Public Open House July 27, 2015 Royal Canadian Legion Branch No. 10 240 Main St, Borden-Carleton, PE C0B 1X0	• Project schedule • method of cable installation • potential impact to fishery and compensation plan

3.2.1.2.2 New Brunswick

Details of public consultation activities and key issues raised in NB are shown in Table 3.2. This section outlines activities completed up to the submission of the EIA document.

Table 3.2 Summary of Public Consultation in NB and Key Issues Raised to Date

Public Consultation	Information Provided/Key Issues Raised
Public Open House July 21, 2015 Royal Canadian Legion Branch No. 89 1215 Royal Rd, Memramcook, NB E4K 1Y3	• Project schedule • method of cable installation • land easements from property owners
Public Open House July 22, 2015 Royal Canadian Legion Branch No. 81 72 Route 955, Cape Tormentine, NB E7M 2A8	• Project schedule • method of cable installation • timeline for the land easements and process • impact on the fishery

3.2.2 Stakeholders

Stakeholders are identified by the Study Team as individuals or groups that may have interest in or be affected by the Project, including government agencies, local groups and adjacent property owners. Aboriginal Rights Holders are addressed in a separate section.

3.2.2.1 Key Stakeholders

Key Stakeholders, as identified by the Study Team, are shown in Table 3.3.

Table 3.3 Identification of Key Stakeholders by Region

Stakeholders Within PEI	
Provincial	**Municipal and Community-Based**
• PEI Department of Communities, Land and Environment • PEI Department of Transportation, Infrastructure and Energy • PEI Department of Education, Early Learning and Culture	• PEI Fishermen's Association • PEI Aquaculture Alliance • Borden Town Council • local fishers • property owners in the vicinity of the Project
Stakeholders Within New Brunswick	
Provincial	**Municipal and Community-Based**
• New Brunswick Department of Natural Resources • New Brunswick Department of Transportation and Infrastructure • New Brunswick Department of Energy and Mines • New Brunswick Department of Public Safety • New Brunswick Department of Agriculture, Aquaculture and Fisheries	• New Brunswick Federation of Snowmobile Clubs • New Brunswick All-Terrain Vehicle Federation • The NB Trails Council • Beaubassin Planning Commission • Village of Memramcook and Village of Port Elgin • Petitcodiac Watershed Alliance • Northumberland Fishermen's Association • Maritime Fishermen's Union • local fishers • property owners in the vicinity of the Project
Federal Stakeholders	
• Environment Canada • Transport Canada • Fisheries and Oceans Canada • Public Works and Government Services Canada	

3.2.2.2 Approach

3.2.2.2.1 Prince Edward Island

Stakeholder consultation within PEI has been and will continue to be accomplished through meetings and written communication with the identified stakeholders. Communication with stakeholders will be updated as the EIA process progresses.

3.2.2.2.2 New Brunswick

As per guidelines, stakeholders within NB, including elected officials, must be made aware of the Project and be given an opportunity to ask questions and/or raise concerns (NBDELG 2012). This may be achieved through the following:

- holding an information session or meeting for stakeholders
- being present at a regularly scheduled stakeholder meeting to provide information concerning the Project
- sending Project information to stakeholders via a letter or information flyer

Landowners and/or residents that may be affected by Project activities should be notified about the Project in writing. A report detailing all public notification activities must be submitted to NBDELG 60 days after registration of the Project.

3.2.2.2.3 Federal

Stakeholder consultation with federal bodies has been and will continue to be accomplished through meetings and written communication with the identified stakeholders. Communication with stakeholders will be updated as the EIA process progresses.

3.2.2.3 Activities and Key Issues Raised to Date

3.2.2.3.1 Prince Edward Island

Details of stakeholder consultation activities and key issues raised in PEI are shown in Table 3.4. This section outlines activities completed up to the submission of the EIA document.

Table 3.4 Summary of Key Issues Raised by Stakeholders During Pre-consultation in PEI

Stakeholder Consultation	Information Provided/Key Issues Raised
Provincial	
PEI Provincial Cabinet Ministers Briefing May 1, 2014	• initial Project overview provided • requested more information as project details become available
Opposition Briefing May 2, 2014	• initial Project overview provided • requested more information as project details become available
PEI Department of Environment, Labour and Justice (currently PEIDCLE) Scoping Letter Sent November 18, 2014 P.O. Box 2000, Charlottetown PE C1A 7N8	• key issues raised in response to the scoping letter has been reviewed by the Study Team and addressed within the EIA where applicable
PEI Department of Communities, Land and Environment Meeting June 2, 2015 PEIDCLE Offices 11 Kent Street, Charlottetown PE C1A 7N8	• request that aquaculture group(s) be informed about the Project
Municipal and Community-Based	
Borden Town Council Meeting May 1, 2014 and September 14, 2015 Borden-Carleton, PE	• initial Project overview provided • requested more information as project details become available

Table 3.4 Summary of Key Issues Raised by Stakeholders During Pre-consultation in PEI

Stakeholder Consultation	Information Provided/Key Issues Raised
PEI Fishermen's Association Annual General Meeting May 2, 2014 Royal Canadian Legion Branch No. 2 69 Ellis Ave, O'Leary PE C0B 1V0	• presented an overview of the proposed submarine cable Project during their AGM • effects of cable on marine fish and potential loss of fishing grounds
PEI Fishermen's Association Executive Meeting July 14, 2015 PEIFA Offices 420 University Avenue, Suite 102 Charlottetown, PE C1A 7Z5	• Project schedule • method of cable installation • how to best communicate to fishers • impact on the fishery • discussed Project specifics and requested an information session with all members • agreed to send letters to all members to notify of upcoming information session
PEI Fishermen's Association Information Session July 24, 2015 Royal Canadian Legion Branch No. 2 69 Ellis Ave, O'Leary PE C0B 1V0	• information session was provided • proposed dates for installation in the strait • method of cable installation • impact to the fishers

3.2.2.3.2 New Brunswick

Details of the stakeholder consultation activities in NB and key issues raised are shown in Table 3.5. This will be updated as the EIA process progresses.

Table 3.5 Summary of Key Issues Raised by Stakeholders in NB

Stakeholder Consultation	Information Provided/Key Issues Raised
Provincial	
New Brunswick Department of Environment and Local Government Meeting June 26, 2014 Marysville Place 20 McGloin Street, Fredericton NB E3B 5H1	• introduction of Project • discussion of potential regulatory approaches for the environmental approvals required • identification of potential stakeholders
New Brunswick Department of Environment and Local Government Meeting September 12, 2014 Marysville Place 20 McGloin Street, Fredericton NB E3B 5H1	• Project update • discussion on potential timelines for EIA submission • First Nations engagement must be considered
New Brunswick Department of Environment and Local Government Scoping Letter Sent January 6, 2015 NBDELG, Marysville Place 20 McGloin Street, Fredericton NB E3B 5H1	• Key issues raised in response to the scoping letter has been reviewed by the Study Team and addressed within the EIA where applicable.

Table 3.5 Summary of Key Issues Raised by Stakeholders in NB

Stakeholder Consultation	Information Provided/Key Issues Raised
New Brunswick Department of Tourism, Culture and Heritage Meeting January 14, 2015 Archaeological Services Offices, Andal Building 225 King Street, Fredericton, NB E3B 1E1	• discussion regarding Archaeological Services proposal
New Brunswick Department of Tourism, Culture and Heritage Meeting May 14, 2015 Archaeological Services Offices, Andal Building 225 King Street, Fredericton, NB E3B 1E1	• Project update • summary of results of the archaeological assessment performed on the proposed route in 2014 • discussion of the proposed mitigation measures to be implemented during construction for elevated potential areas
New Brunswick Department of Natural Resources, New Brunswick Department of Energy, Aboriginal Affairs Secretariat, New Brunswick Department of Agriculture, Aquaculture and Fisheries Meeting August 18, 2015	• Project overview • update on consultations with First Nations communities • Department of Agriculture, Aquaculture and Fisheries asked that they be advised on future discussion with the Fishermen's Union
Municipal and Community-Based	
Cape Tormentine Community Development Corporation July 30, 2014 Cape Tormentine	• discussion regarding potential cable landing sites
Land Owner Notification Registered letters sent in early August 2014	• registered letters were sent to land owners identified by NB Power to have land within the proposed RoW • initial Project overview provided • request made for access to property to conduct preliminary environmental field studies
Maritime Fishermen's Union Annual General Meeting July 28, 2015 Bouctouche Golden Age Club, NB 25 Church Street, Bouctouche, NB E4S 2Z5	• review of the Project during AGM • Project schedule • proposed method of cable installation • compensation plan should fishery be affected • concerns over siltation due to cable installation • post-construction monitoring of marine environment
Maritime Fishermen's Union Meeting August 5, 2015 Shemogue Golden Age Club 15 Shemogue Rd, Port Elgin, NB E4M 1C2	• proposed method of cable installation • compensation plan should fishery be affected • Confederation Bridge as an option • post-construction monitoring of marine environment • EMF and thermal effects on fish
Cape Tormentine Community Development Corporation August 16, 2015 Royal Canadian Legion Branch No. 81 72 Route 955, Cape Tormentine, NB E7M 2A8	• Project update and schedule • impact or restrictions on campground • discussion on easement requirements

3.2.2.3.3 Federal

Details of federal stakeholder consultation activities and key issues raised are shown in Table 3.6. This will be updated as the EIA process progresses.

Table 3.6 Summary of Key Issues Raised by Federal Stakeholders

Stakeholder Consultation	Information Provided/Key Issues Raised
Department of Fisheries and Oceans Meeting May 6, 2015 Department of Fisheries and Oceans Office 343 Université Avenue, Moncton, NB E1C 9B6	• Provided Project overview • concerns raised regarding local fisheries • clarification of cable installation/operation details • DFO requested that the marine section discuss how quickly the marine bed will return to pre-construction state
Public Works and Government Services Canada Scoping Report Sent April 17, 2015 PWGSC 1713 Bedford Row, Halifax, NS B3J 3C9	• Key issues raised in response to the scoping report have been reviewed by the Study Team and addressed within the EIA where applicable.
Public Works and Government Services Canada Meeting April 15, 2015 PEIEC Offices 11 Kent Street, Charlottetown, PE C1A 7N8	• clarification and discussion regarding federal Project requirements
National Energy Board Scoping Letter April 2015 NEB 517 Tenth Avenue SW, Calgary, AB T2R 0A8	• Confirmation requested that NEB is not a regulator for the Project and that the Project is not subject to the federal environmental assessment process under *CEAA 2012*.
Public Works and Government Services Canada Meeting with the NB Department of Natural Resources, the NB Department of Energy, the NB Aboriginal Affairs Secretariat and the PEI Aboriginal Affairs Secretariat Conference call on July 29, 2015	• First Nations consultation was discussed • ownership of submerged lands was raised
Transport Canada NPP Officer Meeting Phone conversation on August 27, 2015	• reviewed minor works definitions and guidelines • additional information requested by TC • initial determination was that the submarine cable Project would be designated a minor works
Public Works and Government Services Canada Meeting with the Department of Fisheries and Oceans, Environment Canada, Transport Canada, the NB Department of Environment and Local Government, the PEI Department of Environment, Land and Communities, the PEI Energy Corporation, NB Power, MECL and Stantec In-person and video conferencing on August 28, 2015	• presented proposed method for submarine cable installation and proposed timelines • EC mentioned that trenching may require disposal at sea permit • DFO will evaluate EIA and determine if there is potential for serious harm to CRA fisheries • discussed Navigation Protection Program minor works triggers and recommended that discussions

Table 3.6 Summary of Key Issues Raised by Federal Stakeholders

Stakeholder Consultation	Information Provided/Key Issues Raised
Atlantic Technology Centre 90 University Avenue, Charlottetown, PE C1A 4K9	resume after draft EIA is submitted
Environment Canada Meeting Phone conversation on September 24, 2015	• discussion of sediment data collected to date • EC requested additional information on sediment and potential sources of contamination in the areas of the trenching.

3.2.3 Aboriginal Rights Holders

Aboriginal Rights Holders are identified by the Study Team as First Nations bands or representative First Nations assemblies or groups that may have interest in or interaction with Project components. This includes associated government departments within the applicable regions.

Table 3.7 Identification of Aboriginal Rights Holders and Associated Government Departments by Region

Aboriginal Rights Holders and Associated Government Departments Within PEI
• Mi'kmaq Confederacy of PEI • Abegweit First Nation • Lennox Island First Nation • PEI Department of Education, Early Learning and Culture
Aboriginal Rights Holders and Associated Government Departments Within New Brunswick
• The Assembly of First Nations' Chiefs in New Brunswick • Indian Island First Nation • Fort Folly First Nation • Elsipogtog First Nation • Madawaska Maliseet First Nation • St. Mary's First Nation • Woodstock First Nation • Oromocto First Nation • Tobique First Nation • Kingsclear First Nation • New Brunswick Department of Tourism Heritage and Culture • New Brunswick Aboriginal Affairs Secretariat

3.2.3.1 Approach

3.2.3.1.1 Prince Edward Island

Consultation with Aboriginal Rights Holders and associated government departments in PEI has been and will continue to be accomplished through meetings and written communication with the identified groups. Communication with the identified groups will be updated as the EIA process progresses.

3.2.3.1.2 New Brunswick

As per guidelines, Aboriginal Rights Holders and associated government departments must be made aware of the Project and be given an opportunity to ask questions and/or raise concerns (NBDELG 2012). This may be achieved through the following:

- holding an information session or meeting for stakeholders
- being present at a regularly scheduled stakeholder meeting to provide information concerning the Project
- sending Project information to stakeholders via a letter or information flyer

Communication with Aboriginal Rights Holders will be completed as the EIA process progresses. This section outlines activities completed up to the submission of the EIA document.

3.2.3.2 Activities and Key Issues Raised to Date

3.2.3.2.1 Prince Edward Island

Details of Aboriginal Rights Holders consultation activities and key issues raised in PEI are shown in Table 3.8. This will be updated as the EIA process progresses.

Table 3.8 Summary of Key Issues Raised by Aboriginal Rights Holders in PEI

Rights Holder Consultation	Information Provided/Key Issues Raised
Formal First Nation Consultation Letter Sent March 15, 2015 <u>Recipients:</u> Lennox Island First Nation Abegweit First Nation	• Letter sent to both bands under the Mi'kmaq Confederacy of PEI as formal notification of consultation on the Project.
Mi'Kmaq Confederacy of PEI Meeting April 27, 2015 Mi'Kmaq Confederacy of PEI Office Suite 501, 199 Grafton Street, Charlottetown, PE C1A 1L2	• questions on the monitoring of cable to detect malfunction • confirmation that EIA will consider fishery • clarification of cable installation/operation details • potential employment opportunities
Mi'kmaq Confederacy of PEI Letter Sent July 31, 2015	• Letter from Stantec forwarded to the Mi'kmaq Confederacy of PEI by PEIEC providing information on Project.

3.2.3.2.2 New Brunswick

Details of Aboriginal Rights Holders consultation activities and key issues raised in NB are shown in Table 3.9. This section outlines activities completed up to the submission of the EIA document.

Table 3.9 Summary of Key Issues Raised by Aboriginal Rights Holders in NB

Rights Holder Consultation	Information Provided/Key Issues Raised
The Assembly of First Nations' Chiefs in NB Meeting June 29, 2015 Assembly of First Nations Chiefs' of NB Head Office P.O. Box 296, Station A Fredericton, NB E3B 4Y9	• effects of EMF on fish at various depth • need for TEK study • A more detailed project description was requested for the NB side (i.e., amount of clearing, jobs, schedule, etc.).
The Assembly of First Nations' Chiefs in NB and Elsipogtog First Nation Letter Sent July 18, 2015	• A letter was sent to the Assembly of First Nations' Chiefs and Elsipogtog First Nation in accordance with the Interim Consultation Protocol. The letter included a Project description, map and a formal notification to consult.
First Nations Consultations Indian Island Band Office July 20, 2015 Indian Island Band Council Office 61 Island Drive, Indian Island, NB E4W 1S9	• Project impact and scheduling • amount of clearing associated with the transmission line • amount of Crown land affected • EMF on fish • bridge as an alternative • job opportunities • TEK study
First Nations Consultations Fort Folly July 21, 2015 Fort Folly Health Office P.O. Box 1007, Dorchester, NB E4K 3V5	• Project overview and as right holders concerns about Project impact and timing • wanted to review traditional hunting grounds areas and potential impact • job opportunities • TEK study
The Assembly of First Nations' Chiefs in NB Phone call July 28, 2015	• A call was made to the Assembly of Chiefs of NB to inquire if contact had been with Elsipogtog First Nation and whether or not a meeting had been arranged.
The Assembly of First Nations' Chiefs in NB Email sent July 31, 2015	• draft Project Description sent via email
Non-members of the Assembly of First Nations' Chiefs in NB Letter Sent August 25, 2015 <u>Recipients:</u> Madawaska Maliseet First Nation St. Mary's First Nation Woodstock First Nation Oromocto First Nation	• A letter was sent to the non-members of the Assembly of First Nations' Chiefs in NB in accordance with the Interim Consultation Protocol. The letter included a Project description, map and a formal notification to consult.
The Assembly of First Nations' Chiefs in NB Email sent August 27, 2015	• An email was sent to the Assembly of First Nations' Chiefs in NB regarding the need to discuss the budget associated with a TEK study as well as potential dates for open houses at Fort Folly and Indian Island.

Table 3.9 Summary of Key Issues Raised by Aboriginal Rights Holders in NB

Rights Holder Consultation	Information Provided/Key Issues Raised
Non-members of the Assembly of First Nations' Chiefs in NB Sent September 3, 2015 Recipients: Tobique First Nation Kingsclear First Nation	• A letter was sent to the non-members of the Assembly of First Nations' Chiefs in NB in accordance with the Interim Consultation Protocol. The letter included a Project description, map and a formal notification to consult.

3.2.4 Summary of Consultation Activities to Date

3.2.4.1 Public

Public Open Houses were held in both PEI and NB to inform the public of the proposed Project and to record any key issues raised by the public. Open Houses were held in communities nearest to proposed Project infrastructure; in Borden-Carleton, PEI, location of the cable landfall site and MECL substation expansion, and in both Cape Tormentine, NB, location of the cable landfall site, termination site and starting point for transmission line infrastructure, and Memramcook, NB, end point of transmission line infrastructure and location of the NB Power substation upgrade. Method of cable installation (addressed in Section 2.4.4) and impact to the fishery (addressed in Volume 4, Section 3.2) were key issues raised in both PEI and NB. Landowners in NB that attended the Open Houses were informed of the land easement process for transmission line construction.

3.2.4.2 Key Stakeholders

Scoping documents were sent to provincial and federal regulators to outline the proposed Project and request input on Project components. Responses from regulatory bodies identified additional key stakeholders and regulation pertaining to the Project, as well as key areas of focus for the EIA process. Key issues raised in response to the scoping documents have been addressed within the EIA, where applicable. Information on impacts of trenching within the Northumberland Strait can be found in Volume 4. EMF and potential effects on marine species is addressed in Volume 4, Section 3.1. Mitigation measures to be implemented during construction for high archaeological potential areas in NB are addressed in Volume 3, Section 3.5. The effects of climate on Project infrastructure in PEI is addressed in Volume 2, Section 4.3. Based on concerns regarding sediment generation in the marine environment, the method of trenching was re-evaluated by MECL and PEIEC and a TROV with a saw cutter will be used in lieu of plowing or water jetting.

Landowners potentially affected by the transmission line RoW were identified and sent a personal letter by registered mail in early August 2014. The letter provided information about the Project and requested permission to conduct preliminary environmental field studies. Follow-up calls were made by NB Power representatives to those landowners that did not respond. Key issues raised by landowners were addressed at Open Houses in NB.

Fishery stakeholders in both PEI and NB were informed of the proposed Project through meetings and information sessions. Impact to the fishery was the key issue raised by fishery stakeholders in both provinces. Marine-related issues are addressed within Volume 4; Marine Environment and CRA Fisheries are addressed in Sections 3.1 and 3.2, respectively**.** The concerns associated with the timing of marine construction was re-evaluated by MECL and PEIEC and the installation of the submarine cables is now planned for October and November of 2016 after the Fall lobster fishery.

3.2.4.3 Aboriginal Rights Holders

The Mi'kmaq Confederacy of PEI and the Assembly of First Nations' Chiefs in NB were primary contact points for Aboriginal rights holders in PEI and NB, respectively. Formal consultation notice letters were sent to Abegweit First Nation and Lennox Island First Nation, both members of the Mi'kmaq Confederacy of PEI, notifiying the Chiefs of the proposed Project and providing an opportunity for comments. The purpose of consultation and engagement initiatives have been to provide Aboriginal communities with information about to the proposed Project (e.g., description, regulatory framework, schedule and construction practices) and to identify current use of lands and resources for traditional purposes by Aboriginal persons within the Project area. Bands that were identified as non-members of the Assembly of First Nations' Chiefs in NB were contacted separately and informed of Project details via letter, email or meeting. Although, to date, no specific resource locations have been identified within the Project Area in NB, some individuals have expressed interest in the consultation process. This interest is expected to lead to Aboriginal community meetings in Fort Folly and Indian Island in fall 2016. EIA volumes addressing EMF, CRA fisheries and trenching within the Northumberland Strait are detailed in above sections. Information on Project employment in NB is addressed in Volume 3, Section 3.4. Information on Project employment in PEI is addressed in Volume 2, Section 3.2.

3.2.5 Future Consultation and Engagement

The Project Team will continue to work with anyone who expresses issues or concerns associated with the proposed Project. Additional First Nations engagement activities will be undertaken as outlined above. Both the NB Power and MECL company website will continue to be used as a tool to inform and provide regular updates to the general public.

As per notification requirements in NB, notices will be published in local NB newspapers informing the public that the Project has been registered with the NBDELG and identifying the locations where the EIA document can be viewed. In addition, Open Houses in both PEI and NB will be held to provide the public with an opportunity to provide input and express their concerns.

3.3 SCOPE OF THE ASSESSMENT

The potential environmental effects of the Project are assessed in the EIA. The scope of assessment includes all activities necessary for the construction and operation of the Project. Environmental effects will be assessed separately for each Project location (PEI, NB and the Northumberland Strait) for each phase of the Project (i.e., construction, operation, decommissioning and abandonment), where relevant, as well as for credible Accidents, Malfunctions, and Unplanned Events. The assessment will be conducted within defined assessment boundaries (spatial, temporal, administrative, and technical) and in consideration of defined residual environmental effects rating criteria aimed at determining the significance of the environmental effects. The EIA considers measures that are technically and environmentally feasible that would mitigate significant adverse environmental effects of the Project.

3.3.1 Scope of Project

The Project under assessment involves the development of a high voltage alternating current transmission system within the Northumberland Strait, between PEI and NB. For the purpose of this assessment, the Scope of the Project includes the following Project activities:

- construction of transmission lines within NB
- construction of landfall sites in PEI and NB
- upgrading of the NB Power substation in NB
- expansion of the MECL substation in PEI
- construction of termination sites in PEI and NB (for converting submarine cables to overhead transmission lines or substation)
- installation and operation of two submarine cables within the Northumberland Strait

3.3.2 Factors to be Considered

While this Project is not considered a designated Project under *CEAA 2012*, the framework pursuant to section 19 of *CEAA 2012*, is used as a tool to guide the assessment process.

The EIA must take into account the following factors:

- the environmental effects of the physical activity (as it is not a designated project), including the environmental effects of malfunctions or accidents that may occur in connection with the Project
- comments from the public
- mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project
- the requirements of the follow-up program in respect to the Project
- the purpose of the Project
- alternative means of carrying out the Project
- any change to the Project that may be caused by the environment

3.3.3 Scope of Factors to be Considered

The scope of the factors to be considered focuses the assessment on the relevant issues and concerns. As per section 5(1) of *CEAA 2012*, the environmental effects that are to be taken into account in relation to an act or thing, a physical activity, a designated project, or a project are:

> *(a) a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:*
>
> > *(i) fish as defined in section 2 of the Fisheries Act and fish habitat as defined in subsection 34(1) of that Act,*

> *(ii) aquatic species as defined in subsection 2(1) of the Species at Risk Act,*
> *(iii) migratory birds as defined in subsection 2(1) of the Migratory Birds Convention Act, 1994, and*
> *(iv) any other component of the environment that is set out in Schedule 2 of [CEAA 2012];*

(b) a change that may be caused to the environment that would occur

> *(i) on federal lands,*
> *(ii) in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or*
> *(iii) outside Canada; and*

(c) with respect to Aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on

> *(i) health and socio-economic conditions,*
> *(ii) physical and cultural heritage,*
> *(iii) the current use of lands and resources for traditional purposes, or*
> *(iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.*

Certain additional environmental effects must be considered under Section 5(2) of *CEAA 2012* where the carrying out of the physical activity, the designated project, or the project requires a federal authority to exercise a power or perform a duty or function conferred on it under any Act of Parliament other than *CEAA 2012*. This is the case for the Project, as PEIEC will require a Subsea Use Agreement from PWGSC - Real Property Branch pursuant to the *Federal Real Property and Federal Immovables Act* to occupy the seafloor of the Northumberland Strait. Therefore, the following environmental effects are also considered:

(a) a change, other than those referred to in paragraphs (1)(a) and (b), that may be caused to the environment and that is directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part, of the physical activity, the designated project or the project; and
(b) an effect, other than those referred to in paragraph (1)(c), of any change referred to in paragraph (a) on

> *(i) health and socio-economic conditions,*
> *(ii) physical and cultural heritage, or*
> *(iii) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.*

Provincial legislation may not necessarily be limited to the factors outlined in *CEAA 2012*, as presented above, and may include a broader definition of interaction of the Project with the surrounding environment. Both the PEI *EPA* and the NB *Environmental Impact Assessment Regulation* and the relevant provincial guidelines will be used in addition to guidance from *CEAA 2012*.

3.3.4 Selection of Valued Components

The selection of VCs was carried out in consideration of:

- regulatory issues, guidelines, and requirements
- knowledge of the Project, its components and activities
- knowledge of existing conditions where the Project will be located
- issues raised by regulatory agencies, the public, Aboriginal groups and stakeholders
- the scope of factors to be considered in the EIA as determined by applicable regulatory authorities
- the professional judgment of the Study Team

The following 11 VCs were selected to facilitate a focused and effective EIA process that complies with government requirements and supports public review:

- Atmospheric Environment
- Groundwater Resources
- Freshwater Environment
- Terrestrial Environment
- Marine Environment
- Land Use
- Commercial, Recreational and Aboriginal Fisheries
- Socioeconomic Environment
- Heritage Resources
- Other Marine Users
- Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons
- The rationale for including these VCs, and the factors to be considered in this EIA are shown in Table 3.10

Table 3.10 Selected Valued Components

Valued Component (VC)	Rationale for Inclusion as a VC	EIA Volume			Factors to be Considered
		Volume 2	Volume 3	Volume 4	
		PEI	NB	Northumberland Strait	
Atmospheric Environment	Project-related emissions of particulate matter, combustion gases, and sound may affect the Atmospheric Environment and/or be perceptible to nearby receptors. Construction-related noise has been noted as a concern in PEI due to the expansion of the substation in the town of Borden.	✓	✓	✓	• ambient air quality • greenhouse gases (GHGs) • sound quality
Groundwater Resources	The Project may overlap or run adjacent to wells. There may be public concern regarding potential interactions with drinking water. NB guidelines for linear facilities require assessment of effects on groundwater quality.	✓	✓		• groundwater quality
Freshwater Environment	The Project will span and/or run adjacent to watercourses. Interactions with fish and/or fish habitat, however unlikely, could occur because of potential crossing and/or proximity to these watercourses.	✓	✓		• freshwater fish and fish habitat • surface water quality
Terrestrial Environment	The Project may be located in or adjacent to wildlife habitat. Therefore, there are potential interactions with terrestrial wildlife species (wildlife including birds, mammals, and herptiles; flora), as well as wildlife habitats including wetlands, and any local species of conservation concern, or species at risk.	✓	✓		• plant and wildlife (including bird) species and communities, and their habitats, including wetland habitats • species of conservation concern (i.e., *Species at Risk Act* Schedule 1 species; Committee on the Status of Endangered Wildlife in Canada listings) and any species of concern of PEIDCLE or NBDELG

Table 3.10 Selected Valued Components

Valued Component (VC)	Rationale for Inclusion as a VC	EIA Volume			Factors to be Considered
		Volume 2	Volume 3	Volume 4	
		PEI	NB	Northumberland Strait	
Marine Environment	The Project will interact with the Marine Environment through installation of cables across the Northumberland Strait and with construction in the coastal environments where the cable makes landfall. There has also been concern raised regarding the interaction between fish and shellfish and electromagnetic fields (EMF) emitted from the subsea cable.			✓	• marine fish and fish habitat, including shellfish • species of conservation concern (i.e., *Species at Risk Act* Schedule 1 species; Committee on the Status of Endangered Wildlife in Canada listings) and any species of concern of PEIDCLE or NBDELG
Land Use	The Project may change or adversely affect the environment in such a way that Land Use in the vicinity of the Project may be affected. Land Use includes privately owned land along the RoW, other industrial users, and commercial (tourism) and recreational land use, as well as protected areas. Potential effects on visual quality may be of public concern with respect to commercial tourism and recreation activities.	✓	✓		• existing land uses in the area of the proposed routes, including residential, commercial, and industrial properties, as well as protected areas
Commercial, Recreational and Aboriginal Fisheries	Disruptions to fisheries activities during construction may cause public concern due to their economic and socio-cultural importance to communities.			✓	• existing commercial fisheries and aquaculture that could be affected by the Project
Socioeconomic Environment	Project construction has the potential to interact with labour and economy through employment and expenditures. However, due to the specialized nature of subsea cable installation and use of existing transmission line installation workforce, economic and employment effects are not likely to be substantial.	✓	✓		• economic and employment benefits of the Project to PEI and NB

Table 3.10 Selected Valued Components

Valued Component (VC)	Rationale for Inclusion as a VC	EIA Volume			Factors to be Considered
		Volume 2	Volume 3	Volume 4	
		PEI	NB	Northumberland Strait	
Heritage Resources	The Project may be carried out within areas with potential for archaeological or heritage resources. Physical disturbance of land may affect such resources. There is also potential for marine heritage resources to overlap with the subsea cable.	✓	✓	✓	• archaeological and heritage resources potentially located on land or in the water that may be subject to disturbance
Other Marine Users	There is potential for the marine component of the Project to interact with current marine transportation.			✓	• shipping of Construction materials and equipment to Project location • existing marine traffic and commercial activity that could be affected by the Project
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons	First Nations consultations are required for any Projects crossing public lands.	✓	✓	✓	• Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons that may be affected by the Project

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PEI-NB Cable Interconnection Upgrade Project - VOLUME 2 Prince Edward Island

Project No. 121811475

Prepared for:
Maritime Electric Company, Limited

Prepared by:
Stantec Consulting Ltd.
165 Maple Hills Avenue
Charlottetown PE C1C 1N9

September 30, 2015

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ABBREVIATIONS

%	Percent
°C	Degree Centigrade
BBS	Breeding Bird Survey
CEAA	*Canadian Environmental Assessment Act*
cm	Centimetre
CO_2e	Carbon Dioxide Equivalent
COSEWIC	Committee on the Status of Endangered Wildlife Species in Canada
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMF	Electromagnetic Fields
EPP	Environmental Protection Plan
GHG	Greenhouse Gas
H-Frame	Horizontal Frame
Hz	Hertz
IPCC	Intergovernmental Panel on Climate Change
km	Kilometre
km/h	Kilometre per Hour
km^2	Square Kilometre
kV	Kilovolt
LAA	Local Assessment Area
LiDAR	Light Detection and Ranging
m	Metre
MBBA	Maritimes Breeding Bird Atlas
MBCA	*Migratory Birds Convention Act, 1994*
MCPEI	Mi'kmaq Confederacy of Prince Edward Island
MECL	Maritime Electric Company, Limited
mm	Millimetre
NB	New Brunswick
NB *CEA*	New Brunswick *Clean Environment Act*
NB Power	New Brunswick Power
NBDELG	New Brunswick Department of Environment and Local Government
PDA	Project Development Area
PEI	Prince Edward Island

PEI *EPA*	Prince Edward Island *Environmental Protection Act*
PEIDCLE	Prince Edward Island Department of Community, Land and Environment
PEIEC	Prince Edward Island Energy Corporation
PPA	Power Purchase Agreement
PWGSC	Public Works and Government Services Canada
RAA	Regional Assessment Area
RoW	Right-of-Way
SAR	Species at Risk
SARA	*Species at Risk Act, 2002*
SOCC	Species of Conservation Concern
TRC	Technical Review Committee
VC	Valued Component

1.0 INTRODUCTION

Prince Edward Island Energy Corporation (PEIEC), with Maritime Electric Company, Limited (MECL) serving as construction agent, proposes to upgrade the electrical power interconnection between Prince Edward Island (PEI) and New Brunswick (NB).

The PEI-NB Cable Interconnection Upgrade Project (the "Project") includes construction and operation of a high voltage alternating current transmission system with the following primary components:

- two 180 megawatt, 138 kilovolt (kV) submarine cables
- two landfall sites (where the submarine cable trenches are brought ashore)
- two termination sites (for converting submarine cables to overhead transmission lines or substation)
- three-phase, 138 kV transmission lines within NB
- expansion of the existing MECL substation in Borden-Carleton, PEI
- upgrading of the New Brunswick Power Corporation (NB Power) substation in Memramcook, NB

The Project will span three geographic regions as shown in Volume 1, Figure 1.1 and includes:

- PEI – a landfall site will be located adjacent to the expanded MECL substation in Borden-Carleton, and a termination site will be located within the substation
- the Northumberland Strait – two high voltage alternating current submarine cables will span approximately 16.5 km from Cape Tormentine to Borden-Carleton
- NB – a landfall site and termination site will be constructed in Cape Tormentine as well as approximately 57 km of overhead transmission lines within new and existing easements to the existing NB Power substation in Memramcook

To reflect the three geographic regions, the environmental impact statement (EIS) for the Project is divided into four volumes:

- Volume 1 includes a detailed description of the overall Project, regulatory framework, consultation activities, and an overview of EIA methodology.
- Volume 2 (this volume) includes an assessment of potential environmental effects associated with land-based Project components and activities located in PEI.
- Volume 3 includes an assessment of potential environmental effects associated with land-based Project components and activities located in NB.
- Volume 4 includes an assessment of potential environmental effects associated with marine-based Project components and activities located in the Northumberland Strait

The following sub-sections provide an overview of Project components and activities located within PEI. A detailed description of all components and activities related to the Project is provided in Volume 1, Chapter 2.

1.1 DESCRIPTION OF PROJECT COMPONENTS IN PRINCE EDWARD ISLAND

For the province of PEI, the Project will require the construction of a new cable landfall site, construction of a cable storage building, the expansion of the existing substation (including the cable termination site and substation control building), and a short span of overhead transmission line (approximately 115 m) in Borden-Carleton (Figure 1.2).

1.1.1 Landfall Site

The submarine cables will make landfall within Borden-Carleton. The landfall site is expected to be 10 m wide with one trench for both cables. The trenches will continue from the seafloor through the intertidal zone and onto land, and will be up to 2 m in depth, depending on soil conditions. The submarine cables will diverge at the cable landfall site and continue to the substation in separate trenches. Approximately 300 m of trench onshore will be required to connect to the termination site within the new substation.

1.1.2 Termination Site

Construction of a cable termination site within the new substation at Borden-Carleton is required to transition from cable to overhead transmission. The cable termination site on the PEI side of the Northumberland Strait will be on land approximately 300 m from shore. The termination site will consist of a riser pole, ground grid, overhead switches, and perimeter fencing.

1.1.3 Substation Expansion

As a result of the additional electrical power transmitted between Memramcook and Borden-Carleton, upgrades and expansions are required to the Borden-Carleton substation. The upgrades to the Borden-Carleton substation will include expansion of the substation into a breaker-and-a-half scheme (i.e., one spare breaker for every two circuits). In addition, weather sensitive equipment will be housed in a substation control building to be built on site. The climate-controlled building will cover a footprint of approximately 125 m^2 in area (18 m x 7 m) and will house the station service for the substation as well back-up batteries and a generator. The substation will be designed so that it can be expanded to accommodate potential future transmission, generation or cable connections.

To allow for on-site storage of four 250 m spools of spare cable, a temperature-controlled cable storage building will be constructed adjacent to the existing storage building in Borden-Carleton. The building will be one-story and cover a footprint of approximately 400 m^2 in area (20 m x 20 m). Access will be through a main access door and the building will be built with a removable roof for crane access to the spools. As the building will be temperature-controlled, an on-site back-up diesel generator will be installed to maintain power to the building in the event of a power disruption.

The substation expansion and building construction will be completed within lands owned by MECL.

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Sources: Base Data - Natural Resources (2011).Project Data from Stantec or provided by NB Power / MECL. Imagery - ArcGIS Map Service World Imagery, PEI Government (2010), Natural Resources (2011).

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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121811475 - PEI-NB Marine Cable Interconnection - Maritime Electric Company Limited

General Project Overview

Figure 1.1

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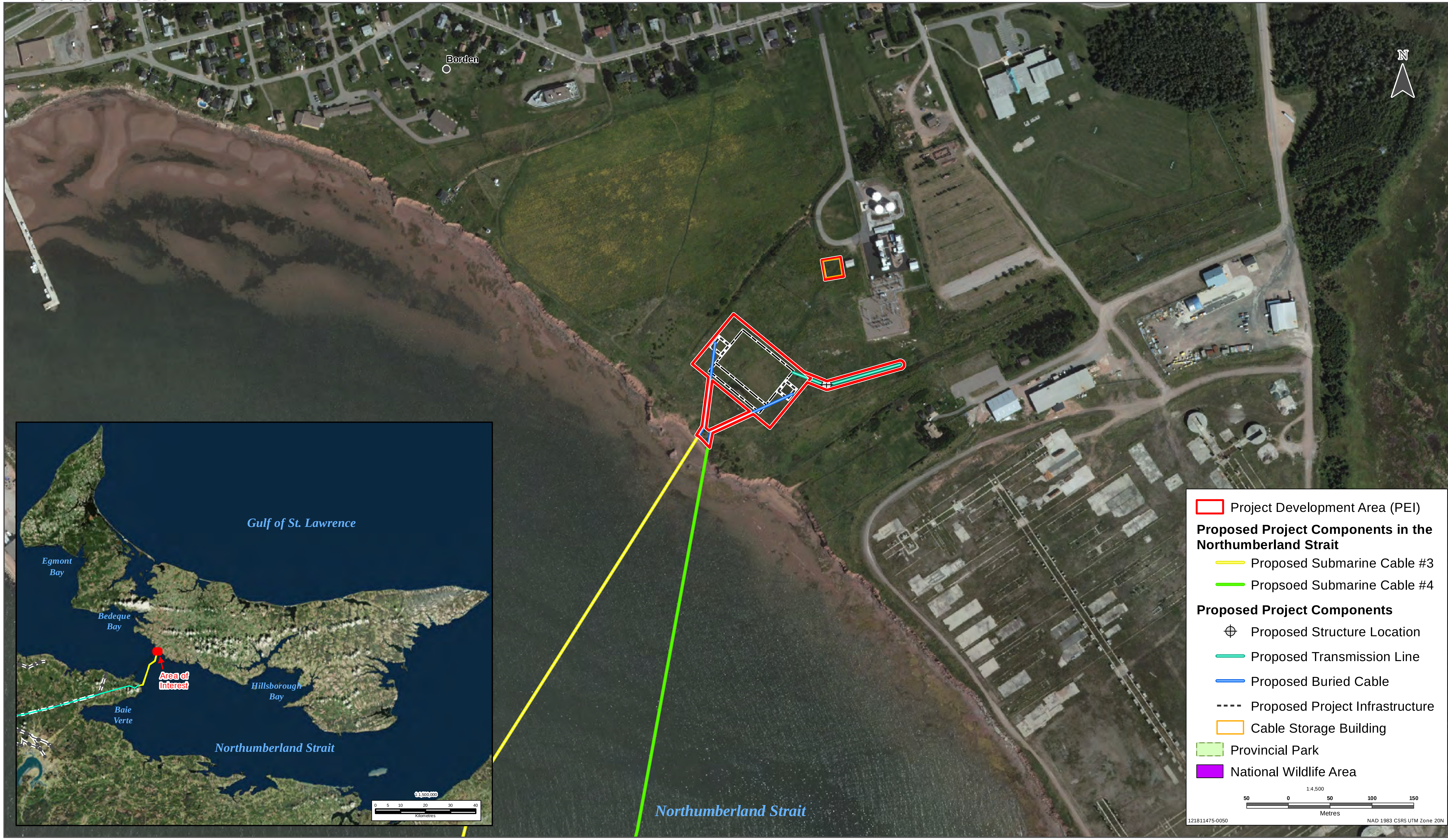

Sources: GeoNB, NB Power, PEI Government (2010),Thematic Data - ERBC, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Disclaimer: This map is for illustrative purposes to support this project; questions can be directed to the issuing agency.

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Overview of PEI Landing Site and Substation

Figure 1.2

1.1.4 Project Footprint

The total Project footprint or Project Development Area (PDA) within PEI is approximately 1.1 ha.

1.2 PROJECT PHASES AND SCHEDULE

The Project includes three phases: construction, operation, and decommissioning and abandonment.

Construction in PEI is scheduled from July to November 2016 with substation upgrades, onshore trenching and cable installation at Borden-Carleton. Construction of these components is expected to take five months. Key Project timelines are provided in Volume 1, Section 2.5.

The operation phase will begin with energizing of the marine cables, scheduled for December 2016. The operation phase duration is based on the predicted useful service life of the Project, which is estimated to be 40 years.

Land-based infrastructure will be decommissioned and abandoned at the end of its useful service life, in accordance with the applicable standards and regulations at that time. Most site infrastructure will be decommissioned, removed and sold or disposed of.

2.0 ENVIRONMENTAL SETTING AND POTENTIAL INTERACTIONS

PEI is the smallest and most densely populated province in Canada, with approximately 138,000 residents on an island approximately 220 km long and 6 to 60 km wide (CLE 2014a; Somers and Savard 2008). The geology of PEI is predominantly a sequence of flat lying continental red beds covered by a thin layer of permeable glacial till, glacio-fluvial and glaciomarine deposits (Prest 1973; Somers and Savard 2008). The majority (46%) of PEI's land mass is used for agricultural purposes, followed by approximately 40% forest cover; the remaining land use is residential, industrial/commercial, and institutional (Somers and Savard 2008).

The climate of PEI is humid-continental, the average temperature ranges from monthly average means of -8.6°C in January, to 18.4°C in July (Somers and Savard 2008). The mean average precipitation is approximately 1,078 millimetres (mm), the majority of which (75%) falls as rain (Somers and Savard 2008).

Historically, wildlife species of PEI were consistent with those of the eastern Atlantic mainland provinces, including caribou (*Rangifer tarandus*), moose (*Alces alces*), Canada lynx (*Lynx canadensis*), and others which have since been extirpated from PEI (CLE 2014b). There are more than 300 species of birds found on PEI (AF 2014), including 42 species of ducks, geese and swans, gulls, loons, grebes, cormorants, osprey (*Pandion haliaetus*), plover, sandpipers, bitterns, belted kingfisher (*Megaceryle alcyon*), and bald eagles (*Haliaeetus leucocephalus*), which are all fairly common in coastal and shoreline areas, particularly during spring through autumn months. In context of the terrestrial environment, the blackbirds, sparrows, warblers, buntings, starlings, nuthatches, chickadees, swallows, American crows (*Corvus brachyrhynchos*), and falcons are fairly common in inshore areas during the spring through fall months (AF 2014).

The Project components and activities in PEI will be within the Borden-Carleton community on the south coast of PEI, approximately 500 m from the north end of the Confederation Bridge. The proposed Project Development Area (PDA) within PEI is relatively small (approximately 1.1 ha) and is on private land which is owned by MECL. The PDA is adjacent to the MECL Generating Facility and an existing electrical substation that was built in the early 1970s when the land was acquired by MECL, The land was previously used as a fallow field for agricultural purposes and as a quarry. Recent geotechnical work conducted on the property indicated that the site is covered in 1.2 to 2.9 m of fill (Stantec 2014), likely deposited during the restoration of the quarry area.

Overall, the proposed PDA has a relatively small footprint, has already been extensively altered from its natural condition, and has no freshwater features associated with it. Aside from the post-quarry fill, there is no record of the site having been restored to its pre-disturbed condition.

2.1 POTENTIAL INTERACTIONS

Potential valued components (VCs) were reviewed to determine if there was potential for interaction with Project components located in PEI (Table 2.1). This volume considers only Project interactions in PEI. Potential interactions in New Brunswick are considered separately in Volume 3 (New Brunswick) and marine-based components of the environment are considered in Volume 4 (Northumberland Strait).

Table 2.1 Interactions Between Potential Valued Components and Project Components Located in Prince Edward Island

Valued Component	Interaction with Project Components Located in Prince Edward Island?
Atmospheric Environment	No
Groundwater Resources	No
Freshwater Environment	No
Terrestrial Environment	Yes
Marine Environment	N/A
Land Use	No
Commercial Fisheries	N/A
Labour and Economy	Yes
Heritage Resources	Yes
Other Marine Uses	N/A
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons	No
Note: N/A- Not Applicable to PEI volume.	

Terrestrial Environment, Labour and Economy, and Heritage Resources are carried through this environmental assessment as VCs (Section 3).

The following sub-sections provide rationale for not including Atmospheric Environment, Groundwater Resources, Freshwater Environment, Land Use, and Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons.

2.1.1 Atmospheric Environment

The Atmospheric Environment can be characterized by three components; air quality, climate and sound quality. The Atmospheric Environment is typically described as:

- Air quality is characterized by the measure of the constituents of ambient air, and includes the presence and the quantity of air contaminants in the atmosphere.
- Climate is characterized by the composite of generally prevailing meteorological conditions of a region, including temperature, air pressure, humidity, precipitation, sunshine, cloudiness and winds, throughout the seasons, averaged over a number of years (typically a 30 year period of record). In relation to climate change, understood to be influenced by releases of greenhouse gases (GHGs) from human activities as well as natural sources, Project-based releases of GHGs are typically used as an indicator of potential environmental effects on climate. The assessment of potential environmental effects of climate on the Project is addressed in Chapter 4 (Effects of the Environment on the Project).

Sound quality is characterized by the type, character, frequency, intensity, and duration of noise (unwanted sound) in the outdoor environment. The audible frequencies for humans are in the range of 20 to 20,000 Hertz (Hz). Vibration, identified as oscillations in matter that may lead to unwanted sound or stress in materials, is also typically considered as part of sound quality.

For the purpose of Project components assessed in Volume 2 (PEI), combustion gases and particulate matter are considered in relation to air quality, and GHGs released during combustion processes are considered in relation to climate change. Noise is evaluated based on sound pressure levels and consideration of vibration levels. Project phases include construction, operation, and decommissioning and abandonment.

The Prince Edward Island *Environmental Protection Act–Air Quality Regulations* apply to the Project for air quality objectives. There are no applicable sound quality or GHG regulations governing the Project.

2.1.1.1 Existing Conditions

The existing air quality in the vicinity of the Project is mainly influenced by traffic, nearby farming activities, and the two existing combustion turbines at the MECL site. Contributors to air pollution include combustion emissions from the MECL combustion turbines and vehicle traffic (mainly from the Confederation Bridge) and combustion and fugitive emissions, agricultural contaminant emissions, and the generation of airborne dust during agricultural activities such as plowing.

In general, air quality in the vicinity of the Project meets the air quality standards set forth by the Prince Edward Island *Environmental Protection Act–Air Quality Regulations*. During most times of the year, wind patterns in the area tend to disperse most pollutants released in the region. The ambient air quality also benefits from the infusion of relatively clean oceanic air masses from the North Atlantic. Occasionally, air masses from central Canada or the eastern seaboard to the south may transport contaminants such as ozone into the area, causing a reduction in air quality. At other times, the weather is dominated by high-pressure air masses that produce low wind speed and poor dispersion of local emissions, which can lead to elevated concentrations of air contaminants and reduced air quality.

The quantities of GHGs released to the atmosphere have been reported in Canada's national inventory report for 2013 as 1.80 million tonnes CO_2e for the province of PEI, and 726 million tonnes for Canada (Environment Canada 2015). On this basis, PEI represents a small fraction of Canada's GHG releases annually (0.25%).

Sound quality in the vicinity of the Project is mainly influenced by vehicle traffic due to the presence of the Confederation Bridge and an existing highway, as well as from operating farm machinery, and existing MECL infrastructure (combustion turbines, substation, and transmission lines). No other noise sensitive areas were identified near the PDA.

Baseline monitoring was conducted at two locations near the PDA on July 9, 2015. These locations are in a residential neighborhood/subdivision within close proximity to the substation location. A description of the locations and the monitoring periods are provided in Table 2.2. The monitoring locations are shown in Figure 2.1. The combustion turbines were not operating while baseline monitoring was conducted.

Table 2.2 Sound Pressure Level Monitoring Events

Location	Description	Date and Time		Duration (h)	Leq Measured (max. 1-hr)			Leq Measured (min. 1-hr)		
		Start	Stop		Day	Evening	Night	Day	Evening	Night
1	Adjacent to Existing Substation (100 m north)	July 9, 9:20 am	July 10, 7:17 am	22h57m	49	46	46	39	41	38
2	Nearest Residence to Substation (150 m south)	July 9, 9:38 am	July 10, 9:06 pm	11h28m	44	40	N/A	38	32	N/A
Note: L_{eq}- equivalent sound pressure level is equivalent to the total sound energy during the period.										

Monitoring was conducted using a Type A precision sound level meter manufactured by Larson Davis. The meter was located in an open area, away from trees, walls, or other obstructions.

The monitoring results are put into perspective by comparison with Nova Scotia Environment (NSE) criteria for ambient sound levels based on time of day (NSE 1989). No criteria currently exist for PEI. The criteria are written in terms of hourly equivalent (L_{eq}), which is used to represent the overall sound pressure levels during the hour. The criteria established by the NSE are as follows:

- an Leq of 65 dBA between 0700 to 1900 hours (daytime)
- an Leq of 60 dBA between 1900 to 2300 hours (evening)
- an Leq of 55 dBA between 2300 to 0700 hours (nighttime)

No exceedance of the NS criteria was recorded during the monitoring period and overall both locations are considered representative of quiet rural environments.

2.1.1.2 Potential Interactions with Project Components

Project-related releases of air contaminants to the atmosphere will include small amounts of combustion gases from the operation of on-site construction equipment and large trucks used to deliver equipment to the site. There may also be some dust generated as a result of excavation activities and equipment traveling on unpaved surfaces. However, with the use of well-maintained equipment and standard mitigation to control dust, combustion gases and dust are not likely to cause notable changes to air quality.

Releases of GHGs will occur in small quantities from fuel combustion in heavy equipment and trucks used for Project activities.

Dust is typically the primary concern in relation to air quality during construction; however, standard mitigation can control dust to below regulatory objectives. Mitigation includes timely re-vegetation of exposed soil to limit dust generation, as well as the use of dust suppressants (typically water sprays) on unpaved areas during dry periods.

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Sources: Base Data - Natural Earth. Thematic Data - ERBC, Imagery from ArcGIS Map Service GeoNB, PEI Government (2010), Natural Resources (2011).Project Data from Stantec or provided by NB Power / MECL. Buildings digitized from survey of aerial imagery.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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Noise Monitoring Locations, Borden Substation, PEI

Figure 2.1

The construction phase is short in duration, and the contractor will be required to follow a preventative maintenance schedule for equipment. As a result, Project-related releases of air contaminants to the atmosphere are not likely to cause the ambient air quality standards to be exceeded.

During construction, sound emissions and vibration will result from the operation of heavy equipment and from transportation vehicles on Project access roads.

No substantive emissions of air contaminants or GHGs will occur during Project operation. Emissions during eventual decommissioning and abandonment are expected to be similar or less than those that would occur during construction.

During operation, sound quality may be influenced by the substation, including two new reactors at the substation in Borden-Carleton. Based on the relatively low sound pressure levels measured at the site (see Table 2.1), noise is not expected to be a concern.

During operation, the effects of EMFs are not expected to be a concern. Several studies have been done to assess the potential effects of electric and magnetic fields (or EMF) at extremely low frequencies (ELF in the range of 30-300 Hertz, where power frequency is 50-60 Hertz) on human health.

Related specifically to electrical transmission lines, a federal-provincial territorial committee in Canada has reviewed the evidence and prepared a response statement in 2008 and updated it in 2009, on public concerns regarding EMF. The main conclusions are that, "In the context of power frequency EMFs, health risks to the public from such exposures have not been established" and secondly, "there is insufficient evidence showing exposure to EMFs from power lines can cause adverse health effects" (Health Canada 2009).

It is also noted that a warning to the public to avoid living near or spending time in proximity to power lines is not required (Health Canada 2009). Therefore, based on the above, no substantive interactions between the Project and the effects of EMFs are anticipated.

2.1.1.3 Summary

Based on the lack of interactions noted above, and the planned implementation of known and proven mitigation, no substantive interactions between the Project and the Atmospheric Environment are anticipated. Atmospheric Environment is therefore not considered as a VC in PEI for the purpose of environmental assessment.

2.1.2 Groundwater Resources

2.1.2.1 Existing Conditions

Groundwater is the source of drinking water for the residents and businesses of the town of Borden-Carleton. The municipal well-field for Borden-Carleton is located more than 1 km to the northeast of the PDA near Highway No. 10. The closest groundwater wells to the Project include two (inactive) industrial wells installed at the former Strait Crossing Joint Venture staging yard, located 600 m south of the Project.

2.1.2.2 Potential Interactions with Project Components

Trenching will be required for the installation of the cables to the termination site/substation. This may also require some dewatering within the trenches during the construction of the Project. Due to the depth to groundwater (estimated 2.0 to 4.5 m below ground between the power plant and the coastline) and distance to well users, these activities are not expected to interact with the existing uses of Groundwater Resources. The effects of dewatering of the trenches are expected to be local and would not extend more than 250 m from the Project site, and would not interact with pumping from the municipal wells more than 1 km inland from the site.

Once the cables are installed there will be no additional interaction during operation. During eventual decommissioning and abandonment, interactions between Groundwater Resources and the Project are anticipated to be similar to, or less than, those occurring during construction.

2.1.2.3 Summary

Based on the lack of interactions noted above, there are no substantive interactions between the Project and Groundwater Resources anticipated. Groundwater Resources is therefore not considered as a VC in PEI for the purpose of environmental assessment.

2.1.3 Freshwater Environment

2.1.3.1 Existing Conditions

Provincial mapping indicated that no watercourses or bodies of fresh water were present on the Project site in PEI. This was further substantiated with a site visit by a biologist who indicated no freshwater resources were observed.

2.1.3.2 Potential Interactions with Project Components

There are no expected interactions between the Project and the Freshwater Environment VC.

2.1.3.3 Summary

Based on the lack of interactions noted above, no substantive interactions between the Project and the Freshwater Environment are anticipated. Freshwater Environment is therefore not considered as a VC in PEI for the purpose of environmental assessment.

2.1.4 Land Use

Land Use refers to the current and future proposed use of public and private land and resources. It includes uses such as industrial, commercial, recreational, public, and private enjoyment of land and resources.

2.1.4.1 Existing Conditions

The existing MECL substation and planned landfall site are owned entirely by MECL and have been characterized as a brownfield site. The Project is adjacent to the MECL Generating Facility and an existing electrical substation built in the early 1970s when the land was acquired by MECL. The land was previously used as a fallow field for agricultural purposes and as a quarry.

The waterfront in the immediate vicinity of the Project landfall site is located in a mixture of industrial lands and former industrial lands currently available for development (Borden-Carleton 2015). The Borden-Carleton Official Plan states that land located in the Business Park is designated for light to medium industrial uses, as well as commercial use intended to support industry, or that require a significant amount of land to operate (Borden-Carleton 2015). The business park area is designed to encourage a clustered industrial development. Industrial land use development will be restricted to the Borden-Carleton Business Park, with other locations being considered based on specific location needs of a potential industrial enterprise (Borden-Carleton 2015).

2.1.4.2 Potential Interactions with Project Components

The Project is compatible with the existing land uses of the MECL substation. Local residents use the beach to walk or have bonfires; there is a well-constructed fire pit above the high water mark in the area the cables will be landing. MECL has committed to attempting to maintain a through fair for beach use during construction (where possible) and reinstating the fire pit once construction is complete.

2.1.4.3 Summary

Based on the information provided above, the Project is consistent with approved land uses for the area, and it is anticipated there will be no substantive interactions with the Project and non-commercial land use. Land Use is therefore not considered as a VC in PEI for the purpose of environmental assessment.

2.1.5 Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

The Current Use of Land and Resources for Traditional Purposes by Aboriginal People pertains to the use of land and resources for traditional purposes and to determine where the Project has the potential to interact with and change access to those lands and resources.

2.1.5.1 Existing Conditions

The landfall location for the submarine cables and termination site is located on land considered to be within Mi'kmaq traditional territory. There are two Mi'kmaq First Nation communities in PEI (Figure 2.2), Lennox Island First Nation and Abegweit First Nation, represented by the Mi'kmaq Confederacy of Prince Edward Island (MCPEI). Lennox Island First Nation is located along the northwestern coastal region of the Province (Lennox Island First Nation 2013). Abegweit First Nation consists of three reserves in different geographic locations in eastern parts of the Province (Morell Rear Reserve #2, Rocky Point Reserve #3, and Scotchfort Reserve #4) (Abegweit First Nation 2015).

While the Project lies within traditional territory of the Mi'kmaq, the land on which the PDA is located is on land that has been privately owned by MECL since the early 1970s, a portion of which was developed as a substation for existing electrical infrastructure. Prior to the acquisition of the land by MECL, the land was privately owned and used for agricultural purposes. Based on available aerial imagery, a portion of the landing site was used as a quarry between the mid-1970s and 1990.

2.1.5.2 Potential Interactions with Project Components

The Project components and activities in PEI have a relatively small footprint (approximately 1.1 ha), that is located on private land owned by MECL, and is adjacent to the MECL Generating Facility and an existing electrical substation. The land is a fallow field historically used for agricultural and as a quarry. The adjacent substation was built shortly after the acquisition of the land (early 1970s) and the previous owner was granted permission to continue to use the surrounding field for agriculture.

In the fall of 2014 and spring of 2015, initial notification and details regarding the Project were provided by email to MCPEI, and the provincial office of the Aboriginal Affairs Secretariat. On June 1, 2015, MCPEI responded with a letter stating that based on the information they have, historical and traditional Mi'kmaq use occurs outside of the PDA. A copy of the letter is included in Appendix A. Consultation with the provincial office of the Aboriginal Affairs Secretariat indicated that there are no records of current Aboriginal land and resource use in the area. It also indicated that there are no known sites of historic or cultural importance within the Project site.

Engagement and consultation activities with Aboriginal communities in PEI have been initiated and will be on-going. The exact nature, scope and detail of First Nation consultation will be determined with the Aboriginal Communities involved. Should any information regarding First Nations current use of the Project Site be identified during the regulatory approval process for the Project, this information will be presented to the regulators for consideration for the environmental assessment.

2.1.5.3 Summary

In consideration of the lack of identified Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons within or adjacent to the Project, Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons is not considered as a VC in PEI for the purpose of environmental assessment.

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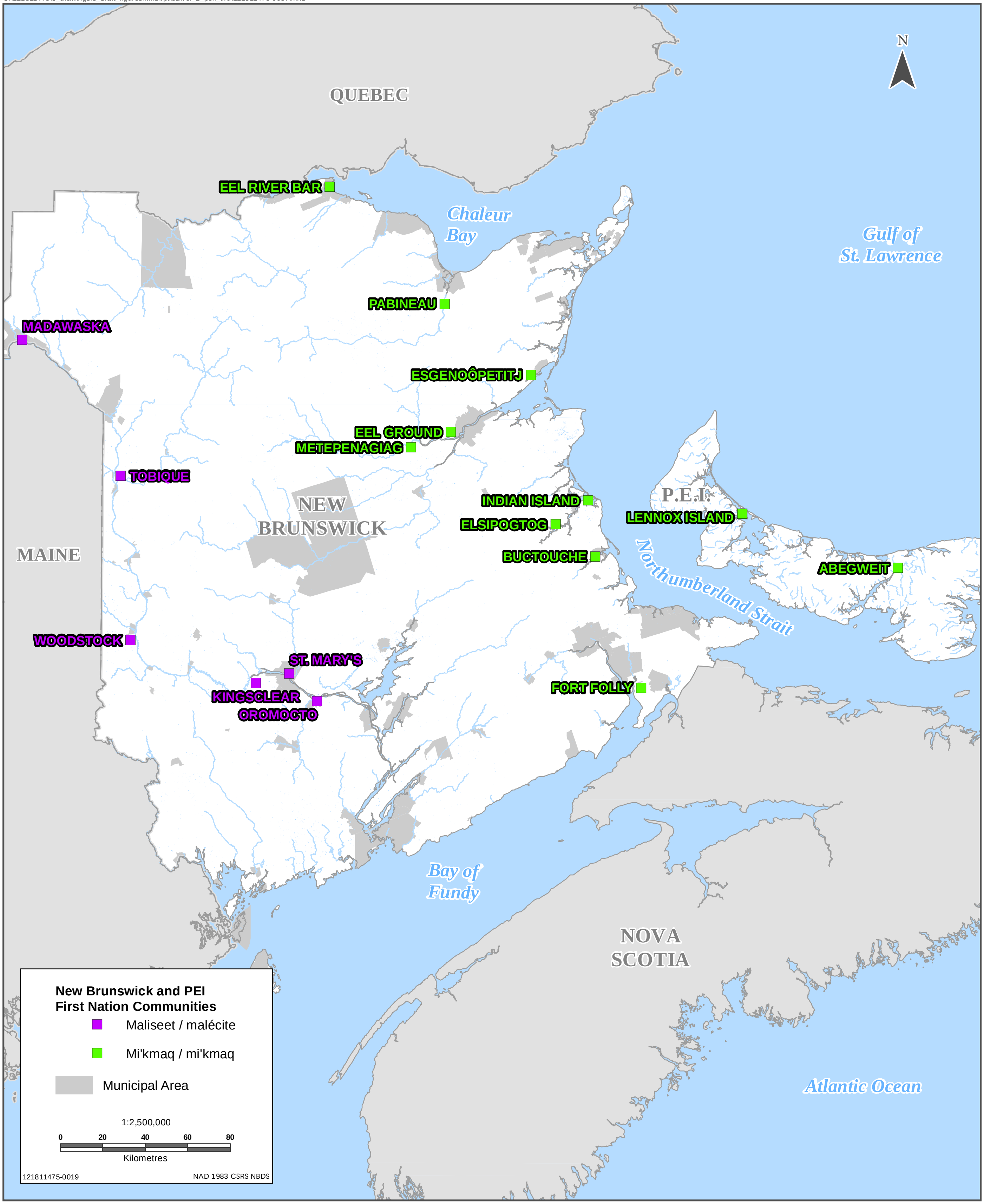

Sources: Mi'Kmaq Areas Data - Paul, Danieln: http://www.danielnpaul.com/Map-Mi'kmaqTerritory.html. Natural Resources (2011).Project Data from Stantec or provided by NB Power / MECL.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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New Brunswick and Prince Edward Island First Nation Communities

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Figure 2.2

3.0 ENVIRONMENTAL EFFECTS ASSESSMENT

3.1 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS ON THE TERRESTRIAL ENVIRONMENT

The Terrestrial Environment, including vegetation, wildlife, and wetlands, is an important environmental component that is valued by the people of Prince Edward Island for environmental, recreational, aesthetic and socioeconomic importance. Terrestrial Environment has therefore been selected as a valued component (VC) based on potential interactions between the Project and vegetation and wildlife, including species at risk (SAR) and species of conservation concern (SOCC), and wetlands, including wetland area and wetland function.

3.1.1 Scope of Assessment

This section defines and describes the scope of the assessment of potential environmental effects on Terrestrial Environment.

3.1.1.1 Regulatory and Policy Setting

3.1.1.1.1 Vegetation and Wildlife Species

This VC focuses on SAR and SOCC. SAR species include those listed as endangered, threatened or special concern by the federal *Species at Risk Act* (*SARA*) or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC assesses and designates the status of species and recommends this designation for legal protection under *SARA*. On lands under provincial jurisdiction, *SARA* goals are typically reflected through provincial legislation, policy, and guidelines. In PEI, SAR are also protected under the provincial *Wildlife Conservation Act*. The "offenses" under the provincial act are similar to *SARA*, and there are currently no associated regulations; thus, the act applies to those species listed by the federal act.

While some species included as SAR in this assessment have regulatory protection under Schedule 1 of the federal *SARA*, the definition above also includes those species listed by COSEWIC that are candidates for further review and may become protected within the timeframe of this Project.

SARA serves several purposes: to prevent the extirpation or extinction of wildlife species; to provide recovery strategies for species that are extirpated, endangered or threatened due to human activity; and to manage species of special concern so they do not become threatened or endangered. Under *SARA*, it is forbidden to kill, injure, harass, destroy the residence of, destroy the critical habitat of, capture or take an individual designated as extirpated, endangered, or threatened on federally regulated lands or designated critical habitat elsewhere.

SOCC are not listed under federal or provincial legislation but are considered rare in PEI, or the long-term sustainability of their populations has been evaluated as tenuous. SOCC are here defined as non-SAR species ranked S1 (critically imperiled) or S2 (imperiled), or S3 (vulnerable) in PEI by the Atlantic Canada Conservation Data Centre (ACCDC) (ACCDC 2015a). Unlike SAR, SOCC are not afforded any direct protection by either federal or provincial legislation. SOCC are included in this VC as a precautionary measure, reflecting observations and trends in their provincial population status, and are often important indicators of ecosystem health and regional biodiversity. Rare species are often an indicator of the presence of unusual and/or sensitive habitat; their protection as umbrella species can confer protection on their associated unusual habitats and co-existing species. Also relevant to the Terrestrial Environment, the PEI *Natural Protected Areas Act* restricts the management activities that can take place in designated Natural Protected Areas in order to preserve the natural features for which they were selected; however, there are no Natural Protected Areas near the Project.

The *Migratory Birds Convention Act* (*MBCA*) protects and conserves migratory bird populations, individuals, and their nests within all lands in Canada. All birds are covered under the *MBCA* in Canada, with the exception of some bird families (e.g., cormorants, pelicans, grouse, quail, pheasants, ptarmigan, hawks, owls, eagles, falcons, kingfishers, crows, and jays). The *MBCA* is the enabling statute for the *Migratory Birds Regulations*. Section 6 of the *Migratory Birds Regulations* states that without the authorization of a permit, the disturbance, destruction, or taking of a nest, egg, nest shelter, eider duck shelter, or duck box of a migratory bird, or possession of a migratory bird, carcass, skin, nest, or egg of a migratory bird are prohibited. As there are no authorizations to allow construction-related effects on migratory birds and their nests, best management practices and guidelines (e.g., *Migratory Birds Convention Act*: A Best Management Practice for Pipelines (Canadian Energy Pipeline Association and Stantec 2013), Incidental Take Avoidance Guidelines (EC 2015)) are available to facilitate compliance with the *MBCA*.

3.1.1.1.2 Wetlands

Wetlands are defined in the federal policy as land permanently or temporarily submerged or saturated by water near the soil surface, for long enough that the area maintains aquatic processes. These aquatic processes are characterized by plants that are adapted to saturated soil conditions, wet or poorly drained soils, and other biotic conditions found in wet environments (Government of Canada 1991).

A federal mandate for wetland conservation is provided by The Federal Policy on Wetland Conservation (Government of Canada 1991). Policy goals are intended to apply on federal lands and waters or to federal programs where wetland loss has reached critical levels, or to federally designated wetlands such as Ramsar sites. None of these conditions apply to Project lands to be developed in PEI. Wetlands in PEI are also protected under A Wetland Conservation Policy for Prince Edward Island (PEIDFAE 2003). Similar to the federal policy, the provincial policy promotes a no net loss of wetlands and wetland function within the province, and a mitigation approach that favours avoidance, then minimization, and finally, compensation.

3.1.1.2 The Influence of Consultation and Engagement on the Assessment

As outlined in Volume 1, Section 3.2 (Consultation and Engagement), scoping documents were sent to provincial regulators in PEI and New Brunswick, in addition to Public Works and Government Services Canada (PWGSC)). Responses were received from provincial regulators and Environment Canada. For the Terrestrial Environment in PEI, concerns were raised and mitigation measures were suggested regarding migratory birds, particularly in terms of site lighting and collisions with transmission lines.

3.1.1.3 Potential Environmental Effects, Pathways and Measurable Parameters

Based on knowledge of the terrestrial conditions within the PDA and surroundings, and the Project and its associated activities, the following potential environmental effects were selected for the assessment of the Terrestrial Environment: change in vegetation and wildlife; and change in wetland area and function.

Table 3.1 summarizes the potential effects, effect pathways, and measureable parameters for the Terrestrial Environment VC.

Table 3.1 Potential Environmental Effects, Effects Pathways and Measurable Parameters for the Terrestrial Environment

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in Vegetation and Wildlife	• Vegetation clearing and ground disturbance along the cable landfall sites, at the termination site, and for the substation upgrades may have an effect on vegetation and wildlife SAR/SOCC, if they are present, and will change vegetation communities and habitat for wildlife, including sensitive areas. • Sensory disturbance related to construction activities can lead to avoidance by wildlife species.	• Loss of vascular plant or wildlife SAR or SOCC (number of individuals or populations). • Loss of vegetation communities (ha). • Loss or alteration of wildlife habitat (ha). • Habitat avoidance.
	• The presence of termination site/substation and transmission cables between the cable termination site/substation and the existing transmission lines may lead to wildlife collisions, which are a cause of mortality for many avian species.	• Mortality of wildlife.
Change in wetland area and function	• Vegetation clearing and ground disturbance at grounding sites may change wetland area and function.	• Loss of wetland area (ha). • Change in wetland function.

3.1.1.4 Boundaries

3.1.1.4.1 Spatial Boundaries

The spatial boundaries for the environmental effects assessment of the Terrestrial Environment are defined below, and illustrated in Figure 3.1.

- Project Development Area (PDA): The PDA comprises the immediate area of physical disturbance associated with the construction and operation of the Project. The PDA includes 5 m around each of the cable lines, the substation expansion (including the cable termination site and substation control building), and a fence line around the expanded substation. The PDA also includes a short span of overhead transmission line that will connect the substation to the existing transmission line grid.
- Local Assessment Area (LAA): The LAA is the maximum area within which Project-related environmental effects can be predicted or measured with a reasonable degree of accuracy and confidence, and encompassing the likely zone of influence. For the Terrestrial Environment specifically, this area includes the PDA plus an additional 500 m perimeter around the PDA. The LAA is primarily defined by wildlife and wildlife habitat, where noise may penetrate wildlife habitats. The area of potential direct or indirect effects on vegetation and wetlands is expected to be much smaller than that for wildlife and wildlife habitat.
- Regional Assessment Area (RAA): The RAA is the area within which Project-related environmental effects may overlap or accumulate with the environmental effects of other projects or activities that have been or will be carried out (i.e., cumulative effects). The RAA also accommodates a wider geographic area for ecological context.

For the Terrestrial Environment, the RAA is defined as the East Prince Ecodistrict, which is 1,226.6 km^2, and cuts through Bedeque Bay and Malpeque Bay in the west, and includes those watersheds that drain into Bedeque Bay and Malpeque Bay, with the exception of Dunk River.

3.1.1.4.2 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on the Terrestrial Environment include construction, operation, and decommissioning and abandonment. Construction in the Terrestrial Environment is expected to occur over a period of 5 months, beginning in July 2016. Operation will begin following construction in December 2016 and is anticipated to continue for the life of the Project (approximately 40 years). Decommissioning and abandonment would take place following the useful service life of the Project and which would be carried out in accordance with regulations in place at that time.

Sources: GeoNB, NB Power, PEI Government (2010),Thematic Data - ERBC, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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Terrestrial Assessment Area, Wetland Boundaries and Locations of Vascular Plants

Figure 3.1

3.1.1.5 Residual Environmental Effects Description Criteria

Criteria used to characterize and describe residual environmental effects for the assessment of Terrestrial Environment are provided in Table 3.2.

Table 3.2 Characterization of Residual Environmental Effects on the Terrestrial Environment

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect.	**Positive**—an effect that moves measurable parameters in a direction beneficial to the Terrestrial Environment relative to baseline conditions. **Adverse**—an effect that moves measurable parameters in a direction detrimental to the Terrestrial Environment relative to baseline conditions. **Neutral**—no net change in measureable parameters for the Terrestrial Environment relative to baseline conditions.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions.	**Negligible**—no measurable change from baseline conditions. **Low**—a measurable change from baseline conditions, but below regulatory thresholds and does not affect the ongoing viability of terrestrial populations. **Moderate**—measurable change from baseline conditions that is above regulatory thresholds, but does not affect the ongoing viability of terrestrial populations. **High**—measurable change from baseline conditions that is above regulatory thresholds, and adversely affects the ongoing viability of terrestrial populations.
Geographic Extent	The geographic area in which an environmental, effect occurs.	**PDA**—residual environmental effects are restricted to the PDA. **LAA**—residual environmental effects extend into the LAA. **RAA**—residual environmental effects extend beyond the LAA, into the RAA.
Frequency	Identifies when the residual effect occurs and how often during the Project or in a specific phase.	**Single event**—occurs once during the life of the project. **Multiple irregular event**—occurs more than once at no set schedule. **Multiple regular event**—occurs more than once at regular intervals. **Continuous**—occurs continuously.
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the effect can no longer be measured or otherwise perceived.	**Short-term**—residual effect restricted to the duration of proposed construction. **Medium-term**—residual effect extends through two or more growing/breeding seasons. **Long-term**—residual effect extends beyond the life of the project.
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases.	**Reversible**—the effect is likely to be reversed after activity completion and reclamation. **Irreversible**—the effect is unlikely to be reversed.

Table 3.2 Characterization of Residual Environmental Effects on the Terrestrial Environment

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Ecological and Socioeconomic Context	Existing condition and trends in the area where environmental effects occur.	**Undisturbed**—area is relatively undisturbed or not adversely affected by human activity. **Disturbed**—area has been substantially previously disturbed by human development or human development is still present.

3.1.1.6 Significance Definition

3.1.1.6.1 Change in Vegetation and Wildlife

For a change in vegetation and wildlife, a significant adverse residual environmental effect on the Terrestrial Environment is defined as one or more of the following:

- one which alters the terrestrial habitat in such a way as to cause decline in the distribution or abundance of a viable population of SAR/SOCC
- one which results in direct mortality of individuals or communities of SAR/SOCC such that long term survival within the RAA is substantially reduced as a result
- one which results in a non-permitted contravention of any of the prohibitions stated in Sections 32-36 of *SARA*
- in the case of any SAR/SOCC, any non-compliance with the management plans (developed as a result of Section 65 of *SARA*) currently in place
- one which results in direct mortality of individuals such that long-term survival of wildlife populations within the RAA is substantially reduced as a result
- one which results in a reduction in wildlife dispersal or migration such that long-term survival of wildlife populations within the RAA is substantially reduced as a result
- one which affects vegetation communities and wildlife habitat in such a way as to cause a decline in abundance or change in distribution of common and secure populations such that the populations will not be sustainable within the RAA

3.1.1.6.2 Change in Wetland Area and Function

For a change in wetland area and function, a significant adverse residual environmental effect on the Terrestrial Environment is defined as:

- one which results in an unauthorized permanent net loss of wetland function
- one which results in the loss of important function (i.e., one that would result in a significant effect on another VC that relies upon wetlands) at the RAA level, provided by a wetland that cannot be avoided or mitigated

3.1.2 Existing Conditions for the Terrestrial Environment

3.1.2.1 Methods

3.1.2.1.1 Information Sources

Records for vegetation, wildlife, and sensitive areas occurring within the LAA and surrounding area were obtained from various sources, including the ACCDC, the North American Breeding Bird Survey (BBS), the Maritimes Breeding Bird Atlas (MBBA), and the Atlantic Canada Nocturnal Owl Surveys.

Atlantic Canada Conservation Data Centre

The ACCDC is a registered charity that was established in 1997, and has the following mission statement: "*To assemble and provide objective and understandable data and expertise about species and ecological communities of conservation concern, including those at risk, and to undertake field biological inventories in support of decision-making, research, and education in Atlantic Canada*." (ACCDC 2015b). ACCDC data, including SAR, SOCC, and managed areas, were obtained within 5 km of the Project (ACCDC 2015c).

North American Breeding Bird Survey

The BBS began in 1966 and is now one of the longest-running breeding bird surveys in North America. The BBS database is extensive and can be used to determine long-term population trends of breeding bird species in Canada. A search of the BBS database was conducted to obtain records of bird species observed near the PDA (EC 2014).

A request for BBS data from NatureCounts (BSC 2015) within the LAA returned no results.

Maritimes Breeding Bird Atlas

The second MBBA 2006-2010 was a five-year project to update the distribution and abundance of all bird species breeding in the three Maritime provinces. The first MBBA was conducted from 1986 to 1990. The MBBA database provides information including species presence, breeding evidence, and relative abundance in a given 10 km by 10 km area (known as an "atlas square"). Data was obtained for the atlas square 20MS42, which encompasses the Project.

Atlantic Canada Nocturnal Owl Surveys

The Atlantic Canada Nocturnal Owl Survey was initiated in 2001 to help monitor trends in the abundance of relatively common owls. The survey seeks to monitor the region's owl populations and gather information about the distribution of owls in Atlantic Canada.

The Atlantic Canada Nocturnal Owl Survey database from Bird Studies Canada, accessed via the NatureCounts website (BSC 2015), provides basic information about the presence of owl species detected from specific points on survey routes (called "survey stops") in a given year. Data are available from 2001 to 2007.

A request for Atlantic Canada Nocturnal Owl data from NatureCounts (BSC 2015) returned no results within the LAA.

3.1.2.1.2 Field Methods

Field surveys for vegetation and wetlands were conducted on September 10, 2014, within the PDA and a 30 m buffer, and between the PDA and coastline, as a specific landing site was not identified at that time. All vascular plant species encountered were recorded. Wetland boundaries were delineated using hydrophytic vegetation and evidence of hydrology; dominant species were recorded for each wetland. Wetland classification followed the Canadian Wetland Classification System (NWWG 1997). Incidental wildlife observations were recorded during this survey.

A bird survey was conducted within the breeding bird season on June 25, 2015. Approximately 1.5 hours were spent on site conducting an area search of the PDA and a 50 m buffer, and all birds that were seen or observed within the PDA and surrounding area during that time, including nearshore birds, were recorded.

Nomenclature for all taxa follows that used by the ACCDC (ACCDC 2014).

3.1.2.2 Overview

3.1.2.2.1 Vegetation

The ACCDC data for the site did not indicate the presence of any SAR or SOCC plants within the PDA or LAA (ACCDC 2015c). The closest managed area is Noonan's Marsh, a Ducks Unlimited wetland, approximately 1 km north of the PDA, on the north side of TransCanada Highway 1 (ACCDC 2015c; DUC 2015).

The PDA is located within a graminoid-dominated field adjacent to the existing Borden-Carleton substation. The field contains several wetlands, described further in Section 3.1.2.2. Part of this field is currently used for hay, including portions of the wetlands. Historical imagery of the site indicates a variety of past land uses, including farming, and a quarry that was active in the mid-1970s (PEIDAF 1935, 1958, 1974, 1990, 2000).

Land classification within the PDA, LAA, and RAA is summarized by area and percent in Table 3.3.

Table 3.3 Land Classification within the PDA, LAA and RAA

Land Classification	PDA		LAA		RAA	
	Hectares	%	Hectares	%	Hectares	%
Agricultural	-	-	6.2	10.2	34,618.4	65.4
Bare soil	-	-	-	-	26.1	0.05
Beach	-	-	-	-	0.7	0.001
Developed	0.04	3.5	54.6	76.0	4,787.5	9.0
Forest	-	-	1.1	1.5	9,211.1	17.4

Table 3.3 Land Classification within the PDA, LAA and RAA

Land Classification	PDA		LAA		RAA	
	Hectares	%	Hectares	%	Hectares	%
Graminoid-dominated Upland Area	0.9	78.1	9.5	13.2	1,119.9	2.1
Shrub-dominated Upland Area	-	-	0.1	0.2	481.0	0.9
Water	-	-	-	-	0.3	0.0006
Wetland	0.2	18.4	0.3	0.5	2,008.04	3.8
Wetland - Forested	-	-	-	-	670.1	1.3
Total	**1.1**	**100**	**71.9**	**100**	**52,923.3**	**100**

During the 2014 site visit, 98 vascular plants were observed within the PDA and surrounding surveyed area (Appendix B). No vascular plant SAR were observed within the surveyed area. Two vascular plant SOCC were observed: slender wild rye (*Elymus trachycaulus*) ranked S2 by the ACCDC; and rough cocklebur (*Xanthium strumarium*) ranked S3. Slender wild rye was observed at the edge of the coast, amid northern bayberry (*Morella pensylvanica*), approximately 75 m northwest of the northern cable PDA. Rough cocklebur is located at the base of the till face, approximately 10 m northwest of the edge of the northern cable PDA. The locations are indicated on Figure 3.1.

3.1.2.2.2 Wildlife

Information sources, including the ACCDC and MBBA, indicate 87 species of birds have been recorded near the LAA (i.e., within 5 km of the PDA, or within the MBBA square, Appendix C). Of the species recorded by the ACCDC and MBBA, three are SAR and ten are SOCC (two that were field observed).

Nine bird species were observed during the two site visits (Table 3.4). No SAR were observed within the PDA or surrounding area, but two SOCC, a single Arctic tern (*Sterna paradisaea*) and a single herring gull (*Larus argentatus*), were observed flying in the Northumberland Strait. Arctic tern is ranked S1B in PEI, which means that its breeding population is considered critically imperiled in PEI (ACCDC 2015a). Herring gull is ranked S3B, S5N in PEI, which means that its breeding population is considered vulnerable in PEI. Neither bird was interacting with the PDA or surrounding area, nor are there known seabird colonies within the LAA. A flock of double-crested cormorants was observed in both September 2014 and June 2015, using the coastal areas, breakwaters, and docks beyond the PDA for foraging and loafing. Although no SAR or SOCC were observed using the site, the habitat may be appropriate for some SAR and SOCC, including bobolink (*Dolichonyx oryzivorus*), which is threatened under *SARA*, NB *SARA*, and COSEWIC; common nighthawk (*Chordeiles minor*), which is also threatened under *SARA*, NB *SARA*, and COSEWIC; and killdeer (*Charadrius vociferus*), which is listed as S3B by ACCDC.

Table 3.4 Bird Species Observed during Field Surveys within the PDA and Surrounding Area

Common Name	Scientific Name	ACCDC Rank	Number Observed Sept. 2014	Number Observed June 2015
American Crow	*Corvus brachyrhynchos*	S5	1	-
Arctic tern	***Sterna paradisaea***	S1B	1	-
Double-crested Cormorant	*Phalacrocorax auritus*	S5B	100	150
European Starling	*Sturnus vulgaris*	SNA	20	-
Great black-backed Gull	*Larus marinus*	S4B,S5N	-	3
Herring Gull	***Larus argentatus***	S3B,S5N	1	-
Northern Harrier	*Circus cyaneus*	S4B	1	-
Savannah Sparrow	*Passerculus sandwichensis*	S5B	1	2
Song Sparrow	*Melospiza melodia*	S5B	-	3
Yellow Warbler	*Dendroica petechia*	S5B	-	1
Note: SOCC are indicated in bold text.				

Of the other, non-SAR/SOCC observed on or near the PDA, evidence of nesting was recorded for the savannah sparrow, song sparrow, and yellow warbler.

One herpetile, spring peeper (*Hyla crucifer*, S5), was observed within a wetland within the PDA. No other wildlife species were observed.

Species at Risk

Based on data provided by ACCDC and MBBA, three species at risk have historically been recorded in the Project vicinity: barn swallow, bobolink and Canada warbler. Barn swallow and bobolink have potential to nest within the LAA due to the presence of suitable habitat. These species were not observed during field surveys conducted within the PDA in June 2015.

<u>Barn Swallow</u>

The barn swallow is a mid-sized passerine that is closely associated with rural human settlements. This species is the most widespread swallow in the world, and is known to breed in all provinces and territories in Canada (COSEWIC 2011). The barn swallow is ranked as threatened by COSEWIC and S3B by the ACCDC. It has no *SARA* rank at this time.

Following European settlement of North America, barn swallows shifted from nesting in caves and on ledges to nesting largely in man-made structures. This insectivorous species prefers open habitats for foraging such as pastoral lands, shorelines, and cleared rights-of-way. Although this species was not observed within the PDA or surrounding area, it is possible that it could use the PDA and LAA for foraging. There are buildings within the LAA, so there is also some potential that barn swallow may nest within the LAA.

The BBS (EC 2014) indicates that this species is undergoing a decline in population, although the species is still common and widespread (COSEWIC 2011). The main threats to the species include loss of nesting and foraging habitat, and the large-scale declines in some insect populations which provide food for this species.

<u>Bobolink</u>

Bobolink is a medium-sized passerine that breeds in the southern part of all Canadian provinces from British Columbia to Newfoundland and Labrador. Bobolink is ranked as threatened by COSEWIC, and S3B by the ACCDC. It has no *SARA* rank at this time.

Bobolink originally nested in the tall-grass prairie of the mid-western US and south central Canada. As this habitat was converted to agricultural land, and forests of eastern North America were cleared to hayfields and meadows, the range of bobolink expanded (COSEWIC 2010). Bobolink presently nest in a variety of forage crop habitats, and natural grassland habitats including wet prairie, graminoid peatlands, and abandoned fields dominated by tall grasses. The habitat within the PDA and LAA represents suitable nesting habitat for bobolink, though the periodic mowing of the site for hay would limit the potential for Bobolink to nest in the LAA.

The BBS (EC 2014) indicates that this species is in decline at a Canada-wide and province-wide level.

<u>Canada Warbler</u>

Canada warbler is a small and brightly colored passerine. Approximately 80% of the entire breeding range of this species is located in Canada (COSEWIC 2008), where it can be found breeding in every province and territory except Newfoundland and Labrador and Nunavut. Canada warbler is ranked as threatened on Schedule 1 of *SARA* and S3B by the ACCDC.

Canada warbler inhabits a wide range of forest types, including deciduous, coniferous and mixedwood forests. It is often associated with moist mixed wood forest and riparian shrub forests on slopes and ravines (COSEWIC 2008). The presence of a well-developed shrub layer also seems to be associated with preferred Canada warbler habitat. This habitat does not occur within the PDA or LAA; therefore, it is unlikely that this species uses the PDA or LAA.

The BBS (EC 2014) reports that this species is in decline Canada-wide and at a province-wide level in PEI.

Species of Conservation Concern

A search of the ACCDC and MBBA databases revealed records of seven species of conservation concern with the potential to occur in the LAA. One of these, herring gull, and an additional species, Arctic tern, were identified during field surveys conducted by Stantec in June 2014.

Arctic Tern

The Arctic tern is a small, slender bird that is well-known for its long yearly migration, which is the farthest yearly journey of any bird species. This species is ranked as S1B in PEI by the ACCDC. It has no *SARA* rank at this time.

Arctic terns breed colonially in open tundra, boreal forest, or on rocky islands and beaches. This species may migrate far off shore in search of small fish and crustaceans (Cornell Lab of Ornithology 2015). There are no known colonies near the LAA and minimal optimal habitat within the LAA, so it is unlikely that this species is nesting in or near the LAA.

The BBS (EC 2014) indicates that this species is undergoing a decline in population Canada-wide. Data on populations and threats for this species are limited (Cornell Lab of Ornithology 2015).

Herring Gull

The herring gull is a large gull species, and one of the most recognizable and ubiquitous gulls in Canada. This species is ranked as S3B, S5N in PEI by the ACCDC and has no *SARA* rank at this time.

Herring gulls scavenge over open water, intertidal pools and shallows, mud flats, landfills, picnic ground, fish-processing plants and other anthropogenic locations. Colonial breeding takes place near lakes and coastal areas, and often on isolated islands, barrier beaches, and marshy hummocks safe from terrestrial predators. The LAA would not represent optimal nesting habitat for this species because of the lack of suitable coastal habitat, although there is some potential that they could nest on flat-topped buildings within the LAA. No nests were observed during field surveys.

The BBS (EC 2014) reports that this species population is in decline at the Canada-wide and provincial-wide level. Human activities constitute the key threats to this species (Cornell Laboratory of Ornithology 2015).

3.1.2.2.3 Wetlands

There are five wetlands within the PDA and surrounding surveyed area, which range in size from 0.01 to 0.16 ha (Figure 3.1). All wetlands within and adjacent to the PDA are graminoid-dominated basin marshes, with no trees. The largest wetland, Wetland 1, is marginal except for an area in the northern portion of the wetland that is located near a guy wire for a communications tower. This wetland is dominated by reed canary grass (*Phalaris arundinaceae*), and the majority of it is used as a hay field. The hayfield had been recently mowed at the time of the site visit in 2014. Wetland 1 is hydrologically connected to (and drains into) Wetland 2, the next largest wetland, located to the south. Wetland 2 has a dense cover of narrow-leaved cattail (*Typha angustifolia*) and broad-leaved cattail (*T. latifolia*). There is no open water, but in the centre of the wetland the vegetation forms a floating mat. This wetland discharges into the ocean via a drainage swale.

There are three smaller wetlands (Wetlands 3, 4, and 5) to the west that are similar in species composition. These wetlands contain scattered shrubs including red osier dogwood (*Cornus sericea*), green alder (*Alnus viride*), northern bayberry, and a variety of willows such as pussy willow (*Salix discolor*), shining willow (*S. lucida*), Bebb's willow (*S. bebbiana*), and upland willow (*S. humilis*). Herbaceous vegetation was dominated by black-girdled bulrush (*Scirpus atrocinctus*), Arctic rush (*Juncus balticus*), and New York aster (*Symphyotrichum novi-belgii*). Despite their proximity to the coast, these wetlands are not dominated by typical coastal species.

There is no evidence that the wetlands within the PDA existed when this land was used for farming and prior to the development of the quarry. The wetlands that are currently present likely formed within low-lying areas as the site slowly rehabilitated after the quarry was abandoned, sometime before 1990 (PEIDAF 1974, 1990, 2000).

The wetlands in the study area have limited functions. There is no evidence that they provide important habitat for wildlife or plant SAR or SOCC. Wetland 1 provides economic benefits in the form of hay, as do the upland hay fields. All of the wetlands provide a hydrological benefit in that they slow the flow of surface water and prevent erosion. Given the close proximity of the wetlands to the ocean, they would have no value in regards to flood control.

3.1.3 Project Interactions with the Terrestrial Environment

Potential Project interactions with Terrestrial Environment are presented in Table 3.5. These interactions are indicated by check marks, and are discussed in Section 3.1.4 in the context of effects pathways, standard and project-specific mitigation/enhancement, and residual effects. Following the table, justification is provided for non-interactions (no check marks).

Table 3.5 Potential Project-Environment Interactions and Effects on the Terrestrial Environment

Project Components and Physical Activities	Potential Environmental Effects	
	Change in Vegetation and Wildlife	Change in Wetland Area or Function
Construction		
Landfall Construction	✓	✓
Expansion of Electrical Substation	✓	✓
Emissions and Wastes	✓	–
Transportation	–	–
Employment and Expenditure	–	–
Operation		
Energy Transmission	✓	–
Vegetation Management	✓	–

Table 3.5 Potential Project-Environment Interactions and Effects on the Terrestrial Environment

Project Components and Physical Activities	Potential Environmental Effects	
	Change in Vegetation and Wildlife	Change in Wetland Area or Function
Infrastructure Inspection, Maintenance and Repair (Transmission Lines and Substations)	–	–
Emissions and Wastes	–	–
Transportation	–	–
Employment and Expenditure	–	–
Decommissioning and Abandonment		
Decommissioning	✓	–
Reclamation	✓	–
Emissions and Wastes	✓	–
Employment and Expenditure	–	–

Notes:
✓ = Potential interactions that might cause an effect.
– = Interactions between the project and the VC are not expected.

3.1.3.1 Construction

Transportation, and employment and expenditure are not expected to interact with a change in vegetation and wildlife or a change in wetland function during construction. Emissions and wastes are not expected to interact with a change in wetland function. Construction activities with potential interactions are further discussed below in Section 3.1.4.

3.1.3.2 Operation

Infrastructure inspection, maintenance and repair, emissions and wastes, transportation and employment and expenditure are not expected to interact with a change in vegetation and wildlife during operation. Operation activities with potential interactions are further discussed below in Section 3.1.4.

There are no activities associated with operation that have potential interactions that might cause an effect with a change in wetland function.

3.1.3.3 Decommissioning and Abandonment

Employment and expenditure is not expected to interact with a change in vegetation and wildlife during operation. Decommissioning and abandonment activities with potential interactions are further discussed below in Section 3.1.4.

There are no activities associated with decommissioning and abandonment that have potential interactions that might cause an effect with a change in wetland function.

3.1.4 Assessment of Residual Environmental Effects on the Terrestrial Environment

3.1.4.1 Analytical Assessment Techniques

The assessment of potential environmental effects on the Terrestrial Environment was conducted using both desktop information and the results of field surveys, as described in Section 3.1.2. Vegetation and wetlands surveys within the PDA and surrounding area were conducted within the growing season by qualified biologists with experience in botany, wetland delineation and classification, and wildlife surveys. Bird surveys were conducted within the breeding bird season by a qualified avian biologist who conducted an area search of the PDA and surroundings.

3.1.4.2 Assessment of Change in Vegetation and Wildlife

3.1.4.2.1 Project Pathways for Change in Vegetation and Wildlife

Construction

The construction of the Project has potential to result in adverse environmental effects resulting in the loss of vascular plant SOCC, the loss of vegetation communities and wildlife habitat, sensory disturbance to wildlife resulting in habitat avoidance, and mortality of wildlife through transmission line strikes.

Landfall construction includes the substation expansion (including the cable termination site and substation control building) and trenching and infilling approximately 300 m above the high water mark for each cable line. One of the SOCC observed near the PDA, rough cocklebur, is located at the base of the till face, approximately 10 m northwest of the edge of the PDA of the northern cable line. Although this plant is outside of the PDA, in the absence of mitigation, machinery used to install the cable line could damage or destroy this plant.

These activities will disturb approximately 1.1 ha of vegetation communities and wildlife habitat, including 0.2 ha of wetland, discussed in Section 3.1.2. Of the 1.1 ha that will be disturbed during construction, approximately 0.5 ha (including 0.1 ha of wetland) will be permanently lost due to the construction of the cable termination site and placement of a transmission line pole. Areas disturbed during construction will be restored to natural vegetation after construction is complete.

Construction activities will also produce sensory disturbance such as light and noise. Such disturbance has potential to result in temporary habitat loss as a result of reduced habitat effectiveness (i.e., avoidance). Breeding and rearing success for some wildlife species could potentially be affected by sensory disturbance (Bayne *et al.* 2008).

The Project may lead to increased bird mortality resulting from collision with construction equipment. Although birds can collide with non-illuminated structures, light sources have been shown to be an attractant to migrating birds. This phenomenon is worse at night or during inclement weather

(Avery *et al.* 1976; Ogden 1996; Wiese *et al.* 2001; Longcore and Rich 2004). This interaction would be of short duration, limited in extent to areas near active construction, and would cease at the completion of construction activities.

Increased activity, noise, and illumination at night during construction activities could also cause an increase in indirect mortality risk. Sensory disturbance could result in certain wildlife species suffering reduced productivity and nest abandonment. Some wildlife, including small mammals, reptiles, and amphibians, might move out from cover in response to disturbance (particularly noise or vibration) which could increase mortality risk from exposure to predation. However, as the site is currently mowed for hay on at least an annual basis, wildlife that use the PDA are currently experiencing periodic disturbance.

Operation

During operation, vegetation management (particularly, vegetation control) has potential to result in adverse environmental effects resulting in the alteration of vegetation communities and wildlife habitat. These areas will have been disturbed during initial construction activities. Considering the habitat currently present within the PDA (graminoid-dominated field), minimal, if any, vegetation management will be required.

The presence of the cable termination site/substation could interact with migrating birds through direct collisions, and lighting, described above in Section 3.1.3. Although many birds migrating through this area (seabirds such as scoters, eiders, gannets, and mergansers) will migrate over the Northumberland Strait, some species groups such as dabbling ducks will migrate over land, potentially stopping or staging in nearby wetlands, such as Amherst Cove Marsh, approximately 700 m east of the PDA, or Noonans Marsh, approximately 1 km north of the PDA (Jacques Whitford 1994; M. Crowell, pers. comm.). The height of the cable termination site will be approximately 12 m, which is equal to or lower than the surrounding infrastructure, including the communication tower located on the property.

The presence of transmission lines to connect the termination site/substation to the existing transmission lines may result in wildlife mortality through wildlife strikes. Transmission line collisions have recently been estimated to be the third leading cause of human-related mortality of birds in Canada, behind predation by feral cats and domestic cats (Calvert *et al.* 2013). In particular, waterfowl and waterbirds are more susceptible to transmission line collisions due to high wing loading (i.e., body weight divided by wing area), which limits their reaction time (APLIC 2012; Bevanger 1998; Rioux *et al.* 2013).

Birds which are attracted to transmission lines may be electrocuted when there is inadequate separation between energized conductors or energized conductors and grounded hardware. Most electrocutions occur on medium-voltage distribution lines (4 to 34.5 kilovolts (kV)), in which the spacing between conductors may not be adequate to allow birds to pass through (APLIC and USFWS 2005). Poles with energized hardware such as transformers can be especially hazardous, even to small birds, as the numerous energized parts are closely-spaced. Dry feathers can act as insulation, so contact must be made between fleshy parts, such as the wrists, feet, or other skin, for electrocution to occur (APLIC and USFWS 2005).

In general, nocturnal migrants (i.e., passerines) are high-flyers and are not prone to collision during flight. In contrast, diurnal migrants (e.g., waterfowl, waterbirds, raptors) have flight heights that are more varied. Waterfowl are the species group most susceptible to wire collision (Erickson et al. 2001); however, in the absence of potential staging areas (e.g., shallow water wetlands, lakes), they are likely to be flying higher than the height of the transmission lines. Although there are potential staging areas near the PDA (Amherst Cove Marsh and Noonans Marsh), these are far enough away that birds will typically have reached a height above the planned height of the cable termination site (i.e., approximately 10 m) prior to passing the PDA. The transmission line is relatively short (approximately 115 m) and the site is not heavily used by birds (as observed during field surveys), which will further limit interactions between the project and migrating birds.

Decommissioning and Abandonment

It is well known that birds (especially ospreys, but also crows, owls, and hawks) nest on transmission structures. The riser stations could present ideal nesting locations for larger birds, as they are typically the highest point in an area, are stable, and are easily accessible to birds. Decommissioning the riser stations may interact with nesting birds, if any are present.

Similar to construction, decommissioning and abandonment activities may also produce sensory disturbance such as light and noise. Such disturbance has potential to result in temporary habitat loss as a result of reduced habitat effectiveness (i.e., avoidance). Breeding and rearing success for some wildlife species could potentially be affected by sensory disturbance (Bayne et al. 2008).

Reclamation activities associated with decommissioning, if the site is re-naturalized, will result in an increase in native vegetation communities and wildlife habitat.

3.1.4.2.2 Mitigation for Change in Vegetation and Wildlife

The following well-established practices to reduce the interaction between the Project and vegetation and wildlife will be implemented during construction and operation:

- Flag and avoid known locations of individuals of SOCC, when possible.
- Avoid construction, particularly clearing activities, in areas of native vegetation during the breeding season for migratory birds (April 1 to August 31), if possible.
- If completion of clearing outside the breeding season is not possible, work will be conducted according to an avian management plan which will include breeding bird surveys to determine if any nesting activity is occurring at this time. If active nests are observed in the area to be cleared, additional mitigation will be employed such as flagging the area and avoidance of nests until the young have fledged.
- Use approved noise arrest mufflers on equipment to reduce potential environmental effects of noise.
- Use full cut-off lighting to reduce attraction to migrating birds, where possible.
- Avoid exterior decorative lights such as spot lights and flood lights, where only intended to highlight features of structures.
- Use motion sensors to reduce lighting use, where possible.

- Confine clearing and grubbing to PDA footprint.
- Reduce grading in native vegetation communities.
- Ensure equipment arrives at the site clean and free of soil or vegetative debris.
- Operate vehicles and equipment on previously disturbed areas, wherever feasible.
- Limit size of temporary workspaces.
- Properly store and dispose of construction site wastes that might attract wildlife.
- Allow for natural regeneration when possible, and when not possible, use a native seed mix for revegetation.
- Restrict vegetation management to necessary areas.
- Comply with the conditions of the vegetation management permit received from PEIDCLE.
- Use an Environmental Protection Plan.
- Provide a nesting platform during and following decommissioning and abandonment if any bird species are nesting at the termination site.
- Restore temporarily disturbed areas to pre-construction conditions.

The mitigation described above will limit the reduction of vegetation communities and wildlife habitat, and will also reduce wildlife mortality that could be caused by the Project. Some loss of vegetation communities and wildlife habitat is predicted, but the mitigation will reduce potential interactions with vegetation and wildlife. Vegetation communities and habitat for wildlife species will remain available in the surrounding landscape.

3.1.4.2.3 Residual Project Environmental Effect for Change in Vegetation and Wildlife

Approximately 0.6 ha of vegetation communities and wildlife habitat will be temporarily disturbed (single event) during construction as a result of cable line installation and general construction (i.e., areas within the PDA but not within the footprint of permanent structures), including 0.4 ha of graminoid-dominated upland area and 0.1 ha of wetland (discussed further in Section 3.1.4.3). This habitat will be restored following construction and thus does not represent a permanent loss; however, it is expected that the wetland areas will be converted to upland in the restoration process.

Approximately 0.5 ha of vegetation communities and wildlife habitat will be permanently lost as a result of the construction of the termination site/substation expansion and installation of a transmission line pole, including 0.4 ha of graminoid-dominated upland area and 0.1 ha of wetland (discussed further in Section 3.1.4.3). With mitigation, permanent habitat loss will be restricted to approximately 0.5 ha of habitat types that are abundant in the LAA and RAA, (i.e., loss of 0.04% of this habitat type within the RAA).

During construction, the Project will result in the direct loss of vegetation communities and wildlife habitat within the PDA. The construction of the Project is not expected to interact with SAR or SOCC. This loss occurs in an area with a history of disturbance, that continues to occur (i.e., mowing for hay at least annually). With mitigation, this activity will result in low adverse changes within the LAA which are medium-term (for restored areas) and permanent (for areas within the permanent footprint) in duration. These changes will occur in a single event, and will be reversible after decommissioning and abandonment.

During operation, vegetation management will result in disturbance of vegetation communities and wildlife habitat. Much of the LAA is currently mowed at least annually for hay; therefore, vegetation management during operation will represent a lower frequency of disturbance than most of the LAA currently experiences. These areas will have been previously disturbed during construction. With mitigation, this activity will result in negligible adverse changes restricted to the PDA, medium-term in duration, occurring at regular intervals, and will be reversible.

During both construction and operation there is potential for the Project to interact with migrating birds. In consideration of the height of the structure relative to surrounding infrastructure and the limited use of the area by migrating birds, with mitigation, the Project will result in low adverse changes restricted to the LAA, medium term in duration, occurring at regular intervals, and will be reversible.

During operation, there is also potential for the presence of the transmission line to result in direct mortality of birds through transmission line strikes. Because of the limited length of the transmission line (approximately 115 m) and the limited use of the site by birds (as observed during field surveys), the potential increase in wildlife mortality within the LAA resulting from the presence of the transmission line is expected to be negligible, restricted to the PDA, medium term in duration, occurring at irregular intervals, and reversible.

During and following decommissioning and abandonment, the site will be restored to natural vegetation. This will represent a low magnitude, positive change to vegetation and wildlife within the LAA, which will be medium-term in duration and occurring in a single event, which will be reversible.

3.1.4.3 Assessment of Change in Wetland Area or Function

3.1.4.3.1 Project Pathways for Change in Wetland Area or Function

Construction

The construction of the Project will result in the loss of wetland area within the footprint of and adjacent to permanent facilities, including the cable lines, buildings, and termination site/substation. The construction of permanent facilities will result in the loss of a minimum of approximately 0.2 ha of wetlands, and their associated functions, which are limited. Approximately 0.1 ha of wetland will be permanently lost under the footprint of the termination site/substation, and 0.1 ha of wetland within the cable line footprint will likely be converted to upland when vegetation is restored. Considering the nature of construction and the heavy machinery that will be required for installing the cable lines and constructing the buildings and riser stations, it is more likely that the Project will result in the disturbance and potential loss of up to 0.3 ha of wetlands.

During construction, emissions and wastes are not anticipated to interact with wetland area and function. Wetlands are not expected to be responsive to air contaminants or sound and vibration emissions, and wastes will not be disposed of in wetlands. Though wetland function could interact with surface runoff, standard erosion and control measures used on all construction projects will limit this potential interaction.

3.1.4.3.2 Mitigation for Change in Wetland Area or Function

The following well-established practices to limit the interaction between the Project and wetlands will be implemented during construction:

- obtain approvals for wetlands expected to be altered or lost as a result of Project construction
- discuss wetland compensation requirements with PEIDCLE (Prince Edward Island Department of Communities, Land and Environment) before commencing Project construction activities
- flag wetlands outside of the PDA and restrict additional disturbance such as temporary work areas to upland areas
- restrict grading to essential areas when working in or near wetlands

3.1.4.3.3 Residual Project Environmental Effects for Change in Wetland Area or Function

The construction of the Project will result in adverse environmental effects resulting in the permanent loss of a minimum of 0.2 ha of wetlands and their associated functions within the footprint of permanent facilities, including the cable lines, buildings, and termination site/substation. This includes 0.1 ha within the footprint of the termination site/substation, and 0.1 ha within the footprint of the cable lines, which will likely be converted to upland habitat.

The wetlands are in an area with a lengthy history of disturbance, and likely formed in response to that disturbance, and currently experience ongoing disturbance associated with hay mowing.

Although the Project will result in the direct loss of wetlands and wetland function within the PDA during the construction phase, which will not be reversible, with wetland compensation, the Project will result in no net loss in wetland area and function within the RAA. Thus the loss of wetland area and wetland function will be medium-term (restricted to the period between the start of construction and the completion of wetland compensation). With successful wetland compensation, the change in wetland area and function will be neutral, low magnitude, and permanent, restricted to a single event, and reversible.

3.1.4.4 Summary of Residual Project Environmental Effects

The residual Project environmental effects for the Terrestrial Environment are summarized in Table 3.6.

Table 3.6 Summary of Project Residual Environmental Effects on the Terrestrial Environment

Residual Effect	Residual Environmental Effects Characterization							
	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological and Socioeconomic Context
Change in Vegetation and Wildlife	C	A	L	LAA	P/MT	S	R	D
Change in Vegetation and Wildlife	O	A	N	PDA	LT	R/IR	R	D
Change in Vegetation and Wildlife	D	P	L	LAA	MT	S	R	D
Change in Wetland Area or Function	C	N	L	PDA	P	S	R	D

KEY
See Table 3.2 for detailed definitions.

Project Phase:
C: Construction
O: Operation
D: Decommissioning and Abandonment

Direction:
P: Positive
A: Adverse
N: Neutral

Magnitude:
N: Negligible
L: Low
M: Moderate
H: High

Geographic Extent:
PDA: Project Development Area
LAA: Local Assessment Area
RAA: Regional Assessment Area

Duration:
ST: Short-term;
MT: Medium-term
LT: Long-term
P: Permanent

NA: Not applicable

Frequency:
S: Single event
IR: Irregular event
R: Regular event
C: Continuous

Reversibility:
R: Reversible
I: Irreversible

Ecological/Socioeconomic Context:
D: Disturbed
U: Undisturbed
R: Resilient
NR: Not resilient

3.1.5 Determination of Significance

3.1.5.1 Significance of Residual Project Effects

The construction phase of the Project will result in both temporary and permanent disturbance to vegetation communities and wildlife habitat, including wetlands, within the PDA. These are limited to vegetation communities and habitat types which are abundant within the LAA and RAA. With mitigation, including wetland compensation, the Project is not expected to interact with SAR or SOCC and will not result in a net loss of wetland function. The operation phase of the Project will result in negligible changes to vegetation, wildlife, and wetlands, through vegetation clearing of a previously disturbed area. With mitigation and environmental protection measures, residual environmental effects on the Terrestrial Environment during all phases of the Project are predicted to be not significant.

3.1.6 Prediction Confidence

Prediction confidence for the assessment of Terrestrial Environment is high because of the quality of desktop and field data available and reliability of proposed mitigation and environmental protection measures.

3.1.7 Follow-up and Monitoring

Follow-up and monitoring programs are not deemed necessary for this assessment.

3.2 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS ON SOCIOECONOMIC ENVIRONMENT

Socioeconomic Environment is selected as a VC because of potential interactions between the Project and the local, regional, and provincial economies, accommodations and public services. Project employment and purchases of goods and services from local and regional businesses will provide new employment opportunities and sources of income for residents and businesses.

Interactions between the Project and local, regional, and provincial economies could also have negative consequences in terms of potential for wage inflation, labour shortages, increased demand for accommodations and increased demand for public services (unaccounted for through current municipal planning).

3.2.1 Scope of Assessment

3.2.1.1 Regulatory and Policy Setting

Section 9 of the PEI *Environmental Protection Act* establishes the regulatory framework for conducting environmental impact assessments in PEI. Pursuant to the Act an EIA must be conducted for the Project and an EIS submitted to the Minister for approval with such content as directed by the minister. This includes assessment of Socioeconomic Environment.

3.2.1.2 The Influence of Consultation and Engagement on the Assessment

Issues related to the Socioeconomic Environment identified during consultation and engagements activities have been related to employment opportunities for local First Nations.

3.2.1.3 Potential Environmental Effects, Pathways and Measurable Parameters

Potential effects on Socioeconomic Environment associated with the Project derive from changes in demand for labour (includes consideration of wage inflation and population growth) and Project expenditures on goods and services. Project demands for labour and goods and services can result in both beneficial and adverse effects. Beneficial effects may not be evenly distributed among populations with some residents in a more advantageous position to receive economic benefits than others. Adverse effects are related to increased demand for skilled labour and changes in labour supply (contributing to wage inflation). There is potential for an adverse change in municipal expenditures;

however, this would occur primarily as a result of population increases. Sudden demographic changes (primarily increased population) could increase.

Potential environmental effects, effect pathways and measurable parameter(s) and units of measurement are provided in Table 3.7.

Table 3.7 Potential Environmental Effects, Effects Pathways and Measurable Parameters for Socioeconomic Environment

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in Employment and Economy	• Project associated demand for labour (direct, indirect, and induced) and goods and services will create employment and business opportunities within the LAA and RAA and will generate revenue for governments. • The Project will contribute to GDP in PEI and Canada. • The Project will contribute to municipal and provincial government revenue through increased tax revenue.	• Direct employment. • Project expenditures on goods and services. • GDP ($). • Labour Income ($).
Change in Accommodations	• The non-resident construction workforce will be housed in short-term accommodations in NB and PEI potentially affecting the availability of accommodations (Project camps will not be constructed). • Project-related demographic changes have the potential to affect demand for accommodations throughout the life of the Project.	• Availability of accommodations (vacancy rates, inventory levels).
Change in Public Services	• The Project workforce has the potential to increase demand for public services (emergency and protective services, health care infrastructure and services and community and municipal services).	• Demand and supply of public services (e.g., police, fire, paramedic [first responder] services).

3.2.1.4 Boundaries

3.2.1.4.1 Spatial Boundaries

The spatial boundaries for the environmental effects assessment of the Socioeconomic Environment are defined below.

- Project Development Area (PDA): The PDA comprises the immediate area of physical disturbance associated with construction and operation of the Project. The PDA includes 5 m around each of the cables, the cable storage building, the substation expansion (including the cable termination site and substation control building) and a fence line around the expanded substation. The PDA also includes a short span of overhead transmission line that will connect the substation to the existing transmission line grid.

- Local Assessment Area (LAA): encompasses the communities that will potentially experience environmental or socioeconomic effects related to Project requirements for labour, goods, and services (see Figure 3.2). The LAA encompasses the PDA and Township and Royalties 19, 25, 26, 27, 28, 29, 30, 67, the Community of Sherbrooke, the Town of Kensington, the Community of Bedeque, the Community of Central Bedeque, the Community of Kinkora, the Community of Borden-Carleton, the Community of Breadalbane, the Community of Crapaud, the Community of Victoria, and the urban and rural communities comprising the Summerside Census Metropolitan Area (CA) and the Charlottetown CA.
- Regional Assessment Area (RAA): encompasses an area that both establishes context for the determination of the significance of Project effects as well as encompasses an area where effects from other projects could occur (see Figure 3.2). The RAA includes the LAA as well as Township and Royalties 18, 20, 21, 22, 24, the Community of Hunter River, the Community of Resort Mun. Stan.B.-Hope R.-Bayv.-Cavend.-N.Rust, and the Community of North Rustico.

3.2.1.4.2 Temporal Boundaries

The temporal boundaries of the assessment of the potential environmental effects of the Project on the Socioeconomic Environment include construction, operation, and decommissioning and abandonment. Construction in the Terrestrial Environment is expected to occur over a period of 5 months, beginning in July 2016. Operation will begin following construction in December 2016 and is anticipated to continue for the life of the Project (approximately 40 years). Decommissioning and abandonment would take place following the useful service life of the Project and which would be carried out in accordance with regulations in place at that time.

U:\121811475\3_drawings\3_draft_figures\mxd\rpt\ea\vol_2_pei\3_2_economy\121811475-0037.mxd

Sources: GeoNB, NB Power, PEI Government (2010),Thematic Data - ERBC, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Disclaimer: This map is for illustrative purposes to support this project; questions can be directed to the issuing agency.

Stantec

121811475 - PEI - NB Marine Cable Interconnection - Maritime Electric Company Limited

Socioeconomic Environment Assessment Area Boundaries

Figure 3.2

3.2.1.5 Residual Environmental Effects Description Criteria

Criteria used to characterize and describe residual environmental effects for the assessment of Socioeconomic Environment are provided in Table 3.8.

Table 3.8 Characterization of Residual Environmental Effects on Socioeconomic Environment

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect.	**Positive**—an effect that moves measurable parameters in a direction beneficial to Socioeconomic Environment relative to baseline. **Adverse**—an effect that moves measurable parameters in a direction detrimental to Socioeconomic Environment relative to baseline. **Neutral**—no net change in measureable parameters for the Socioeconomic Environment relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions.	**Negligible**—no detectable effects. **Low**—a measurable change but within the normal range of variability; cannot be distinguished from baseline conditions. **Moderate**—measurable change but unlikely to pose a serious risk or benefit to the VC or to represent a management. Challenge. **High**—measurable change that is likely to pose a serious risk to the selected VC and, if negative, represents a management challenge.
Geographic Extent	The geographic area in which an environmental, effect occurs.	**PDA**—residual effects are restricted to the PDA. **LAA**—residual effects extend into the LAA. **RAA**—residual effects interact with those of other projects in the RAA.
Frequency	Identifies when the residual effect occurs and how often during the Project or in a specific phase.	**Single event**—occurs once. **Multiple irregular event**—occurs sporadically at irregular intervals throughout construction, operations or decommissioning and abandonment phases. **Multiple regular event**—occurs on a regular basis and at regular intervals throughout construction, operations, or decommissioning and abandonment phases. **Continuous**—occurs continuously throughout the life of the Project.
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the effect can no longer be measured or otherwise perceived.	**Short-term**—residual effect restricted to the duration of the construction period or less. **Medium-term**—residual effect extends through the construction period but less than the life of the Project. **Long-term**—residual effect extends beyond the life of the Project.

Table 3.8 Characterization of Residual Environmental Effects on Socioeconomic Environment

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the Project activity ceases.	**Reversible**—the effect is likely to be reversed after activity completion and reclamation. **Irreversible**—the effect is unlikely to be reversed.
Socioeconomic Context	Existing condition and trends in the area where environmental effects occur.	**Low Socioeconomic Resiliency**—Sparsely populated region with relatively few service centres. **Medium Socioeconomic Resiliency**—A mix of sparsely populated areas along with more populated, urban centres. **High Socioeconomic Resiliency**—Densely populated area with several urban centres.

3.2.1.6 Significance Definition

There are no pre-defined thresholds for assessing the significance of residual effects on Socioeconomic Environment. The context for assessing residual effects is whether Project-related changes are consistent with reasonably expected changes in future Socioeconomic Environment that are anticipated or planned for by municipal, regional, and provincial governments; Aboriginal Groups; private businesses; or households; and, if not, the extent to which they will be able to cope with adverse effects associated with the Project.

The following definition is used to determine significance thresholds for residual effects on Socioeconomic Environment for this assessment:

- A significant residual effect is one that is adverse, of high magnitude, is distinguishable from normal variability, and cannot be managed with current or anticipated programs, policies, or mitigation measures.

3.2.2 Existing Socioeconomic Environment

This section describes existing conditions and data gathering methods for socioeconomic conditions in the assessment areas.

3.2.2.1 Methods

Information on baseline conditions was primarily obtained from statistical data sources and published reports. Principal sources of statistical data included Statistics Canada (Census 2006, Census 2011 and National Household Survey 2011) and the PEI Department of Finance. Baseline information was also collected from the review of community and regional reports from government agencies, community profiles produced by municipalities, community and regional websites, and various socioeconomic community profiles.

3.2.2.2 Overview

3.2.2.2.1 Demographics

Total Population

The 2011 census reported a population total of 140,204 individuals in PEI. Of this total population, 52% were female and 48% were male. The LAA had a population in 2011 of 93,017 people, while the RAA had a population total of 99,132 (Statistics Canada 2013a).

Table 3.9 shows the 2011 data for the population by sex, while Table 3.10 shows the change in population from 2006 to 2011.

Table 3.9 Population by Gender, Province, RAA and LAA

Location	Total Population*	Female*	Male*
Provincial Total	140,204	72,605	67,605
Total RAA	99,132	51,780	47,345
Total LAA	93,017	48,690	44,330

Note:

* Numbers are rounded by Statistics Canada and are reported herein exactly as they are reported by Statistics Canada. Totals may not necessarily add up as a result of rounding.

Source: Statistics Canada 2013a

Table 3.10 Population 2006 and 2011, Province, RAA and LAA

Location	Population 2011*	Population 2006*	% Change*
Provincial Total	140,204	135,851	3.2
Total RAA	99,132	93,533	6.0
Total LAA	93,017	87,419	6.4

Note:

* Numbers are rounded by Statistics Canada and are reported herein exactly as they are reported by Statistics Canada. Totals may not necessarily add up as a result of rounding.

Source: Statistics Canada 2013a; 2007

PEI saw a population increase of 3.2% between 2006 and 2011, growing from 135,851 to 140,204. However, this was still below the national average of 5.9% (Statistics Canada 2013a; 2013d). The LAA had a population increase of 6%, and the RAA grew by 6.4% (see Table 3.10).

The Population of PEI is ageing, following trends throughout many provinces in Canada. In 2011 the median age of PEI was 42.8, up 2 years from 40.8 in 2006 (Statistics Canada 2013a; 2007). Females outnumber males in all age categories above 20. The population projections for Canada, provinces, and territories predicts that the median age of PEI residents will continue to increase in small increments, with the median age becoming 46 years by 2036 (Statistics Canada 2012a).

Aboriginal Population

In 2011, approximately 2% of the total population of PEI identified themselves as Aboriginal people. Aboriginal population data for the LAA and RAA are presented in Table 3.11.

Table 3.11 Aboriginal Population

Location	Aboriginal*
Provincial Total	2,230
Total RAA	1,010
Total LAA	1,010

Note:
* Numbers are rounded by Statistics Canada and are reported herein exactly as they are reported by Statistics Canada. Totals may not necessarily add up as a result of rounding. Population numbers include those living on and off the local reserves.
Source: Statistics Canada 2013a

All Aboriginal communities on PEI are Mi'kmaq, and there are two Mi'kmaq First Nations groups in the province:

- Lennox Island First Nation
- Abegweit First Nation

The Abegweit First Nation community has a registered population of 369 and has three reserves throughout the province. One of these reserves, Rocky Point, is located within the Charlottetown CMA and falls within the study area. In 2011, Rocky Point had a registered population of 45 people (Statistics Canada 2012b). All other reserves from both Aboriginal communities do not fall within the assessment areas (AANDC 2015).

3.2.2.2.2 Economy

Table 3.12 provides information on PEI's Gross Domestic Product (GDP) from 2004 to 2013. The GDP of PEI has grown consistently from 2004-2013, with a 4.9% growth from 2012 to 2013 compared to 1.9% growth from 2011 to 2012 (Statistics Canada 2014).

Table 3.12 Gross Domestic Product, 2004-2013

Economic Indicator	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Gross Domestic Product (millions of Canadian dollars)	4,024	4,147	4,387	4,620	4,767	4,947	5,202	5,409	5,514	5,788

Source: Statistics Canada 2014

According to the province's 41st annual statistical review of the economy, GDP by industry for PEI expanded 1.3% in 2014. Leading growth sectors in the province were: manufacturing (up by $38.2 million or 9.1%), real estate and rental and leasing (up by $11.7 million or 1.8%), agriculture, forestry, fishing and hunting (up by $10.9 million or 3.8%), accommodation and food services (up by $6.6 million or 4.8%) and retail trade (up by $6.2 million or 2.0%). Sectors showing the largest declines were construction (down by $16.4 million or 6.0%), public administration (down by $11.4 million or 1.8%), management of companies and enterprises (down by $2.2 million or 8.6%) and information and culture (down by $1.8 million or 1.3%) (PEIDF 2015).

Manufacturing shipments in PEI increased by 10.4% to $1,608 million in 2014, up from $1,456 in 2013. According to Industry Canada, the value of PEI's international exports of goods rose by 22.2% in 2014 to reach $1.1 billion, the first time annual exports have reached $1 billion. This follows a 5.4% increase in 2013 (PEIDF 2015).

PEI has typically relied on its primary industries such as agriculture, fisheries and tourism for the main source of its economic revenues. However, the province is now in a transition period towards new service based industries. While primary industries still play a large role in the PEI economy, sectors such as information technology, bioscience, and aerospace are becoming major economic contributors (Government of PEI 2014). Some of the major employment sectors in the province of PEI include:

- aerospace
- agriculture
- fisheries/aquaculture
- bioscience
- tourism
- information technology

3.2.2.2.3 Labour and Employment, Income, and Education

Labour and Employment

In 2011, the labour force of the province was 78,060, the participation rate for the province was 68.4%, a small increase from 68.2% in 2006 (Statistics Canada 2013a; 2007). Between 2006 and 2011, the number of persons employed in PEI grew by 3% from 66,855 individuals to 68,640; however, the employment rate fell slightly from 60.7% down to 60.1%. The province's unemployment rate also decreased during this time period, increasing 1 point from 11.1 to 12.1%. This was still higher than the Canadian averages at both times, 6.6 and 7.8% respectively (Statistics Canada 2013a; 2007). Table 3.13 provides detailed labour information for communities within the RAA.

Table 3.13 Labour Characteristics (2011)

Location	Total Population 15 Years and Over	Labour Force	Employed	Participation Rate (%)	Employment Rate (%)	Unemployment Rate (%)
Provincial Total	114,200	78,060	68,640	68.4	60.1	12.1
Lot 18	905	600	495	66.3	54.7	16.7
Lot 20	670	410	400	61.2	59.7	0.0
Lot 21	830	405	350	48.8	42.2	13.6
Lot 22	510	350	310	68.6	60.8	11.4
Lot 24	-	-	-	-	-	-

Table 3.13 Labour Characteristics (2011)

Location	Total Population 15 Years and Over	Labour Force	Employed	Participation Rate (%)	Employment Rate (%)	Unemployment Rate (%)
Hunter River	200	135	115	67.5	57.5	11.1
Resort Mun. Stan.B.-HopeR.-Bayv.-Cavend.-N.Rust	110	100	95	90.9	86.4	0.0
North Rustico	-	-	-	-	-	-
Lot 19	-	-	-	-	-	-
Lot 25	1,015	680	615	67.0	60.6	10.3
Lot 26	850	575	510	67.6	60.0	10.4
Lot 27	695	515	460	74.1	66.2	9.7
Lot 28	695	405	360	58.3	51.8	12.3
Lot 29	750	540	425	72.0	56.7	21.3
Lot 30	660	510	440	77.3	66.7	13.7
Lot 67	685	435	400	63.5	58.4	6.9
Sherbrooke	60	45	45	75.0	75.0	0.0
Kensington	1,245	710	660	57.0	53.0	6.3
Bedeque	95	85	75	89.5	78.9	0.0
Central Bedeque	105	55	45	52.4	42.9	0.0
Kinkora	265	190	170	71.7	64.2	7.9
Borden-Carleton	640	380	340	59.4	53.1	10.5
Breadalbane	110	85	60	77.3	54.5	29.4
Crapaud	250	90	75	36.0	30.0	22.2
Victoria	70	60	30	85.7	42.9	0.0
Charlottetown (CA)	52,505	36,910	33,245	70.3	63.3	9.9
Summerside (CA)	13,335	8,445	7,395	63.3	55.5	12.5

Notes:

Numbers are rounded by Statistics Canada and are reported herein exactly as they are reported by Statistics Canada. Totals may not necessarily add up as a result of rounding.

- Data not available.

Source: Statistics Canada 2013a

Table 3.14 provides information on employment by sector for PEI as of 2011. In 2011, the main sources of employment in PEI were Other Services, which employed 20,610 individuals or 26.8 % of the labour force, business services (10,110, or 13.1%), retail trade (8,860, or 11.6%), and agriculture and other resource based industries (7,690, or 10%). The lowest source of employment in the province consisted of wholesale trade (1,785, or 2.3%), and finance and real estate (2,745, or 3.6%).

Table 3.14 Employment - Industries (2011)

Sector	Experienced Labour Force by Industry in PEI (total)	Experienced Labour Force by Industry (by %)
Total Experienced Labour Force	76,950	100
Agriculture and Other Resource-based Industries*	7,690	10.0
Construction	5,520	7.2
Manufacturing	5,950	7.7
Wholesale Trade	1,785	2.3
Retail Trade	8,860	11.6
Finance and Real Estate	2,745	3.6
Health Care and Social Services	7,520	9.4
Educational Services	6,160	8.0
Business Services**	10,110	13.1
Other Services***	20,610	26.8

Notes:

* Includes the industries of agriculture, forestry, fishing and hunting; mining, quarrying and oil and gas extraction; and utilities.

** Includes industries of transportation, information and cultural services, professional services, management of companies, and administrative support.

*** Includes arts, entertainment, and recreation; accommodation and food services; public administration; and other services.

Source: Statistics Canada 2013a

Income

The median income for all census families in PEI in 2010 was $68,014, while the median income for persons aged 15 years and older in the province was $27,762 (see Table 3.15). Charlottetown had higher median incomes for both census families and persons over 15 years of age ($74,695; $29,826) than Summerside ($60,375; $26,590). Outside of the CMAs within the RAA the highest median incomes for census families belonged to Lot 22 ($92,282), Lot 18 ($79, 885), and Lot 29 ($74, 872). The lowest median incomes for census families belonged to Hunter River ($32,997), Crapaud ($45,251), and Lot 28 ($53,714).

Table 3.15 Median Income (2010)

Location	Median Income - All Census Families*	Median Income - Persons 15 Years and Over	Male	Female
Provincial Total	68,014	27,762	31,816	23,980
Lot 18	79,885	33,414	37,966	28,693
Lot 20	74,428	23,686	29,572	18,129
Lot 21	74,734	25,393	38,747	16,432
Lot 22	96,282	33,440	41,971	27,939

Table 3.15 Median Income (2010)

Location	Median Income - All Census Families*	Median Income - Persons 15 Years and Over	Male	Female
Lot 24	-	-	-	-
Hunter River	32,997	27,693	24,180	27,714
Resort Mun. Stan.B.-HopeR.-Bayv.-Cavend.-N.Rust	-	-	-	-
North Rustico	-	-	-	-
Lot 19	-	-	-	-
Lot 25	72,144	29,080	32,234	19,130
Lot 26	71,528	31,330	42,762	22,621
Lot 27	73,342	27,667	30,819	21,371
Lot 28	53,714	24,239	26,715	22,540
Lot 29	74,872	32,570	36,245	25,491
Lot 30	66,314	30,123	32,153	29,322
Lot 67	56,767	22,624	33,558	19,364
Sherbrooke	-	-	-	-
Kensington	65,347	26,217	28,749	23,470
Bedeque	-	-	-	-
Central Bedeque	-	-	-	-
Kinkora	61,661	27,995	29,065	20,086
Borden-Carleton	56,460	21,420	24,239	17,474
Breadalbane	-	-	-	-
Crapaud	45,251	16,247	16,237	18,037
Victoria	-	-	-	-
Charlottetown (CA)	74,695	29,826	34,367	25,985
Summerside (CA)	60,375	26,590	33,096	22,282

Notes:
* Data for median income was collected in 2010.
- Data not available.
Source: Statistics Canada 2013a

Education

In 2011, approximately 22% of the population of PEI had not completed their high school education; this is higher than the national average of 20%. However, over half of the population (56%) had received some type of post-secondary certificate, diploma, or degree. This is slightly higher than the national average of 54% in Canada. Out of the 59,370 people who had received some type of post-secondary education, 20% had an apprenticeship or trades certificate or diploma, and 33% had a university degree at the bachelor level or higher (see Table 3.16).

Table 3.16 Educational Attainment (2011)

Education	Total
Total Population aged 15 Years and Over by Highest Certificate, Diploma, or Degree	114,195
No certificate, diploma or degree	24,860
High school diploma or equivalent	29,970
Postsecondary certificate, diploma or degree	59,370
Apprenticeship or trades certificate or diploma	11,990
College, CEGEP or other non-university certificate or diploma	24,065
University certificate or diploma below bachelor level	3,875
University certificate, diploma or degree at bachelor level or above	19,445
Bachelor's degree	13,195
University certificate, diploma or degree above bachelor level	6,250
Source: Statistics Canada 2013a	

There are three recognized post-secondary educational institutions in PEI. Collège Acadie Î.-P.-É. is PEI's only French language post-secondary training institution offering diploma programs, General Educational Development studies, language training, and flexible, customized training programs. There are learning centres located in Deblois, Wellington, and Charlottetown.

Holland College is another educational institution in the province, providing education for industry relevant professions including culinary arts, marine related training, and law enforcement. There are campuses spread throughout the province, including one in both Charlottetown and Summerside.

The University of PEI is located in Charlottetown and offers a wide selection of programs and courses in arts, education, science, and veterinary medicine. It also houses a business school and a nursing school, and has a list of graduate programs in its curriculum (Government of PEI 2015).

3.2.2.2.4 Housing

According to the 2011 Census, there were 56,460 private dwelling throughout PEI. Approximately 73% of these dwellings were owned, while 27% were being rented (Statistics Canada 2013a).

Results from CMHC's 2015 Spring Rental Market Survey showed that the vacancy rate for provincial urban centres was 6.5% in April 2015; this was a decrease of 2% from 8.5% in 2014. The vacancy rate in Charlottetown, which stood at 8.7% in 2014, was down to 6.1% in April 2015. The lower vacancy rate was a result of strong demand for rental units in the city. With Fewer new rental units being constructed and a continued increase in net migration, there was a shortage of vacant rental units in 2015.

The pace of rental market construction in Summerside has been considerably slower than what was observed in Charlottetown since 2009. With demand decreasing due to increasing out-migration, the vacancy rate in Summerside in the spring of 2015 was at 9.0%. This vacancy rate was much higher than the ten year historical average of 3.0% (CMHC 2015).

There are five tourism regions in PEI: North Cape Coastal Drive, Green Gables Shore, Red Sands Shore, Charlottetown, and Points East Coastal Drive. The LAA communities are located primarily in the Green Gables Shore, Charlottetown and Red Sands Shore regions. In 2014, the occupancy rate in Green Gables Shore was 43.3%, up 1.7% over the previous year. The occupancy rate of the Charlottetown region increased 1.8% to 46.2 between 2013 and 2014, and in the Red Sands region, the rate decreased 2.6% to 29.1% (Tourism PEI – Strategy, Evaluation and Industry Investment Division 2015).

3.2.2.2.5 Public Services

Police

The RCMP in PEI is responsible for policing all communities in PEI except the cities of Charlottetown and Summerside, and the Towns of Borden-Carleton and Kensington. Community policing services are provided from a Headquarters facility at Charlottetown and three operational districts - Kings, Queens and Prince - through six service centres.

On a per capita basis, PEI continues to have one of the smallest police forces in the country. In 2011, Statistics Canada reported PEI as having 159 officers per 100,000 population compared to a national average of 192 officers per 100,000 population. Charlottetown City Police and the RCMP have added additional resources to form Street-level Drug/Crime Teams in Charlottetown and the Summerside Police Service and RCMP Prince District continue their joint forces operation efforts with respect to street-level drug activity in the Summerside and surrounding area.

After years of steady increases, the rates of violent crime, property crime and criminal code offences began to decline in the province since 2004 (RCMP 2012).

Fire

PEI has 40 fire departments. The Charlottetown Fire Department is a composite department consisting of two stations with a career fire chief and deputy fire chief, two district volunteer chiefs, two deputy district volunteer chiefs, 80 volunteer firefighters, fire inspector, prevention officer, six permanent firefighters and six seasonal staff.

The Summerside station is directed by a Deputy Chief and has 38 firefighters.

Health Care

PEI has an integrated health care system including two main referral acute-care facilities and five rural hospitals. There are also a number of walk-in clinics, including one each in Charlottetown and Summerside.

3.2.3 Project Interactions with Socioeconomic Environment

Table 3.17 identifies potential Project/VC interaction resulting in the identified environmental effect. These interactions are indicated by check marks, and are discussed in detail in Section 3.2.4 in the context of effects pathways, standard and Project-specific mitigation/enhancement, and residual effects. A justification is also provided for non-interactions (no check marks).

Table 3.17 Potential Project-Environment Interactions and Effects on Economic Conditions

Project Components and Physical Activities	Potential Environmental Effects		
	Change in Employment and Economy	Change in Accommodations	Change in Public Services
Land-Based Infrastructure – New Brunswick and PEI			
Construction			
Landfall Construction	–	–	–
Expansion of Electrical Substation	–	–	–
Emissions and Wastes	–	–	–
Transportation	–	–	–
Employment and Expenditure*	✓	✓	✓
Operation			
Energy Transmission	–	–	–
Vegetation Management	–	–	–
Infrastructure Inspection, Maintenance and Repair (Transmission Lines and Substations)	–	–	–
Emissions and Wastes	–	–	–
Transportation	–	–	–
Employment and Expenditure*	✓	✓	✓
Decommissioning and Abandonment			
Decommissioning	N/A	N/A	N/A
Reclamation	N/A	N/A	N/A
Emissions and Wastes	N/A	N/A	N/A
Employment and Expenditure*	N/A	N/A	N/A

Notes:
✓ = Potential interactions that might cause an effect.
– = Interactions between the Project and the VC are not expected.
N/A = Not applicable.
* = All Project activities requiring the presence of workers and/or expenditures.

3.2.3.1 Construction

Landfall construction, expansion of electrical substation, emissions and wastes and transportation are not expected to interact with any of the potential environmental effects during construction. Construction activities with potential interactions are further discussed below in Section 3.2.4.

3.2.3.2 Operation

Energy transmission, vegetation management, infrastructure inspection, maintenance, and repair, emissions and wastes and transportation are not expected to interact with any of the potential environmental effects during operation. Operation activities with potential interactions are further discussed below in Section 3.2.4.

3.2.3.3 Decommissioning and Abandonment

During Project decommissioning and abandonment, the scale of employment will be smaller and of shorter duration than construction and operation; therefore further assessment for this phase is not considered necessary.

3.2.4 Assessment of Residual Environmental Effects on the Socioeconomic Environment

3.2.4.1 Assessment of Change in Employment and Economy

3.2.4.1.1 Analytical Assessment Techniques

Project-related employment and income effects during construction and operation phases are estimated using pre-engineering Project spending estimates for PEI and multipliers for the PEI electric power engineering construction industry (Statistics Canada 2013e). Project demand for labour, by skill category, is then compared to existing labour force characteristics within the LAA to determine the extent to which Project demand can be satisfied by the local labour force. Project expenditures and multipliers for the PEI electric power engineering construction industry are also used to estimate economic effects.

3.2.4.1.2 Project Pathways for Change in Employment and Economy

Project associated demand for labour (direct, indirect, and induced) and goods and services will create employment and business opportunities within the LAA and RAA and will generate revenue for governments. A variety of management, accounting and payroll, engineering and construction personnel will be required during construction. These workers may be employed by New Brunswick or Prince Edward Island based construction or engineering firms. Additionally, specialists from within Canada or abroad may be employed to advise or construct unique aspects of the Project. During operation, no additional employment in PEI beyond current staff at MECL and PEIEC are anticipated.

Project expenditures on goods and services could generate positive economic effects through contracts with local companies in PEI. The Project will also contribute to municipal and provincial government revenue through increased tax revenue.

3.2.4.1.3 Mitigation for Change in Employment and Economy

Project effects on employment and economy are anticipated to be largely beneficial because employment and business opportunities will be created within the LAA and RAA during all Project phases; this in conjunction with taxes paid to municipal and provincial government. Where the Project competes for skilled labour and goods and services potential exists for increased labour costs and price inflation. Since anticipated Project demands for labour and goods and services are small and short-term the magnitude of potential adverse effects on labour costs and price inflation are anticipated to be low. Mitigation measures, therefore, work to enhance beneficial effects of the Project.

MECL commits to the following mitigation measures related to employment and economy:

- Develop and implement a strategy to encourage local and Aboriginal content in staffing and spending. The strategy will ensure local residents, Aboriginal groups and businesses are informed of job and procurement opportunities and will encourage a hire-local first approach.

3.2.4.1.4 Residual Project Environmental Effect for Change in Employment and Economy

Construction

Land-based construction in PEI consists of the development of a landfall site (near Borden-Carleton) and reconfiguration and expansion of the Borden-Carleton substation including connection of transmission lines. The total capital expenditure for the PEI portion of the Project is estimated at $15 million. This represents expenditures on such goods and services as construction materials, equipment, consumables (e.g., fuel, food), and accommodations.

A variety of management, accounting and payroll, engineering and construction personnel will be required during construction. These workers may be employed by New Brunswick or Prince Edward Island based construction or engineering firms. Additionally, specialists from within Canada or abroad may be employed to advise or construct unique aspects of the Project.Workers are anticipated to be employed on a rotational work shift that will likely be 10-hour days for five days.

Due to the relatively small number to full-time employment/employees (FTEs) and regional expenditures on goods and services within the RAA the Project is not anticipated to result in labour shortages or affect the supply of goods and services such that wage or price inflation occurs. Residual effects on employment and economy during Project construction are expected to be positive in direction, low in magnitude, to extend throughout the RAA, to be short-term in duration occurring continuously within moderate socioeconomic resiliency and to be reversible following Project decommissioning and abandonment.

Operation

Since Project operation is not anticipated to require any additional employment and expenditures beyond MECL current levels, no residual effects on employment and economy are anticipated during Project operation.

3.2.4.2 Assessment of Change in Accommodations

3.2.4.2.1 Analytical Assessment Techniques

Demand for accommodations associated with demographic change is compared to the available capacity of short-term accommodations within the LAA and RAA.

3.2.4.2.2 Project Pathways for Change in Accommodations

The construction workforce will be housed in nearby lodging in NB and PEI, which could potentially affect the availability of short-term accommodations (Project camps will not be constructed). Demographic changes related to in-migrant workers satisfying demand for indirect and induced employment also have the potential to affect demand for accommodations throughout the life of the Project.

3.2.4.3 Mitigation for Change in Accommodations

During Project construction, non-local workers will be housed in nearby accommodations in PEI. Since no camps will be constructed demand for nearby accommodations will increase. MECL commits to the following mitigation measures related to accommodations of non-local workers:

- develop preferred accommodations providers, informed through engagement with local community officials
- communicate with community officials where workers are accommodated, as a means of responding to potential community grievances

3.2.4.3.1 Residual Project Environmental Effects for Change in Accommodations

Construction

A variety of management, accounting and payroll, engineering and construction personnel will be required during construction. These workers may be employed by Prince Edward Island based construction or engineering firms. Additionally, specialists from within Canada or abroad may be employed to advise or construct unique aspects of the Project.Workers currently residing within the RAA are within a one-hour commute of Borden-Carleton and are anticipated to commute from their personal residences to the worksite. These workers will not increase demand for short-term accommodations as they are already accommodated within the RAA.

Some specialists from outside the RAA may be required for Project construction. These workers will require short-term accommodation while engaged in construction activities. Potential demand for accommodations related to indirect and induced employment during Project construction is not expected to exceed the current availability of accommodations.

Based on the size of the construction workforce requiring short-term accommodation, the availability of short-term accommodations within the LAA (and to a greater extent the RAA if required) and mitigation measures presented, the availability of existing accommodations are considered sufficient to meet increased Project-related demand during Project construction. Residual effects on accommodation during Project construction are considered neutral in direction, low to moderate in magnitude, to extend throughout the RAA, to be short-term in duration, to occur regularly, are reversible following the completion of project construction and to occur within a moderate socioeconomic resiliency.

Operation

Since Project operation is not anticipated to require any additional workers beyond MECL's current workforce, no residual effects on accommodations are anticipated during Project operation.

3.2.4.4 Assessment of Change in Public Services

3.2.4.4.1 Analytical Assessment Techniques

Demand for select public services associated with demographic change (stemming from direct, indirect, and induced employment) is compared to the available capacity of public services within the LAA and RAA.

3.2.4.4.2 Project Pathways for Change in Public Services

The construction workforce will have a presence in nearby communities, potentially increasing demand for public services. Demographic changes related to in-migrant workers satisfying demand for indirect and induced employment also have the potential to increase demand for public services in nearby communities throughout the life of the Project.

3.2.4.4.3 Mitigation for Change in Public Services

During Project construction workers will be housed in nearby accommodations in PEI and, therefore, could increase demand on public services. To manage potential demand on public services MECL commits to the following mitigation measures:

- Encourage carpooling among local workers to reduce effects on daily traffic volumes and transportation infrastructure.
- Require employees and subcontractors to adhere to code of conduct and health and safety programs.
- Consult with the relevant agencies and organizations to provide Project information, to identify and address potential Project-related implications for local services and infrastructure, and to support responsible organizations in planning for, and adapting to, or benefitting from any changing demand.

3.2.4.4.4 Residual Project Environmental Effects for Change in Public Services

A variety of management, accounting and payroll, engineering and construction personnel will be required during construction. These workers may be employed by Prince Edward Island based construction or engineering firms. Some specialist hires may be required to come from outside of the RAA. A temporary increase in population can lead to increases in demand for public services.

Construction

Construction workers residing within the RAA are anticipated to commute (daily) to the PDA from their current residences. These workers contribute to the funding of public services through municipal tax payments and pay-per-use services in their home communities and therefore demand from these individuals is accounted for through municipal planning. Workers who reside within the RAA but outside the LAA may increase demand for public services in communities near the PDA as a result of commuting or from their presence while on-shift (demand for these residents would not be accounted for through current municipal planning). However, considering these workers will only be present in communities near the PDA for a limited duration of time (while commuting or on-shift), increased demand for public services is not expected to be distinguishable from the normal variability of demand (e.g., Borden-Carleton is an entry point to PEI and is subject to fluctuations in demand associated with tourism). Adverse effects are, therefore, expected to be negligible in magnitude. As such no residual effects on public services are anticipated to result from RAA resident workers during Project construction.

Considering baseline conditions (available capacity), the size of the construction workforce and the duration of their presence in nearby communities, the normal variability of demand for public services in communities near the PDA, and the application of mitigation measures, increased demand associated with temporary and in-migrant workers during Project construction is expected to result in adverse effects that are negligible in magnitude. No residual effects on public services are therefore anticipated during Project construction.

Operation

Since Project operation is not anticipated to require any additional workers beyond MECL's current workforce, no residual effects on public services are anticipated during Project operation.

3.2.4.5 Summary of Residual Project Environmental Effects

The residual Project environmental effects for the Socioeconomic Environment are summarized in Table 3.18.

Table 3.18 Summary of Project Residual Environmental Effects on Socioeconomic Environment

Residual Effect	Residual Environmental Effects Characterization							
	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Socioeconomic Context
Change in Employment and Economy	C	P	L	RAA	S	C	R	M
Change in Accommodation	C	N	L-M	RAA	S	R	R	M
Change in Public Services	C	NA						

KEY See Table 3.8 for detailed definitions. **Project Phase:** C: Construction O: Operation D: Decommissioning and Abandonment **Direction:** P: Positive A: Adverse N: Neutral **Magnitude:** N: Negligible L: Low M: Moderate H: High	**Geographic Extent:** PDA: Project Development Area LAA: Local Assessment Area RAA: Regional Assessment Area **Duration:** ST: Short-term; MT: Medium-term LT: Long-term P: Permanent NA: Not applicable	**Frequency:** S: Single event IR: Irregular event R: Regular event C: Continuous **Reversibility:** R: Reversible I: Irreversible **Socioeconomic Context:** L: Low Resiliency M: Moderate Resiliency H: High Resiliency

3.2.5 Determination of Significance

For change in employment and economy, a significant adverse residual effect would only occur if the Project results in an adverse effect that is of high magnitude, distinguishable from normal variability, and of which cannot be managed with current or anticipated programs, policies, or mitigation measures. Since Project residual effects on employment and economy are largely anticipated to be beneficial creating employment and business opportunities within the RAA and that project demands for labour and goods and services are anticipated to be small and short-term in nature with adverse effects on wage and price inflation low and limited to the construction phase of the Project, effects are anticipated to be not significant.

For change in accommodations and public services, a significant adverse residual effect would only occur if the Project results in demand that is not within normal variability and of which exceeds current capacity and cannot be managed with current or anticipated programs, policies or mitigation measures. Considering the available capacity of accommodations and public services, the short-term and low to medium magnitude of potential demand for accommodations, and proposed mitigation measures targeted at managing the variability of demand for accommodations, effects are anticipated to be not significant.

3.2.6 Prediction Confidence

Prediction confidence is considered moderate-to-high based on available data, MECL's experience with similar projects in PEI and their effects, and proposed mitigation measures. There exist inherent uncertainties about future economic conditions in the LAA and RAA and the extent to which local residents will choose to be involved in project construction, operation, and decommissioning and abandonment.

3.2.7 Follow-up and Monitoring

Follow-up and monitoring programs are not required.

3.3 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS ON HERITAGE RESOURCES

Heritage Resources are those resources, both human-made and naturally occurring, related to human activities from the past that remain to inform present and future societies of that past. Heritage Resources are relatively permanent, although tenuous, features of the environment; if they are present, their integrity is susceptible to construction and ground-disturbing activities. Heritage Resources has been selected as a valued component (VC) because of general interest from provincial and federal regulatory agencies who are responsible for the effective management of these resources; the general public; and Aboriginal people that have an interest in the preservation and management of Heritage Resources related to their history and culture. For this VC, Heritage Resources include consideration of historical, archaeological, architectural (built heritage), and palaeontological resources. Heritage Resources will focus on archaeological, architectural (built heritage), and palaeontological resources; historical resources are included in each of these categories.

3.3.1 Scope of Assessment

This section defines the scope of the assessment of the Heritage Resources VC in consideration of the regulatory setting, the issues identified during public and Aboriginal engagement activities, potential Project-VC interactions, and the existing knowledge of the PDA.

3.3.1.1 Regulatory and Policy Setting

Heritage resources are protected under the *Archaeology Act* and *Heritage Places Protection Act*, and are regulated by the Aboriginal Affairs Secretariat, Department of Intergovernmental and Public Affairs, Government of Prince Edward Island:

- *Archaeology Act* – protection is afforded by the Province for archaeological sites/objects, palaeontological objects/sites, protected archaeological sites, human remains.

- *Heritage Places Protection Act* – protection is afforded by the Province for heritage places and historic resources (including "…*any work of nature or man that is primarily of value of its palaeontological, archaeological, prehistoric, cultural, natural, scientific or aesthetic nature*."). The Act outlines the Minister's authority to "…*require any person proposing a development that may adversely affect any designated site, structure or area to provide, at the expense of that person, a heritage impact statement which specifies in detail the expected effect of the proposed development.*" Section 8. (1).

3.3.1.2 The Influence of Consultation and Engagement on the Assessment

Provincial regulators were contacted on September 29, 2014 and an archaeological archival review was conducted by Aboriginal Affairs Secretariat. The review identified no registered archaeological sites within or in vicinity to the PDA.

As part of the background research to determine the archaeological potential for this project, Stantec contacted the Mi'kmaq Confederacy of Prince Edward Island (MCPEI) to obtain information regarding traditional land use and locations for any known archaeological resources or ceremonial sites in, or around, the PDA. MCPEI responded on June 1, 2015 stating that historical and traditional Mi'kmaq use and activities occurred outside the PDA. While this request is not considered part of formal consultation processes, Aboriginal Affairs has initiated discussions with MCPEI as part of the Province's Duty to Consult.

3.3.1.3 Potential Environmental Effects, Pathways and Measurable Parameters

The environmental assessment of Heritage Resources focuses on the following environmental effect:

- Change in Heritage Resources

The environmental effect has been selected with respect to the need to assess environmental effects of the Project on Heritage Resources, and in recognition of the interest of regulatory agencies, the general public, and potentially affected Aboriginal people that have an interest in the preservation and management of Heritage Resources related to their history and culture.

The measurable parameter used for the assessment of the environmental effect presented above and the rationale for its selection is provided in Table 3.19.

Table 3.19 Potential Environmental Effects, Effects Pathways and Measurable Parameters for Heritage Resources

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in Heritage Resources	• Disturbance or alteration of whole or part of a Heritage Resource from project ground disturbance during construction and operation.	• Presence/absence of Heritage Resource.

3.3.1.4 Boundaries

3.3.1.4.1 Spatial Boundaries

The spatial boundaries for the environmental effects assessment of Heritage Resources are defined below.

- Project Development Area (PDA): The PDA comprises the immediate area of physical disturbance associated with the construction and operation of the Project. The PDA includes 5 m around each of the cable lines, the cable storage building, the substation expansion (including the cable termination site and substation control building), and a fence line around the expanded substation. The PDA also includes a short span of overhead transmission line that will connect the substation to the existing transmission line grid.
- Local Assessment Area (LAA): The LAA is the maximum area within with Project-related environmental effects can be predicted or measured with a reasonable degree of accuracy and confidence; the LAA for Heritage Resources is limited to the PDA.
- Regional Assessment Area (RAA): The area within which the Project's environmental effects may overlap or accumulate with the environmental effects of other projects or activities. For Heritage Resources, the RAA is defined as an area within the central-west coastal region of Prince Edward Island including the Seven Mile Bay, Prevost Cove, Cape Traverse River, Augustine Cove, Richard Point, and Tryon River watershed areas, as well as the Northumberland Strait extending to within 2 km of the shoreline.

3.3.1.4.2 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on Heritage Resources include construction, operation, and decommissioning and abandonment. Construction in the terrestrial environment is expected to occur over a period of 5 months, beginning in July 2016. Operation will begin following construction in December 2016 and is anticipated to continue for the life of the Project (approximately 40 years). Decommissioning and abandonment would take place following the useful service life of the Project and which would be carried out in accordance with regulations in place at that time.

3.3.1.5 Residual Environmental Effects Description Criteria

This assessment considers residual effects on Heritage Resources after the implementation of recommended mitigation. Any archaeological excavation would be implemented only under permit issued by the Province of PEI and in consultation with the appropriate regulatory agencies. It is anticipated that the Province and the Proponent will actively engage relevant Aboriginal groups in the case of a Pre-contact or Aboriginal Historic period archaeological site. Given that undertaking archaeological mitigation or excavation activities under appropriate regulatory authorization is an occurrence contemplated in the *Archaeology Act* and the *Heritage Places Protection Act*, it is anticipated that the implementation of such an activity under these auspices, if required, would not be considered a significant adverse residual environmental effect.

Table 3.20 Characterization of Residual Environmental Effects on Heritage Resources

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect.	**Positive**—an effect that moves measurable parameters in a direction beneficial to Heritage Resources relative to baseline. **Adverse**—an effect that moves measurable parameters in a direction detrimental to Heritage Resources relative to baseline. **Neutral**—no net change in measurable parameters for Heritage Resources relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions.	**Negligible**—no measurable change to Heritage Resources. **Low to Moderate**—if Heritage Resources are encountered within the PDA and cannot be avoided, mitigation (e.g., removal) will create change to Heritage Resources. **High**—a measureable change resulting in a permanent loss of information relating to Heritage Resources (e.g., destruction that occurs without mitigation).
Geographic Extent	The geographic area in which an environmental, effect occurs.	**PDA**—residual effects are restricted to the PDA.
Frequency	Identifies when the residual effect occurs and how often during the Project or in a specific phase.	**Single event**—an effect on Heritage Resources occurs only once (i.e., disturbance results in the loss of context).
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the effect can no longer be measured or otherwise perceived.	**Short-term**—the residual effect is restricted to the construction phase. **Long-term**—the residual effect will extend for the life of the Project. **Permanent**—Heritage Resources cannot be returned to its existing condition.
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases.	**Reversible**—the effect is likely to be reversed. **Irreversible**—the effect cannot be reversed as damage or removal will result in a change to Heritage Resources.
Ecological and Socioeconomic Context	Existing condition and trends in the area where environmental effects occur.	**Undisturbed**—area is relatively undisturbed or not adversely affected by human activity. **Disturbed**—area has been substantially previously disturbed by human development or human development is still present.

3.3.1.6 Significance Definition

A significant adverse residual environmental effect on Heritage Resources is one that results in a permanent Project-related disturbance to, or destruction of, all or part of a heritage resource (i.e., archaeological, architectural or palaeontological resource) considered by the provincial heritage regulators and/or other stakeholders to be of major importance due to factors such as rarity, undisturbed condition, spiritual importance, or research importance, and that cannot be mitigated or compensated for.

3.3.2 Existing Conditions for Heritage Resources

3.3.2.1 Methods

The existing conditions of the PDA were compiled using background research, previous assessments done in the region, and information received from the regulators at Aboriginal Affairs. Historical aerial photography was also used to reconstruct conditions of the PDA as far back as the mid 1930's. Information requests were made to both Aboriginal Affairs Secretariat and the MCPEI. Both Provincial and National Historic Site registers were also consulted.

An archaeological assessment (walkover) was undertaken during August, 2015 to accurately determine existing conditions for Heritage Resources.

3.3.2.2 Overview

Palaeo-environmental reconstruction has shown that water levels around PEI have fluctuated substantially since glacial retreat roughly around 13,000 years ago (Shaw 2002:1869). Starting approximately 11,000 to 12,000 years ago, PEI was connected to the New Brunswick and Nova Scotia mainland, until sometime between 9,000 and 7,000 years before present (BP). Thus the PDA would have been located much further inland (Shaw 2002) than it is today.

The earliest archaeological evidence for human activity on PEI dates to the Palaeoindian Period between ca. 13,000 and 9,000 years ago, and includes finds in North Tryon, Basin Head (Little Harbour), St. Peters Bay (the Greenwich Site), Savage Harbour, and New London Bay (Bonnichsen *et al.* 1991). Evidence for Palaeoindian occupation at the Jones site, on the northern shores of St. Peters Bay (now located within Greenwich Prince Edward Island National Park) suggest Pre-Contact people visited the site between approximately 9,500 and 10,000 years ago (Bonnichsen *et al.* 1991). The closest archaeological evidence of Paleo-Indian occupation in PEI is found at Basin Head (Little Harbour), approximately 6 km northeast of the PDA (Bonnichsen *et al.* 1991; Townshend 1986).

There is limited evidence for Archaic Period (9000-3000 years ago) occupation in PEI; this includes a ground slate semi-lunar knife found about a mile off-shore from North Lake during scallop dragging operations (Keenlyside 1984). The knife is similar to ones found elsewhere in the Northeast that typically date between 5000 and 6000 years ago (Keenlyside 1984:27).

Prior to the arrival of Europeans the area was inhabited by Mi'kmaq people. The Mi'kmaq inhabited the entire Island which they called Apekwit, Abegweit, Abahquit, Epagwit, Epekwitk or Ep-ay-gwit, the Mi'kmaq name for Prince Edward Island, meaning "resting on the waves", "cradled on the waves", or "lying in the water" (Bremner 1936; Douglas 1925; Hamilton 1996; Ganong 1899; MCPEI 2015).

Macnutt (2009:14) states that the first recorded European to sight PEI was Giovanni Caboto (John Cabot) in 1497, followed by Jacques Cartier who visited PEI briefly in 1534 (Arsenault 1990). Sources disagree as to why PEI was named Isle St Jean; possibly it was in reference to the day that PEI was sighted (St. John the Baptist Day) (Macnutt 2009), although it is known that the name was in use for some time by Basque and Breton fishermen before appearing on a map prepared by Champlain in 1612 (Arsenault 1990:20).

Permanent European settlement of PEI was begun by the French following 1719 when the Comte de St. Pierre was granted land to establish inhabitants and a cod fishery (Arsenault 1990:21; Macnutt 2009; Roy 1982). First settled were Port LaJoie at the mouth of what is now Charlottetown Harbour, and Havre Saint Pierre (St. Peters), a fishing settlement that quickly became the most populated settlement in PEI (Arsenault 1990). By the early 18th century, PEI was being developed to supply Fort Louisbourg with adequate food (Pigot 1975). In order to facilitate this, a system of dykes and ditches, some of which are still visible today, were constructed along the Hillsborough River to drain the salt marshes and increase the amount of farmland (Pigot 1975). After the fall of Fort Louisbourg at the hands of the British in 1758, the Acadians, as they had come to be known, were forced to leave PEI after refusing to pledge allegiance to the British (Pigot 1975). There are conflicting accounts of the expulsion of the Acadians from PEI: one account suggests that homes and possessions were not destroyed to discourage the Acadians from returning (Baldwin 2009); another account describes "plumes of smoke" rising from "ravaged homes" (Pigot 1975). The Treaty of Paris (1763) ceded PEI to British control and, by 1767, PEI had been divided up into 67 lots, most of which were granted to prospective settlers. Early British settlement occurred in a few places, including at Cape Traverse under the sponsorship of Captain Samuel Holland, who was also responsible for charting the interior of PEI. Following the American Revolution, a number of Loyalist families, including their slaves, settled various areas within what is now Canada, including PEI. This is reflected in the 1781 Island law that was passed legalizing slavery thereby making PEI more attractive for settlement to slave owning Loyalists.

A database review conducted by Aboriginal Affairs at the request of Stantec revealed that there are no registered archaeological sites within or in the vicinity of the PDA. Both Provincial and National Historic Site registers were consulted and no designated historic place or built heritage is located within or in vicinity of the PDA (CRHP 2015; HPPEI 2015).

A review of historical aerial photography for the PDA indicated that a substantial quarrying operation was started sometime after 1958 (PEIDAF 1935, 1958) and before 1974 (PEIDAF 1974) and continued until the late 1990s (PEIDAF 1990, 2000) along the shoreline inside what is part of the proposed termination site/substation expansion. This would suggest that at least for this particular area of the PDA, there is substantially reduced potential to encounter archaeological resources.

The walkover component of the archaeological assessment was undertaken in August 2015 to determine existing conditions for Heritage Resources. During the course of the walkover, no Heritage Resources were observed; however, specific areas within the PDA were identified as having elevated potential for sub-surface Heritage Resources and additional mitigation (e.g., shovel testing) is recommended to confirm the presence or absence of Heritage Resources within the PDA.

3.3.3 Project Interactions with Heritage Resources

Table 3.21 identifies, for each potential effect, the project physical activities that might interact with the VC. These interactions are indicated by check marks, and are discussed in detail in Section 3.3.4 in the context of effects pathways, standard and project-specific mitigation/enhancement, and residual effects. A justification is also provided for non-interactions (no check marks).

Table 3.21 Potential Project-Environment Interactions and Effects on Heritage Resources

Project Components and Physical Activities	Potential Environmental Effects
	Change in Heritage Resource
Construction	
Landfall Construction (PE)	✓
Upgrading of Electrical Substation (PE)	✓
Inspection and Energizing of the Transmission Lines	–
Clean-Up and Re-vegetation of the Transmission Corridor	–
Emissions and Wastes	–
Transportation	–
Employment and Expenditure	–
Operation	
Energy Transmission	–
Vegetation Management	–
Infrastructure Inspection, Maintenance and Repair (Transmission Lines and Substations)	–
Access Road Maintenance	–
Emissions and Wastes	–
Transportation	–
Employment and Expenditure	–
Decommissioning and Abandonment	
Decommission	–
Reclamation	–
Emissions and Waste	–
Employment and Expenditure	–

Notes:
✓ = Potential interactions that might cause an effect.
– = Interactions between the project and the VC are not expected.

Construction

The potential interactions with Heritage Resources are limited to ground-breaking activities during Project construction.

Operation, and Decommissioning and Abandonment

Once installed, Project operation and any work associated with decommissioning and abandonment are not expected to interact with Heritage Resources. If any ground-breaking is required for Project maintenance or decommissioning and abandonment, it is assumed that will take place only within areas previously disturbed as a result of construction activities. As a result, the operation and decommissioning and abandonment phases of the Project will not be considered further in this VC.

3.3.4 Assessment of Residual Environmental Effects on Heritage Resources

3.3.4.1 Project Pathways for Heritage Resources

In most cases, Heritage Resources, especially archaeological and palaeontological resources, are located on surface or below ground; therefore any construction activity that disturbs the ground has potential to interact with Heritage Resources. As noted above, construction activities with associated ground-breaking are the only Project activities with potential to result in residual environmental effects on Heritage Resources.

3.3.4.2 Mitigation for Heritage Resources

In order to avoid or reduce the environmental effects potentially resulting from the environmental effects mechanisms, mitigation will be required. The primary measure to assess the potential for Heritage Resources to be present within the PDA is to complete an archaeological assessment to confirm the presence or absence of Heritage Resources within the PDA.

The following mitigation measures are recommended to address potential environmental effects on Heritage Resources within the PDA:

- avoidance of ground disturbance in areas of elevated archaeological potential identified during the walkover where practicable
- where avoidance of areas determined to have elevated potential for archaeological resources is not practicable, develop and implement mitigation (e.g., shovel testing) in consultation with provincial heritage regulators
- should any Heritage Resources be discovered during shovel testing, mitigation will be developed and implemented in consultation with the provincial regulators
- in the unlikely event of an unanticipated discovery of Heritage Resources within the PDA, the response procedure outlined in the contingency plan for Heritage Resources in the EPP will be followed

All mitigation will be conducted by an archaeologist permitted by the province of PEI, and in consultation with, and approval by, Aboriginal Affairs Secretariat.

3.3.4.2.1 Residual Project Environmental Effect for Heritage Resources

With the implementation of the proposed mitigation, the likelihood of an unauthorized disturbance to, or destruction of, a Heritage Resource considered by the provincial heritage regulators to be of major importance that is not mitigated is very low. All archaeological mitigation will be carried out under provincial legislation and authorization and in consultation with Aboriginal communities, as applicable. Any chance finds of previously undetected Heritage Resources will be limited to the PDA and will be managed according to a heritage discovery response procedure to protect the information associated with those resources, and in consultation with appropriate provincial regulatory agencies. Combined, this mitigation will reduce the potential for significant adverse residual environmental effects to Heritage Resources.

Construction

Should any Heritage Resources be identified during the field assessment, appropriate mitigation up to and including avoidance, would be implemented prior to construction activities. Therefore the only residual environmental effects would be the unplanned discovery of a Heritage Resource during construction. While mitigation is recommended to address this possibility, the discovery of a Heritage Resource during construction is likely to result in some adverse environmental effect (i.e., disturbance) to the resource. In the unlikely case of a Project-related interaction with Heritage Resources, during construction, the effects are characterized as adverse in direction as the unmitigated disturbance of a Heritage Resource may result in the loss of information. The magnitude of the effect would be rated low to moderate, dependent upon the nature of the Heritage Resource, the extent of the disturbance, and the ability to implement mitigation following the identification of a Heritage Resource. This effect would occur as a single event, the duration would be permanent and would be irreversible as Heritage Resources can only be adversely affected once, and when that occurs, it may result in the permanent loss of some information and context relating to the Heritage Resource, further, no archaeological site can be “reconstituted” after disturbance. The geographic extent of this effect would be limited to the PDA, as it is the area of physical disturbance during this phase of the Project where archaeological resources could potentially be located, and the ecological context of the PDA is disturbed / undisturbed for construction activities. Most of the area has been subject to agricultural and industrial quarrying activities in the relatively recent past, but there remain some areas where pre-project disturbance is minimal. The implementation of mitigation is considered achievable, as within the PDA the potential interaction would be limited to those areas where pre-construction mitigation was not implemented, which is a very small area, and the implementation of a heritage response protocol will likely prevent the loss of information in the event of an accidental disturbance to a heritage resource.

3.3.4.3 Summary of Residual Project Environmental Effects

A summary of Project residual environmental effects on Heritage Resources is provided in Table 3.22.

Table 3.22 Summary of Project Residual Environmental Effects on Heritage Resources

Residual Effect	Residual Environmental Effects Characterization							
	Project Phase	**Direction**	**Magnitude**	**Geographic Extent**	**Duration**	**Frequency**	**Reversibility**	**Ecological and Socioeconomic Context**
Change in Heritage Resources	C	A	L-M	PDA	P	S	I	D/U

KEY See Table 3.20 for detailed definitions. **Project Phase:** C: Construction O: Operation D: Decommissioning and Abandonment **Direction:** P: Positive A: Adverse N: Neutral **Magnitude:** N: Negligible L: Low M: Moderate H: High	**Geographic Extent**: PDA: Project Development Area LAA: Local Assessment Area RAA: Regional Assessment Area **Duration:** ST: Short-term; MT: Medium-term LT: Long-term P: Permanent NA: Not applicable	**Frequency:** S: Single event IR: Irregular event R: Regular event C: Continuous **Reversibility:** R: Reversible I: Irreversible **Ecological/Socioeconomic Context:** D: Disturbed U: Undisturbed

3.3.5 Determination of Significance

Ground-breaking activities associated with Project construction are the only activities with potential to result in residual environmental effects of the Project on Heritage Resources. With the implementation of the proposed mitigation, the Project should not result in the unauthorized disturbance to, or destruction of a heritage resource considered by the provincial heritage regulators and/or other stakeholders to be of major importance that is not mitigated. Where some potential for residual effects still remains, the development and implementation of a heritage response protocol and subsequent mitigation to be developed in consultation with provincial regulators will minimize the potential for unauthorized disturbance of Heritage Resources. Therefore, the residual environmental effects of the Project on Heritage Resources during all Project phases are rated not significant.

3.3.6 Prediction Confidence

This assessment is made with a high level of confidence based on comprehensiveness of the background research, completion of the archaeological assessment (walkover), and the proposed mitigation within the PDA.

3.3.7 Follow-up and Monitoring

Any follow-up and monitoring requirements for Heritage Resources will be determined as a result provincial regulatory officials following acceptance of the site specific archeological assessment.

4.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Effects of the Environment on the project are associated with risks of natural hazards and influences of nature on the Project. These effects may arise due to forces associated with weather, climate, climate change, seismic activity, forest fires, or marine hazards. Potential effects of the environment on any project are typically addressed through design and operational procedures developed in consideration of expected normal and extreme environmental conditions. Effects of the environment, if unanticipated or unmanaged, could result in adverse changes to Project components, schedule, and/or costs.

As a matter of generally accepted engineering practice, designs and design criteria tend to consistently overestimate and account for possible forces of the environment. Engineering design therefore inherently incorporates a considerable margin of safety so that a project is safe and reliable throughout its lifetime. PEI Energy Corporation/MECL will monitor any observed Effects of the Environment on the Project, and take action, as necessary, to repair and upgrade Project infrastructure and modify operations to permit the continued safe operation of the facility.

4.1 SCOPE OF ASSESSMENT

Potential Effects of the Environment on the Project relevant to conditions potentially found in PEI include:

- climate, including weather and weather variables such as:
  - air temperature and precipitation
  - fog and visibility
  - winds
  - extreme weather events
  - storm surges and waves
- climate change (including sea level rise and coastal erosion)
- seismic events
- forest fire from causes other than the Project
- marine hazards

4.1.1 Regulatory and Policy Setting

Direction on the scoping of Effects of the Environment on the Project for this assessment has been provided by PEI government, as noted in the following section.

4.1.2 The Influence of Consultation and Engagement on the Assessment

As outlined in Volume 1, Section 3.2 (Consultation and Engagement), scoping documents were sent to provincial regulators in PEI and New Brunswick, in addition to federal PWGSC).

PEI Department of Communities, Land and Environment (PEIDCLE) advised that "*all climate change adaptation impacts on the infrastructure*" (e.g., flooding, erosion, wind, freezing rain) be addressed in the assessment. The New Brunswick Department of Environment and Local Government (NBDELG) Technical Review Committee has requested that future climate conditions be considered by the Proponent with respect to location, design and construction of the transmission line and its associated infrastructure.

4.1.2.1 Potential Environmental Effects, Pathways and Measurable Parameters

Potential Effects of the Environment on the Project may include:

- reduced visibility and inability to manoeuver construction and operation equipment
- delays in receipt of materials and/or supplies (e.g., construction materials) and/or in delivering products
- changes to the ability of workers to access the site (e.g., if a road were to wash out)
- damage to infrastructure
- increased structural loading
- corrosion of exposed oxidizing metal surfaces and structures, perhaps weakening structures and potentially leading to malfunctions
- loss of electrical power resulting in potential loss of production

These and other changes to the Project can result in delays or damage to the Project processes, equipment, and vehicles. The effects assessment is therefore focused on the following effects:

- change in Project schedule
- damage to infrastructure

Some effects, such as damage to infrastructure, can also result in consequential effects on the environment (e.g., spills); these environmental effects are addressed as Accidents, Malfunctions and Unplanned Events in Volume 2, Chapter 5.

4.1.3 Boundaries

4.1.3.1 Spatial Boundaries

The spatial boundaries for the assessment of Effects of the Environment on the Project include the areas where Project-related activities are expected to occur. For the purpose of this assessment, in PEI the spatial boundaries for Effects of the Environment on the Project are limited to the Project Development Area (PDA), as described below:

- Project Development Area (PDA): The PDA comprises the immediate area of physical disturbance associated with the construction and operation of the Project. The PDA includes 5 m around each of the cable lines, the cable storage building, the substation expansion (including the cable termination site and substation control building), and a fence line around the expanded substation. The PDA also includes a short span of overhead transmission line that will connect the substation to the existing transmission line grid.

Where consequential environmental effects are identified, they are considered within the boundaries of the specific zone of influence of those consequences. Accidental events that could arise as a result of effects of the environment (e.g., spills) are addressed in Volume 2, Section 5.

4.1.4 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects of Effects of the Environment on the Project include construction, operation, and decommissioning and abandonment. Construction in the terrestrial environment is expected to occur over a period of 5 months, beginning July 2016. Operation will begin following construction in December 2016 and is anticipated to continue for the life of the Project (approximately 40 years). Decommissioning and abandonment would take place following the useful service life of the Project and which would be carried out in accordance with regulations in place at that time.

4.1.5 Residual Environmental Effects Description Criteria

A significant adverse residual effect of the environment on the Project is one that would result in:

- a substantial change of the Project schedule (e.g., a delay resulting in the construction period being extended by one season)
- a long-term interruption in service (e.g., interruption in power transmission activities such that electricity demands cannot be met)
- damage to Project infrastructure resulting in a significant environmental effect
- damage to the Project infrastructure resulting in a substantial increase in a health and safety risk to the public or business interruption
- damage to the Project infrastructure resulting in repairs that could not be technically or economically implemented

4.2 EXISTING CONDITIONS FOR EFFECTS OF THE ENVIRONMENT ON THE PROJECT

4.2.1 Climate

Climate is defined as the statistical average (mean and variability) of weather conditions over a substantial period of time (typically 30 years), accounting for the variability of weather during that period (Catto 2006). The relevant parameters used to characterize climate are most often surface variables such as temperature, precipitation, and wind, among others.

The current climate conditions are generally described by the most recent 30 year period (1981 to 2010; Government of Canada 2015a) for which the Government of Canada has developed statistical summaries, referred to as climate normals. The closest weather station to the Project with available historic data is in Summerside, PEI, located approximately 20 km north-west of the Project. Limited historical climate data are available for the Summerside station; therefore, data from the Charlottetown weather station, located approximately 60 km from Borden-Carleton, are also used to supplement information on regional conditions.

4.2.1.1 Air temperature and precipitation

The average monthly temperature in Summerside has ranged between -7.7 °C (January) and 19.2 °C (July) (Table 4.1). Extreme maximum temperature was 33.3 °C (July 1963) and the extreme minimum temperature was -29.9 °C (January 1982).

Summerside averages 1,072.9 mm of precipitation per year, of which, approximately 809.1 mm fell as rain and 277.9 cm as snow. Extreme daily precipitation at Summerside ranged from 41.9 mm (February) to 111.8 mm (August). On average, there have been six days each year with rainfall greater than 25 mm, and snowfalls greater than 25 cm occur on average one day per year (Government of Canada 2015a).

4.2.1.2 Fog and Visibility

Fog is defined as a ground-level cloud. It consists of tiny water droplets suspended in the air and reduced visibility to less than 1 km (Environment Canada 2014). "Days with fog" are days when fog occurs and horizontal visibility is less than 1 km (thick fog) and 10 km (fog) (Phillips 1990). Limited historical climate data for fog and visibility are available for the Summerside station; therefore, fog data from the Charlottetown weather station, located approximately 60 km from the Project, are presented to provide some indication of the magnitude of fog experienced in the region. The hours with the measured increase in hours of reduced visibility (< 1 km) is between December and April (Government of Canada 2015b) (Table 4.2). Days with fog in PEI are relatively low throughout the year, as the surrounding provinces act as a barrier from the southerly fog off the Bay of Fundy (Phillips 1990). The Charlottetown weather station has experienced, on average, 190.8 hours (7.95 days) per year when visibility is less than 1 km.

Table 4.1 Air Temperature and Precipitation Climate Normals, Summerside and Charlottetown (1981-2010)

Month	Temperature (°C)					Precipitation (mm)					Mean No. of Days with							
	Averages			Extreme		Rainfall (mm)	Snowfall (cm)	Precipitation (mm)	Extreme daily Rainfall (mm)(Year)	Extreme Daily Snowfall (mm)(Year)	Temperature (°C)				Snow (cm)		Rain (mm)	
	Max	Min	Avg	Max (Year)	Min (Year)						>=30*	>=20*	<=20	<=-30	>=10	>=25	>=10	>=25
JAN	-3.2	-12.1	-7.7	12.1 (1979)	-29.9 (1982)	25.2	78.5	96.2	56.6 (1979)	53.6 (1961)	0	0	2.7	0	2.1	0.44	0.69	0.13
FEB	-2.5	-11.2	-6.9	12.8 (1976)	-26.1 (1943)	24.9	53.4	74.9	74.4 (1953)	40.4 (1990)	0	0	2.3	0	1.7	0.19	0.88	0.19
MAR	1.1	-6.8	-2.9	15.6 (1945)	-23.9 (1950)	34.6	47.4	79.4	33.3 (1944)	40.9 (1957)	0	0	0.44	0	1.4	0.19	1.1	0.12
APR	6.9	-1	3	23.3 (1945)	-13.4 (1995)	61.3	22.2	84.2	87.6 (1962)	37.6 (1962)	0	0.33	0	0	0.44	0.06	1.9	0.25
MAY	14.2	4.9	9.5	32 (1977)	-5 (1972)	94.9	3.2	97.7	58.7 (1951)	13.4 (1985)	0	5	0	0	0.13	0	3.1	0.67
JUN	19.4	10	14.7	32.2 (1947)	0 (1947)	91.3	0	91.3	57.9 (1968)	0 (1942)	0.07	13.6	0	0	0	0	3.1	0.44
JUL	23.8	14.6	19.2	33.3 (1963)	6.7(1952)	74.1	0	74.1	71.4 (1979)	0 (1942)	0.33	25	0	0	0	0	2.1	0.67
AUG	22.9	14.3	18.6	33.3 (1944)	4.4 (1953)	92.7	0	92.7	111.8 (1948)	0 (1942)	0.43	24.1	0	0	0	0	2.9	1.1
SEP	18.2	10	14.1	31.7 (1942)	-0.1 (1980)	96.8	0	96.7	109.2 (1942)	0 (1942)	0.1	10.1	0	0	0	0	3.3	0.8
OCT	12.1	4.6	8.4	24.4 (1968)	-5.6(1944)	87	0.7	87.7	69.3 (1968)	20.3 (1974)	0	1.1	0	0	0	0	2.9	0.8
NOV	5.8	-0.7	2.6	21.2 (1982)	-13.3 (1978)	77.2	19.1	97.7	90.4 (1944)	27.2 (1968)	0	0.07	0	0	0.5	0.06	2.6	0.31
DEC	-0.1	-7.5	-3.8	15.6 (1950)	-25.6 (1943)	49.2	53.5	100.3	46 (1944)	44.2 (1963)	0	0	0.53	0	1.4	0.07	1.5	0.47
Annual	**9.9**	**1.6**	**5.7**	**-**	**-**	**809.1**	**277.9**	**1072.9**	**-**	**-**	**0.93**	**79.3**	**5.9**	**0**	**7.6**	**1**	**26**	**6**

Note:

* Data taken from the Charlottetown weather station, as these data are not available for Summerside.

Source: Government of Canada 2015a, 2015b

Table 4.2 Visibility - Climate Normals, Charlottetown (1981-2010)

Visibility (hours with)													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
< 1 km	29.4	25.1	28.4	25.4	17	10.9	5.7	4.5	4.2	2.8	11.4	26.1	190.8
1 to 9 km	136.6	117.6	116.5	107	90.1	80	69.2	73	56.3	58.1	91.6	135	1130.9
> 9 km	578	534.2	599.1	587.7	636.9	629.2	669.1	666.5	659.5	683.1	617	582.9	7443.1
Source: Government of Canada 2015b													

4.2.1.3 Wind

Monthly average wind speeds measured at the Charlottetown weather station range from 13.3 to 18.6 km/h (Figure 4.1). From October to February, the dominant wind direction is from the west, with winds predominantly blowing from the north during March and April, from the south during May and June, and from the southwest during July to September (Government of Canada 2015b). Maximum hourly wind speeds measured at the Summerside weather station range from 64 km/h to 121 km/h, while maximum gusts for the same period range from 98 km/h to 145 km/h (Government of Canada 2015a). Occurrences of extreme winds are uncommon at Charlottetown; over the last three decades, there has been an average of 7.9 days per year with winds greater than or equal to 52 km/h and 1.8 days per year with winds greater than or equal to 63 km/h (Government of Canada 2015b).

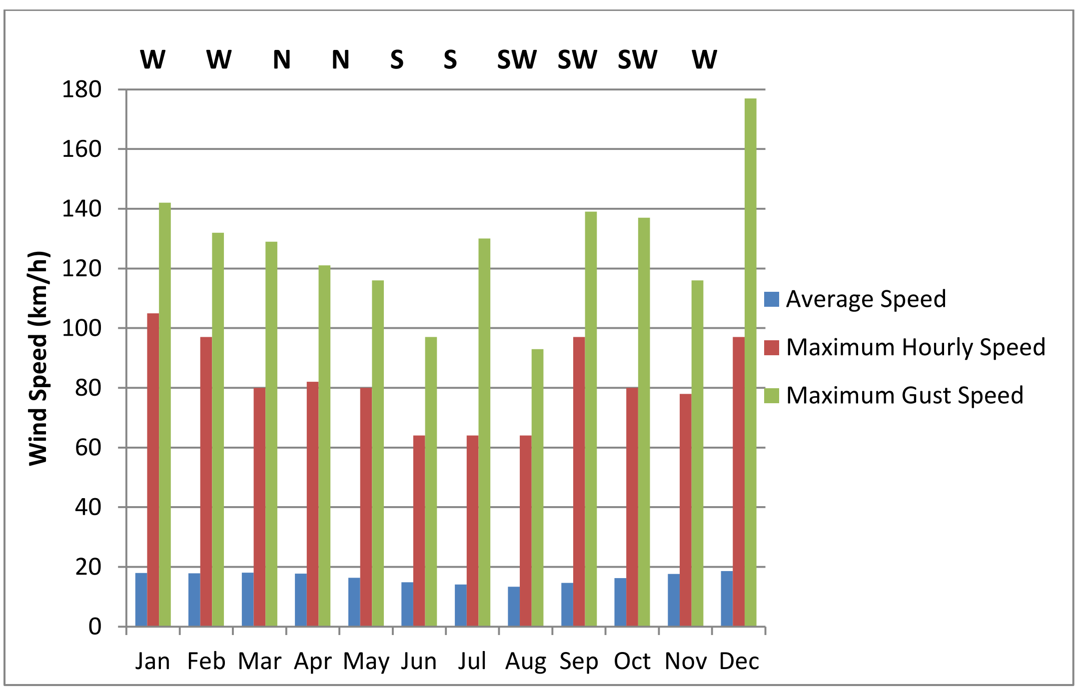

Figure 4.1 Predominant Monthly Wind Direction, Monthly Mean, Maximum Hourly and Maximum Gust Wind Speeds (1981 to 2010) at Summerside and Charlottetown, PE

4.2.1.4 Extreme Weather Events

Extreme precipitation and storms can occur in PEI throughout the year, but tend to be more common and severe during the winter. Winter storms generally bring high winds and combination of snow and rain. Extreme snowfall events in the winter of 2014/2015 affected much of PEI. Some areas received as much as 551 cm of snow which broke the provincial record for the most snowfall recorded in one year. These events threatened public safety and transportation systems all across PEI (University of Prince Edward Island 2015).

Tornadoes are rare, but do occur in PEI. According to Environment Canada (2011), PEI is considered part of Canada's tornado zone. Tornadoes are classified on a scale known as the Fujita scale. F0 Tornadoes (weak tornadoes) have occurred in PEI. They have winds ranging between 40 and 117 km/h, where there may be some light damage, tree branches broken off, shallow-rooted trees pushed over, and sign boards damaged (NOAA nd). These tornadoes, however, are typically the end of wind systems traveling from other provinces (Government of PEI 2010).

Thunderstorms during the early summer typically attenuate as they cross the Northumberland Strait, from New Brunswick, due to the cold waters of the Strait. As the summer progresses, however, water temperatures warm up and are able to sustain or strengthen thunderstorms as they travel across the Strait to PEI (NAV CANADA 2000).

4.2.1.5 Storm Surges and Waves

Rising sea levels and more frequent and severe weather has also brought about an increase in frequency of storm surges. Storm surges are defined as the elevation of water resulting from meteorological effects on sea level. During the past 15 years, storm surges have resulted in property destruction in all four Atlantic Provinces (Vasseur and Catto 2008). In Atlantic Canada, storm surges have been higher in coastal waters and highest in the Gulf of St. Lawrence (Bernier *et al.* 2006).

PEI is vulnerable to coastal flooding as a result of storm surges and sea level rise (Natural Resources Canada 2014). On January 21, 2000, a storm surge in conjunction with a high tide produced water levels of 4.23 m above chart datum in Charlottetown. There was damage to wharves, a lighthouse was removed from its foundation, and parts of downtown Charlottetown were flooded. This historic storm resulted in $20 million in damage to property and infrastructure across PEI (Natural Resources Canada 2014).

4.2.2 Climate Change

While "climate" refers to average weather conditions over a 30-year period, "climate change" is an acknowledged change in climate that has been documented over two or more periods, each with a minimum duration of 30 years (Catto 2006). The Intergovernmental Panel on Climate Change (IPCC) defines climate change as a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes, external forces, or to persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC 2012). The United Nations Framework Convention on Climate Change makes a distinction between climate change attributed to human activities and climate variability attributable to natural causes. Climate change is a change of climate directly or indirectly attributed to human activity that alters the composition of the global atmosphere, which is in addition to natural climate variability observed over comparable time periods (IPCC 2007).

Predictions of effects of climate change are limited by the inherent uncertainty of climate models in predicting future changes in climate parameters. Global and regional climate models can provide useful information for predicting and preparing for global and macro-level changes in climate; however, the ability of models to pinpoint location-specific changes to climate is still relatively limited.

4.2.2.1 Sea Level Rise

Global sea levels have risen 1.8 mm/year over a 40 year period (1961 to 2003) and a more recent rate of 3.1 mm/year between 1993 and 2003 (Bindoff *et al.* 2007). The sea level has been slowly and steadily rising in most of Atlantic Canada for centuries due to crustal subsidence, warming trends, and the melting of polar ice caps (Government of Newfoundland and Labrador 2003). In particular, the sea level has been gradually rising along the southeastern coast of New Brunswick for several thousand years. The changes associated with that rise have become especially evident along the Northumberland Strait over the last several decades (Daigle *et al.* 2006) due to the low coast profile and substantive development near the coast line and on lands near mean sea level. Most of Atlantic Canada is also experiencing some crustal subsidence in coastal areas, thus compounding the rise in sea level (Vasseur and Catto 2008).

Sea level rise sensitivity is defined as the degree to which a coastline may experience physical changes such as flooding, erosion, beach migration, and coastal dune destabilization (Natural Resources Canada 2010).

Sea levels are expected to continue to rise at a greater rate in the 21st Century than was observed between 1961 and 2003 due to more rapid warming; this also increases rate of melting of the ice caps and glaciers. By the mid-2090s, global sea levels are projected to rise at a rate of approximately 4 mm/year, and reach 0.22 m to 0.44 m above 1990 levels (Bindoff *et al.* 2007). It is generally understood that a rise in sea level, coupled with more frequent and severe weather, are likely to bring about storm surges that could flood areas in Atlantic Canada that were once unlikely to flood (Conservation Corps of Newfoundland and Labrador 2008).

At the current sea level, storm surges of 3.6 m are anticipated annually in the southern Gulf of St. Lawrence by 2100 (Parkes *et al.* 2006). Over the next 100 years storm surges in excess of 4.0 m are anticipated to occur once every 10 years (Vasseur and Catto 2008).

Climate systems are highly variable, reducing the certainty with which climate projections can be made. While the directions of some climate conditions are nearly certain, there is greater uncertainty in the projected magnitude or extent of the conditions. For example, while it is expected that temperatures will increase over the next 80 years, determining the extent of that temperature increase becomes progressively more difficult further into the future. When investing in infrastructure and industries of the future that will be subject to sea level rise and storm surges, precautions must be taken in their design to ensure adequate consideration is given to the effects of climate change.

Sea level rise is occurring in Nova Scotia, Prince Edward Island, and most of New Brunswick due to a rising sea and a sinking earth surface. Sea level rise is most significant in areas with low-lying shorelines of estuaries, lagoons and coastal plains, and most sensitive to barrier islands, spits, and salt marshes (PEIDELJ 2011).

Coastal erosion caused by sea level rise and wave action may also be influenced by the strength of the coastal material. The sedimentary rocks (i.e., sandstone and shale) and sand that is common in PEI is extremely vulnerable to erosion, due to the weak resistance of the material (PEIDELJ 2011). A coastal erosion assessment at the landfall site in Borden-Carleton, PEI was conducted in 2015. The objective of this assessment was to determine the present shoreline erosion process and rates in the vicinity of the Prince Edward Island (Borden-Carleton) cable landing site. As a result of the findings of the assessment, long-term protection of the landing sites will be included in the site design.

The assessment consisted of two phases:

- A site visit was conducted with a specific focus on the local physiography. The intent was to help gain an understanding of the dynamics that shaped the present day shoreline. An understanding of the landform history would enable a more accurate prediction of future changes to the shoreline.
- A review and comparison of historical aerial photos was carried out for the cable landing site. A visual representation of the changes in the shoreline is shown on Figure 4.2.

The geology along the shoreline generally consists of horizontally bedded sedimentary bedrock consisting of sandstone and mudstone at varying elevations, underlying a reddish brown silty sand with gravel glacial till. At the cable landing site, the geology is variable. At the low water mark, a sedimentary bedrock outcrop is visible. At the high water mark, a thin marine deposit overlies the bedrock. The slope leading up from the shoreline consists of glacial till. The soil slope shows signs of erosion at the toe (through wave action) and localized slope failures. The topography along the top of the slope is undulating.

Since 1935, the majority of the changes in the shoreline have been diminishing through erosion. The cable landing site area has experienced the most change, with decreases in the shoreline ranging from approximately 15 to 35 m.

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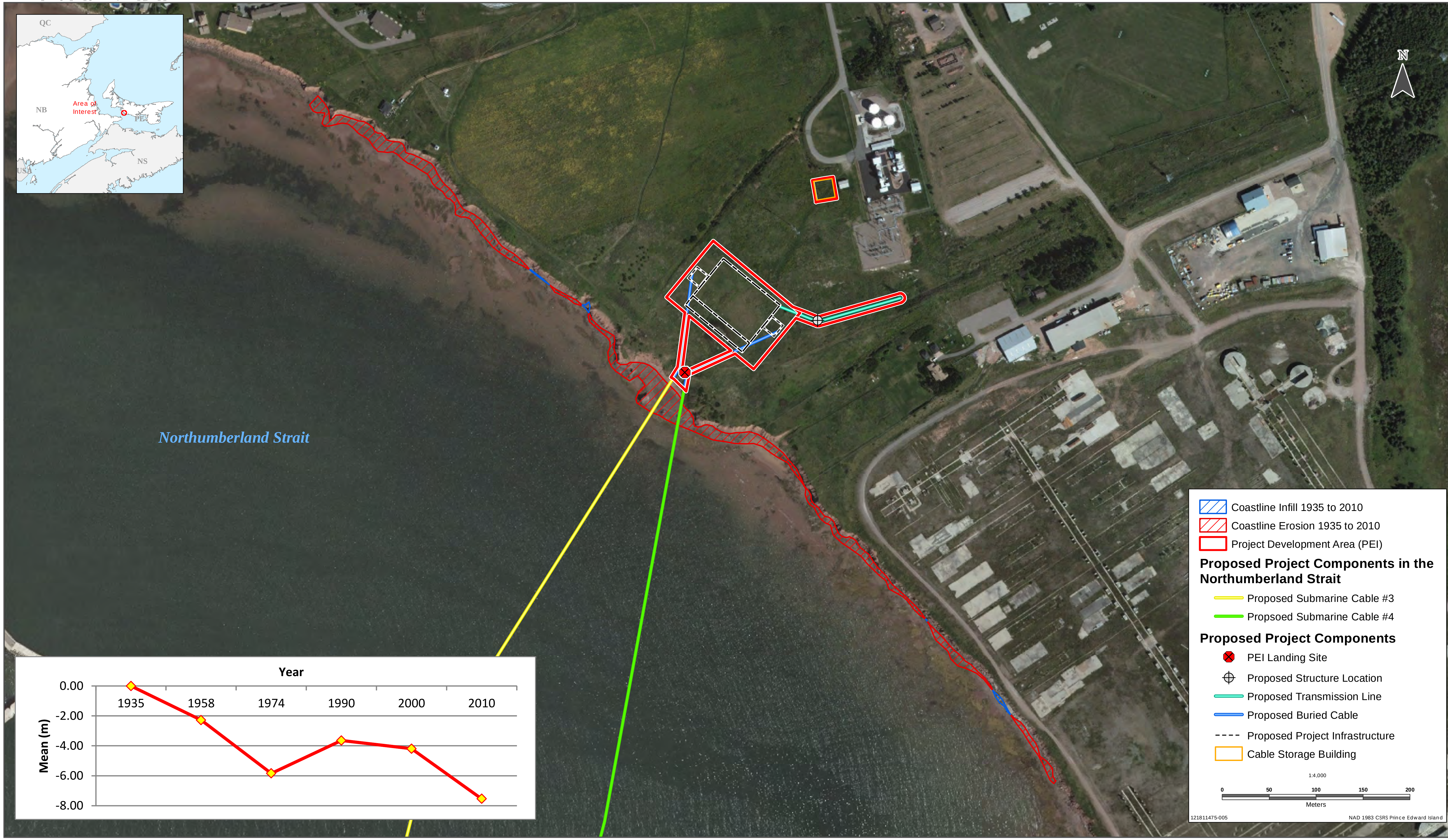


Sources: GeoNB, NB Power, . Imagery: PEI Government (2010). Project Data from Stantec or provided by NB Power.

Disclaimer: This map is for illustrative purposes to support this project; questions can be directed to the issuing agency.

Stantec

121811475 - PEI - NB Marine Cable Interconnection - Maritime Electric Company Limited

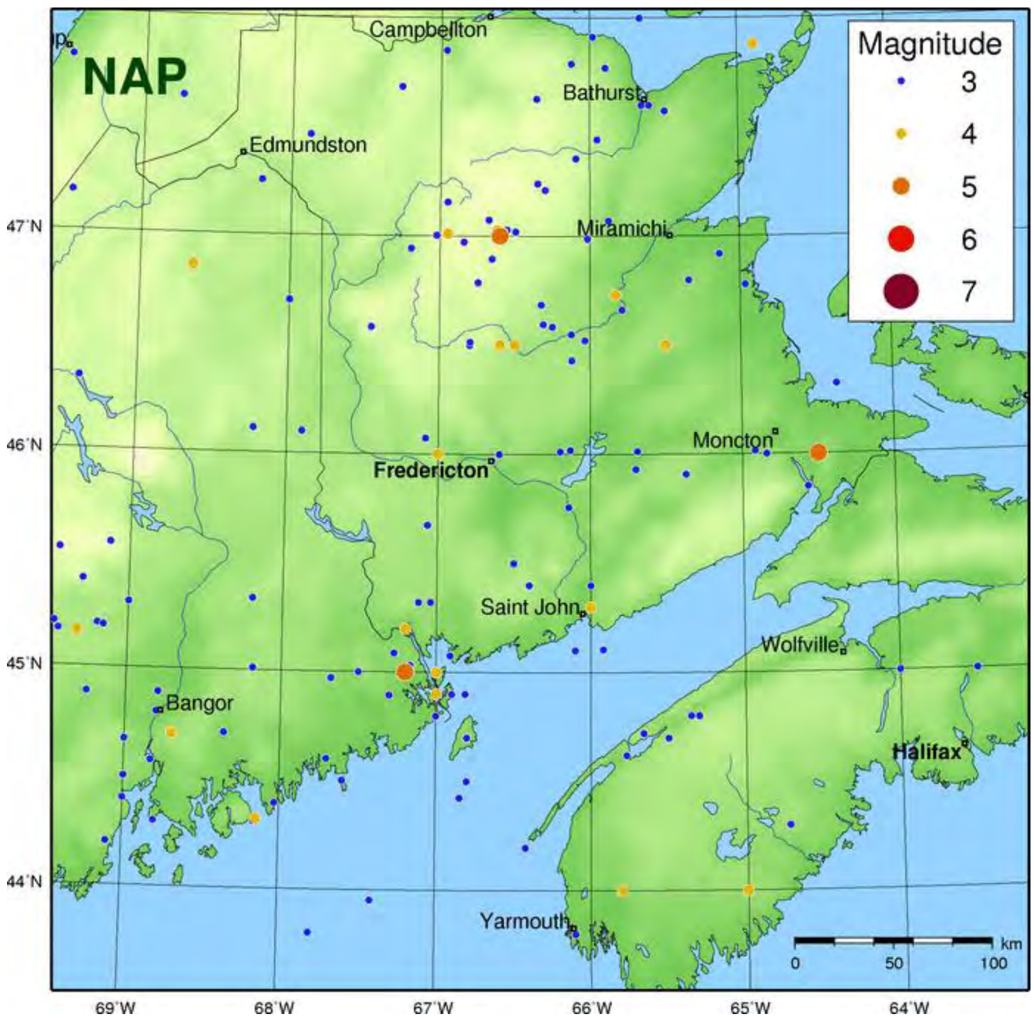
PEI Project Site Coastal Erosion 1935 to 2010

Figure 4.2

4.2.3 Seismic Activity

Seismic activity is dictated by the local geology of an area and the movement of tectonic plates comprising the Earth's crust. Natural Resources Canada monitors seismic activity throughout Canada and identifies areas of known seismic activity in order to document, record, and prepare for seismic events that may occur.

PEI does not lie within a seismic zone (Government of PEI 2010) and therefore seismic activity is not further assessed. The closest seismic zone to the Project is the Northern Appalachians seismic zone (see Figure 4.3) (NRCan 2013), which includes most of New Brunswick and extends southwards into New England and Boston. It is one of five seismic zones in southeastern Canada, where the level of historical seismic activity is low. Historical seismic data recorded throughout eastern Canada has identified clusters of earthquake activity.



Source: NRCan 2013

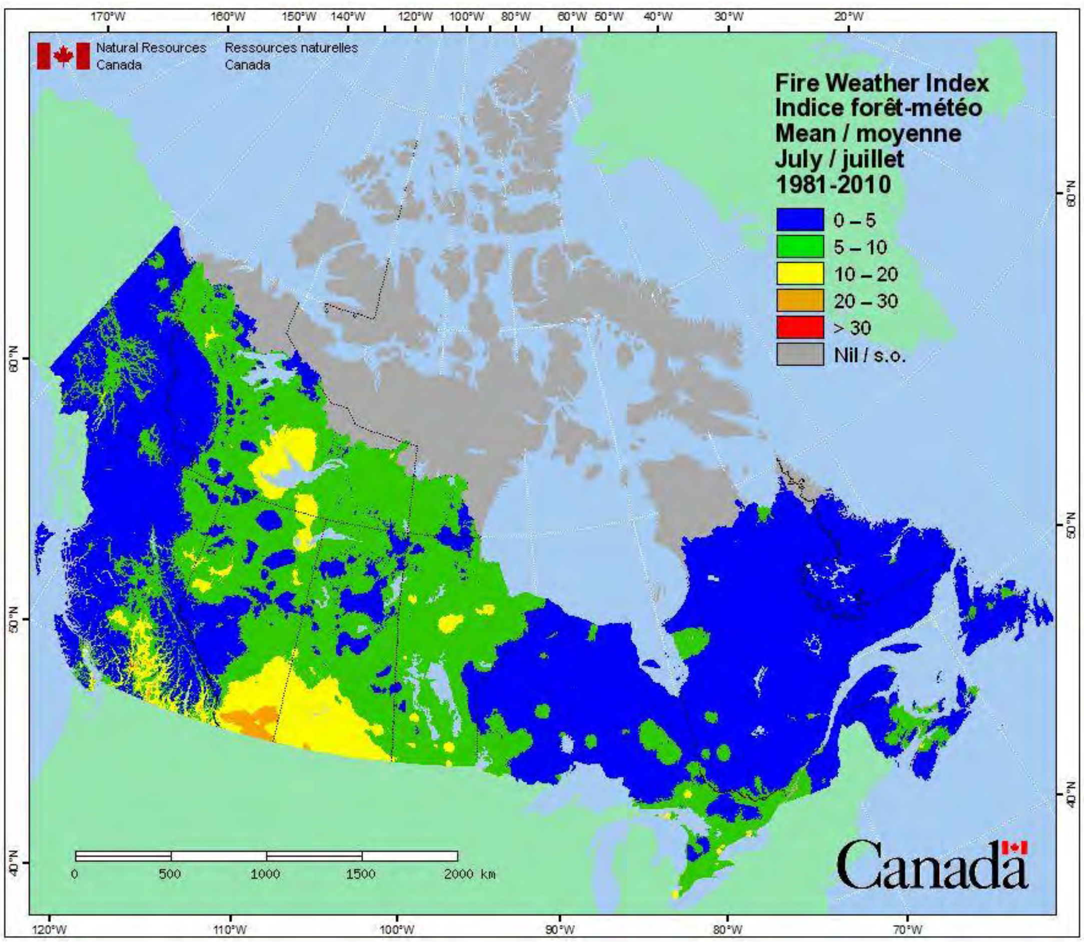
Figure 4.3 Northern Appalachians Seismic Zone

4.2.4 Forest Fires

The Fire Weather Index is a component of the Canadian Forest Fire Weather Index System. It is a numeric rating of fire intensity. It combines the Initial Spread Index and the Buildup Index, and is a general index of fire danger throughout the forested areas of Canada (Natural Resources Canada 2015).

Forest fires in PEI are usually caused by burning off old grass, incinerating trash, removing brush from land clearing or conversion operations, or from equipment sparks (PEIDCLE 2015).

The mean Fire Weather Index for July for PEI (i.e., normally the driest month of the year), when risk of forest fire is typically the greatest, is rated from 5-10 (for years 1981-2010) (Figure 4.4). This is in the lower range of possible risk which, at the highest range, can exceed 30 on the Fire Weather Index (Natural Resources Canada 2015).



Source: Natural Resources Canada 2015

Figure 4.4 Average Fire Weather Index for the Month of July (1981-2010)

PEI has 40 fire departments. The Charlottetown Fire Department is a composite department consisting of two stations with a career fire chief and deputy fire chief, two district volunteer chiefs, two deputy district volunteer chiefs 80 volunteer firefighters, fire inspector, prevention officer, six permanent firefighters and six seasonal staff.

The Summerside station is directed by a Deputy Chief and has 38 firefighters; there is also a small fire department located in Borden-Carleton.

4.2.5 Marine Hazards

Sea spray, fairly common in the Northumberland Strait, results when high winds carry water droplets suspended in air when waves break over rocks. The effects of sea spray would potentially be felt in the PDA at the landfall sites, at the cable termination site and the upgraded substation in Borden-Carleton.

4.3 ASSESSMENT OF EFFECTS OF THE ENVIRONMENT ON THE PROJECT

4.3.1 Effects of Climate on the Project

4.3.1.1 Project Pathways for Effects of Climate on the Project

The potential effects of climate must be considered during infrastructure development, particularly in close proximity to marine environments. Extreme temperatures and severe precipitation, fog and visibility, winds and extreme weather events could potentially cause:

- reduced visibility and inability to manoeuver equipment
- delays in construction/operation activities and delays in receipt of materials
- inability of personnel to access the site (e.g., if a road were to wash out)
- damage to infrastructure
- increased structural loading

During construction, extreme low temperatures have the potential to reduce the ductility of construction materials used in Project components (e.g., ancillary facilities) and increase susceptibility to brittle fracture.

Snow and ice have the potential to increase loadings on Project infrastructure (e.g., substation, termination site). Extreme snowfall can also affect winter construction activities by causing a delay in construction or a delay in delivery of materials, and resulting in additional effort for snow clearing and removal. Construction activities are expected to occur during the spring, summer, and fall; therefore, extreme snowfall during construction is not anticipated.

Extreme precipitation contributing to unusual flooding during snowmelt and extreme rainfall events could potentially lead to flooding and erosion. Flooding and erosion could in turn lead to the release of total suspended solids (TSS) in runoff and related environmental effects. These activities and associated ensuing events are considered accidental events, and are discussed in Volume 2, Section 5.

During operation or decommissioning and abandonment phases, the PDA could experience heavy rain, snowfall and freezing rain events that are capable of causing an interruption of services such as electrical power for extended periods of time, or increasing structural loading on the Project components.

Reduced visibility due to fog could make manoeuvring of equipment difficult in the early part of the day. However, these short delays are anticipated and can often be predicted, and allowance for them will be included in the construction schedule. Disruption of construction activities and delays to the schedule will be avoided by scheduling tasks that require precise movements for periods when the weather conditions are favourable.

Wind storm events could potentially cause reduced visibility (due to blowing snow or rain) and interfere with maneuvering of equipment or transporting materials or staff movements. Wind also has the potential to increase loadings on Project infrastructure and cause possible damage. During electrical storms, for example, fault currents (defined as an electric current that flows from one conductor to ground or to another conductor owing to an abnormal connection (including an arc) between the two conductors (IESO 2010)) may arise in electrical systems during a lightning strike. This could result in danger to personnel and damage to infrastructure. These types of adverse effects can occur where Project infrastructure is close to the grounding facilities of electrical transmission line structures, substations, generating stations, and other facilities that have high fault current-carrying grounding networks. A lightning strike could also ignite a fire (see Volume 2, Section 5.3 for a discussion of fire as an accidental event).

Results of the coastal erosion assessment indicate that the site of the cable landing in Borden-Carleton has been susceptible to erosion in the past, and erosional forces are likely to continue, potentially affecting cable trenches if not adequately protected.

Storm surges and waves could also potentially affect land-based Project facilities if not accounted for in the engineering of and design for near sea level structures (i.e., cable termination site, substation, and associated infrastructure).

4.3.1.2 Mitigation for Climate

To address the potential effects of climate (air temperature, precipitation, fog and visibility, winds and extreme weather events), all aspects of the Project design, materials selection, planning, and maintenance will consider normal and extreme conditions that might be encountered throughout the life of the Project. Work will also be scheduled, where feasible, to avoid predicted times of extreme weather for the safety of crews and Project infrastructure.

The Project will be constructed to meet applicable building, safety and industry codes and standards for wind, snowfall, extreme precipitation, and other weather variables associated with climate. The engineering design of the Project will consider and incorporate potential future changes in the forces of nature that could affect its operation or integrity.

These standards and codes provide factors of safety regarding environmental loading (e.g., snow load, high winds), and Project specific activities and events. Design requirements address issues associated with environmental extremes, such as:

- wind loads
- storm water drainage from rain storms and floods
- weight of snow and ice, and associated water
- erosion protection of slopes, embankments, ditches, and open drains

To account for potential weather extremes, engineering specifications of the National Building Code of Canada contains design specific provisions, such as:

- critical structures, piping, tanks and steel selection to prevent brittle fracture at low ambient temperatures
- electrical grounding structures for lightning protection
- maximum motor ambient temperature
- ice and freeze protection

Other mitigation measures implemented as part of the planning process will reduce the potential for adverse Effects of the Environment on the Project including:

- adherence to engineering design codes and standards (e.g., power lines will be built to codes and standards that reduce the likelihood and effects of fault currents, during lightning strikes)
- care in selection of appropriate construction materials and equipment
- careful planning of operation activities such as receipt of materials and supplies and product deliveries
- implementation of a maintenance and safety management program
- contingency plans, including emergency back-up power for necessary operations; and
- development of a shoreline protection plan to implement recommendations from the coastal erosion assessment at the landfall site in Borden-Carleton, PEI conducted in 2015

4.3.1.3 Residual Effects of Climate on the Project

The potential effects of climate on the Project during the construction, operation, and decommissioning and abandonment phases will be considered and incorporated in the planning and design of Project infrastructure. This will be done to reduce the potential for Project delays and long-term damage to infrastructure, taking into account the existing and predicted climate conditions. Inspection and maintenance programs will reduce the deterioration of the infrastructure and will help to maintain compliance with applicable design criteria and reliability of the transmission system. Significant residual adverse effects of climate on the Project, or interruption to the Project schedule, are not anticipated.

4.3.2 Effects of Climate Change on the project

4.3.2.1 Project Pathways for the Effects of Climate Change on the Project

Long term increases in temperature and precipitation as a result of climate change predicted for Atlantic Canada can result in changes to conditions that could affect the long term integrity and reliability of Project-related land-based infrastructure through changing extremes in temperature and intense precipitation.

4.3.2.2 Climate Change Predictions

Predicting the future environmental effects of climate change for a specific area using global data sets is challenging due to generic data and larger scale model outputs that do not take into account local climate. Accurate regional and local projections require the development of specific regional and local climate variables and climate change scenarios (Lines *et al.* 2005). As a result, downscaling techniques have emerged over the last decade as an important advancement in climate modelling. Downscaling is used to introduce micro-scale interactions by including the local climate variables. Downscaling techniques are particularly important for Atlantic Canada due to the inherent variability associated with this predominantly coastal climate. Statistical downscaling uses global climate model (GCM) projections as well as historical data from weather stations across the region, and studies the relationship between these sets of data. Downscaling produces more detailed predictions for each of these weather stations (Lines *et al.* 2005) and has allowed for a better understanding of future climate scenarios based on precise and accurate historic data sets.

Results tend to differ between a Statistical Downscaling Model (SDSM) and Canadian Coupled General Circulation Model version 2 (CGCM2). The overall mean annual maximum temperature increase projected for Charlottetown (the nearest modelled location to the Project) between years 2020 and 2080 ranged from 1.70°C to 3.51°C for the SDSM model results and 1.16°C to 2.47°C for the CGCM2 model results (Lines *et al.* 2008) (Table 4.3).

Table 4.3 Projected Mean Annual Maximum and Minimum Temperature Change, and Precipitation Percent Change for both SDSM and CGCM2 Model Results

Period	T_{max}		T_{min}		% Precipitation	
	SDSM	CGCM2	SDSM	CGCM2	SDSM	CGCM2
2020s	1.70	1.16	1.69	1.77	13	0
2050s	2.46	1.67	2.33	2.40	16	5
2080s	3.51	2.47	3.34	3.36	18	4

Notes:
A positive value denotes an increase, a negative value denotes a decrease.
SDSM = Statistical Downscaling Model.
CGCM2 = Canadian Coupled General Circulation Model version 2.
T_{max} = Mean annual maximum temperature change.
T_{min} = Mean annual minimum temperature change.
Source: Lines *et al.* 2008

The SDSM projections for maximum temperature for 2050 at Charlottetown are increases for all seasons (1.7°C to 4.2°C) (Lines *et al.* 2005). By the year 2080, temperatures are projected to increase again in all seasons, with greater warming (3.7°C to 6.6°C) (Lines *et al.* 2005). This average temperature change is expected to be gradual over the period and is likely to affect precipitation types and patterns. The warmer fall and winter temperatures could mean later freeze up; wetter, heavier snow; more liquid precipitation occurring later into the fall; and possibly more freezing precipitation during both seasons. Changes to precipitation patterns due to warmer weather over the fall and winter months could lead to stronger spring run-off (Natural Resources Canada 2001).

There is less agreement among the global circulation and regional downscaling models regarding changes in precipitation. Annual precipitation increases projected for Atlantic Canada between the years 2020 and 2080 range from 18% to 21% for the SDSM model results, and -2% to 2% for the Canadian coupled global climate model version 1 (CGCM1) model results (Lines *et al.* 2005). Precipitation trends are of more interest when taken together with the temperature increases and the seasonality of the predicted changes. Statistical Downscaling Model trends for the years 2020 to 2080 indicate a temperature increase of 8% to 12% for the winter months and 21% to 35% for the summer months (Lines *et al.* 2005). It is generally considered that the increased precipitation being projected for portions of western Atlantic Canada may be the result of continued landfall of dying hurricanes and tropical storms reaching into this area in the summer and fall months. While SDSM results highlight an increase in summer and fall precipitation, the CGCM1 results range from no change in the 2020s to a reduction in precipitation over the summer season for 2050 to 2080 (Lines *et al.* 2005).

The inconsistencies between SDSM and CGCM1 predicted seasonal precipitation changes highlight the inherent variability and uncertainty in climate modelling. Due to the increased precision of localized data used in SDSM relative to global modelling, confidence is considered to be greater in the SDSM results relative to global model results. Results must be interpreted with caution for each of the models, although there is a general consensus in the climatological community concerning the overall anticipated environmental effects of climate change. For example, over the next 100 years, Atlantic Canada will likely experience warmer temperatures, more storm events, increasing storm intensity, and flooding (Vasseur and Catto 2008).

4.3.2.3 Mitigation for Climate Change

The Project will be designed according to engineering design practices that will consider predictions for climate and climate change. Several publications are available to guide design engineers in this regard, including, for example, the Public Infrastructure Engineering Vulnerability Committee (PIEVC) "Engineering Protocol for Infrastructure Vulnerability Assessment and Adaptation to a Changing Climate" (PIEVC 2011). This protocol outlines a process to assess the infrastructure component responses to changing climate, which assists engineers and proponents in effectively incorporating climate change into design, development and management of their existing and planned infrastructure. This and other guidance will be considered, as applicable, in advancing the design and construction of the Project.

4.3.2.4 Residual Effects of Climate Change on the Project

The potential effects of climate change on the Project will be considered and incorporated in the planning and design of Project infrastructure and scheduling. This will be done to reduce the potential for Project delays and long-term damage to infrastructure and risk to workers, taking into account predictions for climate change in the region. Inspection and maintenance programs will reduce the deterioration of the infrastructure and will help to maintain compliance with applicable design criteria and reliability of the transmission system. Significant residual adverse effects of climate change on the Project, or system reliability are not anticipated.

4.3.3 Effects of Forest Fires on the Project

4.3.3.1 Project Pathways for the Effects of Forest Fires on the Project

The effects of forest fire on the Project may include:

- reduced visibility and inability to manoeuver construction and operation equipment due to smoke
- delays in receipt of materials and supplies (e.g., construction materials) and in delivering products
- changes to the ability of workers to access the site (e.g., if fire blocks access to transportation routes)
- damage to infrastructure
- loss of electrical power resulting in potential loss of production

4.3.3.2 Mitigation for Forest Fires

In the event of a forest fire in close proximity to Project components there is potential risk of damage to exposed Project infrastructure. Project infrastructure will be constructed primarily of concrete and steel, which are not typically affected by fire.

If a forest fire were to break out in direct proximity to the Project, emergency measures would be in place to quickly control and extinguish the flames prior to contact any flammable structures (i.e., wood). The site personnel would conduct an immediate assessment of the fire scene and risks associated with: a) containing any spread, and b) extinguishing the fire. If deemed safe, site personnel would attempt to contain and extinguish the fire. Even if site personnel are able to contain and extinguish the fire, site personnel would immediately notify the local fire department and give details of the fire.

If warranted by risk to personal safety, staff would be evacuated to a safe area and would be prepared to assist firefighters if necessary. The crew member would direct firefighters and give detailed routing to the closest possible access point(s) at which a fire suppression operation can be initiated and, if necessary, shall station a person to direct the firefighters to the best access point(s).

4.3.3.3 Residual Effects of Forest Fires on the Project

Project structures will be constructed primarily of concrete and steel, which are not typically affected by fire, and the majority of materials handled during construction and operation are not flammable. If a forest fire were to occur in direct proximity to the Project, emergency measures would be in place to quickly control and extinguish the flames prior to contact with Project components. In addition, the cleared safety buffer zone established around Project components further decreases the likelihood of a forest or a brush fire causing substantive damage to the Project. Although there is potential for natural forest fires to occur in or near the PDA, it is not likely to have a substantive effect on the Project.

4.3.4 Effects of Marine Hazards on the Project

4.3.4.1 Project Pathways for the Effects of Marine Hazards on the Project

Sea spray, often accompanied with high winds, contains salt that may lead to long-term corrosion on exposed oxidizing metal surfaces and structures of the Project, potentially weakening structures with the possibility of disruptions to electrical connections and transformers.

Ice scour by sea ice and landfast ice is an issue at landing sites for submarine cables in cold climates, and has been considered in Project design and are considered in Volume 4, Section 4.

4.3.4.2 Mitigation for Marine Hazards

The materials used for construction will be, by design, resistive and tolerant of the effects of sea spray. Further, salt spray effects will be mitigated with operational procedures including regular maintenance (i.e., cleaning) and the use of protective coatings as required.

4.3.4.3 Residual Effects of Marine Hazards on the Project

There is potential for surfaces and structures of the Project to be exposed to sea spray and ice scour during the life of the Project. However, these effects on the Project have been considered in the planning and design of the Project, and substantive damage to the Project or interruption to the Project schedule, are not anticipated.

4.3.5 Determination of Significance

The land-based components of the Project will be designed, constructed and operated to maintain safety, integrity and reliability in consideration of existing and reasonably predicted environmental forces in the PDA in PEI. There are no environmental attributes that, at any time during the Project, are anticipated to result in:

- a substantial change to the Project construction schedule (e.g., a delay resulting in the construction period being extended by one season)
- a substantial change to the Project operation schedule (e.g., an interruption in servicing such that production targets cannot be met)
- damage to Project infrastructure resulting in increased safety risk

PEI Energy Corporation will use an adaptive management approach in its activities throughout the life of the Project to monitor any observed effects of the environment and adapt (e.g., repair/replace) the Project infrastructure or operations as needed. Accordingly, the residual adverse Effects of the Environment on the Project are rated not significant.

5.0 ACCIDENTS, MALFUNCTIONS AND UNPLANNED EVENTS

This section provides an assessment of selected Accidents, Malfunctions, and Unplanned Events scenarios potentially associated with Project components and activities in PEI that could, if they occurred, result in adverse environmental effects.

5.1 APPROACH

In this section, the potential Accidents, Malfunctions, and Unplanned Events that could occur during any phase of the Project components activities undertaken within are described and assessed. The focus is specifically on credible accidents that have a reasonable probability of occurrence, and for which the resulting environmental effects could be significant.

The general approach to assessment of the selected accident scenarios includes the following steps:

- consideration of the potential event that may occur during the life of the Project
- description of the safeguards established to protect against such occurrences
- consideration of the contingency or emergency response procedures applicable to the event
- determination of significance of potential residual adverse environmental effects

5.1.1 Significance Definition

Criteria used for determining the significance of adverse residual environmental effects with respect to Accidents, Malfunctions, and Unplanned Events generally relate to effects on the sustainability of biological and human environments. Where applicable, significance definitions are the same as those for each VC noted in Volume 2.

5.2 POTENTIAL INTERACTIONS

The Accidents, Malfunctions, and Unplanned Events scenarios considered in this assessment are detailed in Volume 1, Section 2.6. The scenarios considered applicable to the PEI-based components of the Project (all phases) are:

- fire
- hazardous material spill
- vehicle accident
- erosion prevention and/or sediment control failure
- major loss of electricity
- discovery of a heritage resource

VCs in Volume 2 with reasonable potential to interact with these scenarios causing adverse environmental effects include (Table 5.1):

- Atmospheric Environment

- Groundwater Resources
- Terrestrial Environment
- Land Use
- Socioeconomic Environment
- Heritage Resources
- Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

Table 5.1 Potential Interactions for Land-Based Project Activities in PEI

Accident, Malfunction or Unplanned Event	Atmospheric Environment	Groundwater Resources	Freshwater Environment	Terrestrial Environment	Land Use	Socioeconomic Environment	Heritage Resources	Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons
Fire	✓					✓		
Hazardous Material Spill		✓	✓	✓	✓	✓		✓
Vehicle Accident				✓		✓		
Erosion Prevention and/or Sediment Control Failure			✓	✓				
Major Loss of Electricity	✓					✓		
Discovery of a Heritage Resource							✓	✓

5.3 FIRE

5.3.1 Potential Event

There is potential that fire could occur during construction or operation of land-based Project components on PEI; however, with limited infrastructure on PEI as compared to New Brunswick, the probability is considered low. A fire affecting Project components would likely involve Project infrastructure (e.g., a substation) or a vehicle or other heavy equipment used during construction and maintenance activities, and result in effects on the Atmospheric and Socioeconomic Environments.

Naturally occurring forest fires are considered an effect the environment could have on the Project and are addressed in Volume 2, Chapter 4.

5.3.2 Risk Management and Mitigation

The following mitigation measures should be applied in general to reduce the probability of a fire and any associated adverse effects:

- vehicles and buildings on-site will be equipped with fire extinguishers sized and rated as appropriate

- Project staff should be trained in the use of fire extinguishers and familiar with the location of the nearest extinguisher
- vehicles are to avoid parking in areas with long grass to minimize the risk of fire caused by the heated vehicle undercarriage
- waste that may be soaked with flammable materials (i.e., oily rags) should be kept away from flammable materials and should be disposed of in an appropriate manner as soon as possible

As the Project location is not remote, local emergency response services are available. In the unlikely event that a fire does occur, Project staff will contact emergency response services immediately.

5.3.3 Potential Environmental Effects and their Significance

If fire were to occur, there is potential for an effect on the Atmospheric Environment and any loss of infrastructure or equipment may have an effect on the Socioeconomic Environment. As the Project footprint within PEI is small and no large wooded areas are located in the vicinity, if a fire were to occur it is expected to be small and easily extinguished resulting in minimal smoke generation and damage to infrastructure.

In consideration of the probability of occurrence and the mitigation and response measures to be undertaken, residual adverse environmental effects of a land-based fire are rated to be not significant for potentially affected VCs.

5.4 HAZARDOUS MATERIAL SPILL

5.4.1 Potential Event

Hazardous material spills can occur in any environment where fuels, lubricants, hydraulic fluid, paints, and corrosion and fouling inhibitors are used or stored. Hazardous materials may be used during both construction, and operation of land-based Project components in PEI with vehicle use being the most common source of hazardous materials on-site. Potential scenarios involving the release of hazardous material would most likely be rupture of a hydraulic line, loss of fuel from a vehicle, or an oil spill from the new reactors.

5.4.2 Risk Management and Mitigation

Response to a hazardous material spill will be carried out as outlined in the MECL Environmental Protection Plan (EPP) (MECL 2013). An Emergency Response Plan (ERP) consistent with those used at MECL's other PEI operations will be developed and will include procedures to prevent and respond to a spill, including:

- routine preventative maintenance and inspection of hydraulic equipment and vehicles is to be undertaken to avoid a hazardous material release
- hazardous materials will not be stored on-site in large quantities
- relevant staff will be trained in the timely and efficient response to hazardous material spills

- vehicles, heavy equipment, and on-site buildings will be equipped with spill kits of an appropriate size and composition
- preventative measures, including daily vehicle inspections and buffers surrounding sensitive areas, will be implemented
- any spill will be reported to PEICLE as per MECL reporting requirements

In the unlikely scenario of a hazardous material spill reaching a body of water or other nearby sensitive area, measures will be taken to stop the spill and isolate/contain the affected area as soon as possible. An assessment of the affected area will be completed and remediation will be completed as required.

5.4.3 Potential Environmental Effects and their Significance

Depending on the quantity and type of material released and the location of the spill, hazardous material spills could potentially affect Groundwater Resources and components of the Terrestrial Environment and Land Use. Remediation efforts may have an effect on the Socioeconomic Environment (e.g., demand for emergency services). The worst case for a land-based hazardous material spill would likely be a rupture of a hydraulic line near a wetland or watercourse. As hazardous material spills can harm wildlife and fish and fish habitat, efforts will be focused on prevention measures. Any spill, if it occurs, is expected to be a small quantity and rapidly contained and cleaned up.

Given the expected limited spill volume, the likelihood of spill scenarios, and anticipated effectiveness of response plans (including spill containment), it is assumed that none of these spills would result in a release to adjacent properties.

In consideration of the mitigation and response measures to be undertaken, residual adverse environmental effects of a hazardous material spill in PEI are rated as not significant for potentially affected VCs.

5.5 VEHICLE ACCIDENT

5.5.1 Potential Event

During the construction phase of the Project, various vehicles will be in motion around the Project site and there is the potential for vehicle-to-vehicle collisions, vehicle accidents with surrounding Project infrastructure, or vehicle collisions with wildlife. Vehicle use is expected to be low during operation and therefore vehicle accidents are not considered likely.

If a vehicle accident were to occur, loss or damage to a vehicle, equipment or Project infrastructure could have an effect on the Socioeconomic Environment. If the incident involved wildlife, it could have an effect on the Terrestrial Environment.

In the event of a vehicle accident there is the potential for loss of life and damage to infrastructure. There is also potential for fire and hazardous materials to be released into the environment. These are addressed in previous sections.

5.5.2 Risk Management and Mitigation

Response to a vehicle accident will be carried out as outlined in the MECL EPP (MECL 2013). The following mitigation measures should be applied in general to reduce the probability of a vehicle accident and any associated adverse effects:

- traffic control measures will be implemented, as needed, to reduce the likelihood of vehicle-to-vehicle collisions
- Project staff are expected to operate vehicles with due care and attention while on-site
- Project staff will be appropriately licensed to operate vehicles on-site
- vehicles are to observe traffic rules and trucks will use only designated truck routes
- if a collision does occur, Project staff are to immediately phone local emergency services
- all Project-related vehicles will carefully abide by speed limits to reduce risk of accidents including collisions with wildlife

5.5.3 Potential Environmental Effects and their Significance

The most likely effect of a vehicle accident during construction would be the damage or loss of a vehicle and potential work stoppage. As the Project components in PEI are located on a small footprint and is largely cleared land, a collision with wildlife is not considered probable. The worst case involving a vehicle collision would most likely involve loss of life, fire or the release of a hazardous material, although the probability of these events occurring is considered low.

In consideration of the mitigation and response measures to be undertaken, residual adverse environmental effects of a land-based vehicle accident are rated to be not significant for potentially affected VCs. A vehicle accident resulting in a serious injury or loss of life for a Project employee or member of the public would result in a significant effect. However, such an incident is considered unlikely to occur.

5.6 EROSION PREVENTION AND/OR SEDIMENT CONTROL FAILURE

5.6.1 Potential Event

Erosion Prevention and/or Sediment Control Failure can occur during construction activities due to the exposure of soil from clearing or excavation of land and failure of planned controls. If it were to occur on PEI, this would most likely happen during land-based trenching for cable installation or excavation for substation upgrades. This scenario has the potential to interact with the Terrestrial Environment, as failure could result in the unintended erosion of land or the release of silt into the surrounding environment.

5.6.2 Risk Management and Mitigation

For the implementation of erosion and sediment control measures, the focus is on proper installation, maintenance and inspection to avoid the potential for failure. Erosion control measures will be implemented during construction, and operation, where necessary, to reduce the likelihood of erosion. Erosion control will be carried out as outlined in the MECL EPP (MECL 2013).

Erosion prevention measures may include:

- reducing quantity of open ground on site
- re-vegetating or re-seeding exposed areas
- covering exposed areas with geotextile or mulch until vegetation is established

Sediment control may include:

- silt fencing-used along contours of exposed land to capture sediment runoff
- silt curtains-used within and along bodies of water to prevent intrusion of sediment into water bodies
- wattles-used on slopes perpendicular to the direction of flow to lessen runoff velocities and capture sediment runoff
- settling ponds-used to capture large volumes of runoff and retain the runoff for a period of time to allow for settling of sediment
- filter bags-used at the discharge point of a settling pond to filter out any remaining suspended sediment

These measures will be reviewed during the detailed engineering phase of Project design. Chosen measures will be installed as per the Project-specific Erosion and Sediment Control Plan (ESCP) and undergo routine inspection, most importantly pre and post rainfall events. Should a failure occur and silt from the Project site reaches a water source, efforts should be made to control the dispersion of sediment and isolate the affected area from unaffected habitat prior to repairing the source of the failure.

5.6.3 Potential Environmental Effects and their Significance

If a failure of erosion prevention and sediment control measures were to occur, Terrestrial Environments may be affected as failure could result in the unintended erosion of land or the release of silt into the surrounding environment. The worst case involving a sediment control failure would be the accidental siltation of a wetland or inshore environment.

In consideration of the mitigation and response measures to be undertaken, residual adverse environmental effects of a land-based erosion prevention and/or sediment control failure are rated to be not significant for potentially affected VCs.

5.7 MAJOR LOSS OF ELECTRICITY

5.7.1 Potential Event

Although most major Project infrastructure is located in New Brunswick and within the Northumberland Strait, a potential event involving a major loss of electricity would have the largest impact on PEI. Loss of transmission line in New Brunswick or loss of both marine cables within the Northumberland Strait would result in loss of the primary source of electricity for PEI.

A major loss of electricity has the potential to affect the Socioeconomic Environment through lost time for employers. It also has the potential to affect the Atmospheric Environment as it would require use of on-island power generation such as oil-fired generation which produces air emissions.

5.7.2 Risk Management and Mitigation

Implementation of risk management and mitigation will be completed by MECL for marine-based Project activities within the Northumberland Strait and by NB Power for land-based Project activities in New Brunswick. The following mitigation measures will be applied in general to reduce the probability of damage to both submarine and terrestrial cables and an associated loss of electricity to PEI:

- conduct periodic submarine cable inspections
- the Project includes a built in redundancy (i.e., two new cables and two existing cables)
- cables will be buried in the marine sediment or covered with concrete mattresses or similar protection methods when burial is not possible to prevent cable damage from fishing gear and vessel anchors
- individual cable trenches will be separated by a distance of several hundred metres to reduce the probability of damage to both cables
- navigation charts will be updated to include the cable location

It is intended that the existing submarine cables be used mostly as backup once the upgrade is complete, and will operate as such until the end of their service life.

For land-based Project activities within New Brunswick, the following mitigation measures should be applied in general to reduce the probability of loss of transmission line and an associated loss of electricity to PEI:

- H-Frame pole structures will be used to support the transmission lines, which are more structurally robust than the single pole structures typically used for distribution lines
- vegetation management activities will be carried out within the transmission line corridor to prevent damage to lines from falling trees. A 30 m RoW (i.e., 15 m on either side of the H-Frame structure centerline) will be cleared of vegetation. Any tall trees (i.e., 'danger trees') outside the RoW that are in excess of a 45° sight line from the H-Frame structure will be topped
- inspections to transmission lines and infrastructure will be carried out on a regular basis. Inspection and maintenance frequency of infrastructure depends on the importance and capacity of the infrastructure within the NB Power system
- the Memramcook substation will be fitted with protection and control and telecommunications equipment to comply with current standards
- comply with North American Electric Reliability Corporation (NERC) Reliability Standards

If a major loss of electricity were to occur, NB Power has the capacity to perform emergency aerial patrols of overhead transmission lines by helicopter to assess damage or potential risk to the electrical system. If needed, helicopters may also be employed to transport material and personnel to remote sections of line for maintenance and repair (NBPTC 2012).

If a major loss of electricity were to occur affecting both the new and existing submarine cables, PEI EC would make use of existing on-island generation facilities (i.e., oil-fired generation and wind energy) to provide power to customers until damage could be repaired.

5.7.3 Potential Environmental Effects and their Significance

PEI will rely on the new submarine cables to supply the majority of the power to PEI and a disruption in cable service could have important socioeconomic consequences for PEI residents depending on the length of the outage. The existing submarine cables, on-island power generation (i.e., oil-fired generation and wind energy) combined with energy usage reduction requirements would likely reduce the length of any outtage. These electricity sources would be in place until repairs to the cables are completed.

In consideration of the mitigation and response measures to be undertaken, residual adverse environmental effects of a major loss of electricity are rated to be not significant for potentially affected VCs.

5.8 DISCOVERY OF A HERITAGE RESOURCE

5.8.1 Potential Event

A heritage resource is defined as a site that contains features (non-removable indications of past human use and activity, such as a fire hearth, a living floor, or a burial site) in addition to artifacts determined by the provincial regulatory agency to be substantive. The disturbance of an individual artifact is not normally considered significant.

Heritage resources, if present, are generally discovered during activities involving ground disturbance such as construction related excavation. It is unlikely that a heritage resource will be discovered during operation.

5.8.2 Risk Management and Mitigation

Field staff will be trained on response to the discovery of a heritage resource as per the MECL EPP (MECL 2013). In the event that a heritage resource is discovered, Project work will cease in the area of the discovery and the provincial Archaeologist will be contacted by MECL immediately. Work in the area will only continue if approval is received from the PEI Aboriginal Affairs Secretariat to resume these activities, and the Project will continue in compliance with mitigation strategies.

5.8.3 Potential Environmental Effects and their Significance

The discovery of a heritage resource has the potential to interact with Heritage Resources and Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons; however, as the Project site in PEI is small and most of the area has been previously disturbed, the probability of discovering a heritage resource is considered low.

With the low probability of encountering heritage resource during Project-related activities, and in consideration of the nature of the Project, planned mitigation, and the contingency response procedures to be used in the unlikely event of such a discovery, the potential residual adverse effect of a discovery of a heritage resource is rated not significant.

5.9 DETERMINATION OF SIGNIFICANCE

MECL has developed environmental protection plans, contingency plans, and emergency response plan to prevent and efficiently respond to accidental or unplanned events. Given the nature of the Project and credible accident and malfunction scenarios and proposed mitigation and emergency response planning, the residual adverse environmental effects of Project-related Accidents, Malfunctions, and Unplanned Events on all VCs during all phases are rated not significant with a high level of confidence.

A vehicle accident resulting in a serious injury or loss of life for a Project employee or member of the public would result in a significant effect. However, such an incident is considered unlikely to occur.

6.0 CUMULATIVE ENVIRONMENTAL EFFECTS: PRINCE EDWARD ISLAND

6.1 INTRODUCTION

The residual effects of the Project that may interact cumulatively with the residual environmental effects of other physical activities are identified in this section and the resulting cumulative environmental effects are assessed.

An assessment of cumulative environmental effects is required if:

- the Project is assessed as having residual environmental effects on the VC
- the residual effects could act cumulatively with residual effects of other past, present, or reasonably foreseeable future physical activities

Six categories of physical activities in Prince Edward Island have been identified as having the potential to result in residual environmental effects that may act cumulatively with those of the Project:

- industrial development
- infrastructure development
- forestry and agriculture
- recreation
- residential development
- current use of land and resources for traditional purposes

In PEI, the following two VCs are anticipated to have residual effects, and a cumulative effects assessment is undertaken:

- Terrestrial Environment
- Socioeconomic Environment

Interactions between the Project and the remaining 10 VCs are not anticipated to result in residual effects, and assessment of cumulative environmental effects is therefore not undertaken.

Table 6.1 highlights the potential for interactions between the residual environmental effects of the Project for the two selected VCs and those of the physical activities identified. These interactions are described in further detail below.

Table 6.1 Potential Cumulative Environmental Effects

Other Physical Activities with Potential for Cumulative Environmental Effects	Terrestrial Environment	Socioeconomic Environment
Industrial Development	✓	✓
Infrastructure Development	✓	✓
Forestry and Agriculture	✓	-
Recreation	✓	✓
Residential Development	✓	✓
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons	✓	-

6.2 ASSESSMENT OF CUMULATIVE ENVIRONMENTAL EFFECTS: PRINCE EDWARD ISLAND

Past and existing physical activities that have been or are being carried out have influenced the baseline conditions for the assessment of Project effects. The effects of other physical activities that have been or are being carried out (i.e., past and current effects) in combination with the predicted effects of the Project are therefore considered in the assessment of the residual environmental effects of the Project.

The residual environmental effects of the Project on the Terrestrial Environment include a temporary and permanent disturbance to vegetation and wildlife habitat including wetland in the PDA. Future industrial, infrastructure and residential development activities within the RAA for the Terrestrial Environment VC, are likely to result in similar effects to the Terrestrial Environment. However, the footprint of disturbance of the Project is small (approximately 0.04% of the RAA) and is likely to be small for any future industrial, infrastructure or residential developments, and the vegetation communities and habitat types within the PDA are abundant within both the LAA and RAA. The disturbance to wetlands will be compensated for so there will be no net loss of wetland function. Therefore, potential cumulative environmental effects of the effects of the Project with those of industrial, infrastructure and residential development activities are not substantive.

The development of additional lands for new and expanded forestry and agricultural activities is not anticipated. The current property has not been farmed in the last 3 to 5 years and the field is cut only as a maintenance activity. Cumulative environmental effects of the environmental effects of the Project with the environmental effects of future forestry or agriculture are not predicted.

Environmental effects of recreation on the Terrestrial Environment that may overlap with those of the Project may include wildlife mortality due to hunting and trapping activities. Similar environmental effects may occur as a result of Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons. The Project is located in close proximity to several private residences, meaning these activities are likely limited. Wildlife mortality as a result of the Project through transmission line strikes are expected to be negligible. Substantive cumulative environmental effects as a result of recreational activity or the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons are therefore not anticipated.

The Project will affect the Socioeconomic Environment in PEI, resulting in positive economic inputs, as well a small increase in demand in the local labour force and accommodations. Industrial, infrastructure, and residential development, and recreation activities have the potential to affect the Socioeconomic Environment in PEI in a similar way. The combined increase in demand for labour and accommodation of the Project and these activities is not expected to exceed the capacity of the labour market or available accommodations.

In summary, cumulative environmental effects of the Project in PEI with the environmental effects of other physical activities are rated not significant.

7.0 SUMMARY

In this EIS, Stantec conducted an EIA of the PEI-NB Cable Interconnection Upgrade Project (the "Project") proposed by PEI Energy Corporation (PEIEC). The Project involves the construction and operation of a high voltage alternating current transmission system, spanning three geographic locations – New Brunswick, the Northumberland Strait, and PEI. Volume 2 (this volume) includes an assessment of potential environmental effects associated with land-based Project components and activities located in PEI.

7.1 SCOPE OF THE EIA

An EIA of the land-based Project components and activities in PEI is required under Section 9(1) of the PEI *Environmental Protection Act* (PEI *EPA*). This EIS follows the Stantec EA Method that has been adapted to meet the requirements of the PEI *EPA*.

The EIA evaluated the potential environmental effects of the Project. The scope of the assessment included all activities necessary for the construction and operation of the Project, but excluded the end uses of the electricity. Environmental effects were assessed for each phase of the Project (i.e., construction, operation, and decommissioning and abandonment), where relevant, as well as for credible Accidents, Malfunctions, and Unplanned Events. The assessment was conducted within defined boundaries (spatial and temporal) for the assessment and in consideration of defined residual environmental effects rating criteria aimed at determining the significance of the environmental effects. The EIA considered measures that are technically and economically feasible that would mitigate any significant adverse environmental effects of the Project.

7.2 ENVIRONMENTAL EFFECTS ASSESSMENT

Terrestrial Environment, Socioeconomic Environment, and Heritage Resources were the VCs identified for detailed assessment. These were identified by the Study Team (based on experience and professional judgment) as being the key VCs for which substantive interactions with the Project were anticipated or could occur. A separate analysis of the potential Effects of the Environment on the Project was also conducted.

This volume concluded that the potential environmental effects of the Project in PEI for the VCs would be not significant during each phase of the Project and for the activities to be conducted as part of the Project. These conclusions were reached in consideration of the nature of the Project, the nature and extent of its environmental effects, and the planned implementation of proven and effective mitigation. The environmental effects of Accidents, Malfunctions, and Unplanned Events were also rated not significant. Effects of the Environment on the Project were rated not significant due to design consideration and compliance with codes and standards that will mitigate against a significant adverse effect on the Project. In most cases, the environmental effects and significance predictions were made with a high level of confidence by the Study Team.

7.3 OVERALL CONCLUSION

Based on the results of the EA for the PEI volume, it is concluded that, with planned mitigation, the residual environmental effects of the Project during each phase is rated not significant.

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APPENDIX A
MCPEI Letter

Stantec

GCB

RECEIVED
JUN 05 2015

Mi'kmaq
Confederacy of
Prince Edward Island

200 Read Drive
Summerside, PE
C1N 5N7
Tel: (902) 436-5101
Fax: (902) 436-5655

Polyclinic
Professional Centre
Suite 501
199 Grafton Street
Charlottetown, PE
C1A 1L2
Tel: (902) 626-2882
Fax: (902) 367-3779

WITHOUT PREJUDICE

1 June 2015

Greg C. Buchanan, M.Sc., R.P.A.
Archaeologist
Stantec
845 Prospect Street Fredericton NB E3B 2T7

Dear Mr. Buchanan:

Re: Archaeological Impact Assessment: Maritime Electric transmission line and substation in Borden, PID 380477, Prince County, Prince Edward Island,

Further to your email message of May 07, 2015, I am writing in relation to the archaeological impact assessment for Maritime Electric transmission line and substation in Borden, PID 380477, your organization is reviewing. Based on our research, historical and traditional Mi'kmaq use occurs outside of the area you have designated for the archaeological impact assessment. This use includes: campsites along the now Confederation Trail area to the north of the area, and a travel route to the east of the area. As well, fish harvesting of mackerel occurs in the waters to the south of the area.

It must be remembered that the MCPEI database is, to date, a partial inventory of existing knowledge. As such, it does not mean that the subject area was not used (or used for additional purposes), rather that evidence of use, if it exists, has not yet been collected.

I trust this is the information required. Please advise as to what the next steps might be in this archaeological impact assessment process.

The response provided herein is specific to the particular activity (ies) in the particular area(s) specified in the information provided by you. Should you have any questions, please do not hesitate to contact me.

Yours truly,

Donald K. MacKenzie
Executive Director
Mi'kmaq Confederacy of PEI

cc. Tammy MacDonald
Randy Angus
Lennox Island FN
Abegweit FN
Helen Kristmanson
Barry MacPhee

APPENDIX B
VASCULAR PLANT LIST

Table B1 Vascular Plants Observed near the PDA

Common Name	Scientific Name	ACCDC S-Rank
A Clover	*Trifolium sp.*	-
A Rush	*Juncus sp.*	-
A Serviceberry	*Amelanchier sp.*	-
Alsike Clover	*Trifolium hybridum*	SNA
American Beach Grass	*Ammophila breviligulata*	S5
American Sea-rocket	*Cakile edentula*	S5
Arctic Rush	*Juncus balticus var. littoralis*	S5
Beach Pea	*Lathyrus japonicus var. maritimus*	S5
Beach Wormwood	*Artemisia stelleriana*	SNA
Bebb's Willow	*Salix bebbiana*	S5
Black Medick	*Medicago lupulina*	SNA
Bog Willowherb	*Epilobium leptophyllum*	S5
Broom Sedge	*Carex scoparia*	S5
Bull Thistle	*Cirsium vulgare*	SNA
Butter-and-eggs	*Linaria vulgaris*	SNA
Canada Goldenrod	*Solidago canadensis*	S5
Canada Horseweed	*Conyza canadensis*	S5
Canada Thistle	*Cirsium arvense*	SNA
Common Dandelion	*Taraxacum officinale*	SNA
Common Evening Primrose	*Oenothera biennis*	S5
Common Lamb's Quarters	*Chenopodium album*	SNA
Common Marsh Bedstraw	*Galium palustre*	S5
Common Plantain	*Plantago major*	SNA
Common Ragweed	*Ambrosia artemisiifolia*	S5
Common Saltwort	*Salsola kali*	SNA
Common Silverweed	*Argentina anserina*	S5
Common Tall Manna Grass	*Glyceria grandis*	S5
Common Timothy	*Phleum pratense*	SNA
Common Woodrush	*Luzula multiflora*	S5
Common Woolly Bulrush	*Scirpus cyperinus*	S5
Common Yarrow	*Achillea millefolium var. occidentalis*	S5?
Creeping Buttercup	*Ranunculus repens*	SNA
Curled Dock	*Rumex crispus*	SNA
Cyperuslike Sedge	*Carex pseudocyperus*	S5
Devil's Beggarticks	*Bidens frondosa*	S5
Fall Dandelion	*Leontodon autumnalis*	SNA

Table B1 Vascular Plants Observed near the PDA

Common Name	Scientific Name	ACCDC S-Rank
Field Horsetail	*Equisetum arvense*	S5
Field Sow Thistle	*Sonchus arvensis*	SNA
Fireweed	*Chamerion angustifolium*	S5
Garden Bird's-Foot Trefoil	*Lotus corniculatus*	SNA
Greater Water Dock	*Rumex orbiculatus*	S5
Green Alder	*Alnus viridis*	S5
Hedge False Bindweed	*Calystegia sepium*	S5
Large Cranberry	*Vaccinium macrocarpon*	S5
Late Lowbush Blueberry	*Vaccinium angustifolium*	S5
Lesser Duckweed	*Lemna minor*	SNA
Little Starwort	*Stellaria graminea*	SNA
Low Hop Clover	*Trifolium campestre*	SNA
Marsh Cudweed	*Gnaphalium uliginosum*	SNA
Marsh Vetchling	*Lathyrus palustris*	S5
Marsh Willowherb	*Epilobium palustre*	S5
Marshpepper Smartweed	*Polygonum hydropiper*	SNA
Meadow Goatsbeard	*Tragopogon pratensis*	SNA
Mountain Blue-eyed-grass	*Sisyrinchium montanum*	S5
Mouse-ear Chickweed	*Cerastium arvense*	SNR
Mouse-ear Hawkweed	*Hieracium pilosella*	SNA
Narrow-leaved Cattail	*Typha angustifolia*	S5
New York Aster	*Symphyotrichum novi-belgii*	S5
Nodding Beggarticks	*Bidens cernua*	S5
Northern Bayberry	*Morella pensylvanica*	S5
Northern Water Horehound	*Lycopus uniflorus*	S5
Pale Smartweed	*Polygonum lapathifolium*	S5
Prairie Cord Grass	*Spartina pectinata*	S5
Queen Anne's Lace	*Daucus carota*	SNA
Rabbit's-foot Clover	*Trifolium arvense*	SNA
Red Bartsia	*Odontites vernus*	SNA
Red Clover	*Trifolium pratense*	SNA
Red Fescue	*Festuca rubra*	S5
Red Osier Dogwood	*Cornus sericea*	S5
Red Raspberry	*Rubus idaeus ssp. strigosus*	S5
Reed Canary Grass	*Phalaris arundinacea*	SNA
Rough Cocklebur	*Xanthium strumarium*	S3

Table B1 Vascular Plants Observed near the PDA

Common Name	Scientific Name	ACCDC S-Rank
Rough-stemmed Goldenrod	*Solidago rugosa*	S5
Scotch Lovage	*Ligusticum scoticum*	S4
Sea Lyme Grass	*Leymus mollis ssp. mollis*	S4
Seaside Plantain	*Plantago maritima*	S5
Sensitive Fern	*Onoclea sensibilis*	S5
Shining Willow	*Salix lucida*	S4S5
Showy Mountain Ash	*Sorbus decora*	SNA
Silvery Cinquefoil	*Potentilla argentea*	SNA
Slender Wild Rye	*Elymus trachycaulus*	S2
Small Forget-me-not	*Myosotis laxa*	S4
Smooth Bedstraw	*Galium mollugo*	SNA
Smooth Brome	*Bromus inermis*	SNA
Soft Rush	*Juncus effusus*	S5
Spotted Lady's-thumb	*Polygonum persicaria*	SNA
Stiff Eyebright	*Euphrasia stricta*	SNA
Tall Fescue	*Lolium arundinaceum*	SNA
Tansy Ragwort	*Senecio jacobaea*	SNA
Thick-leaved Orache	*Atriplex subspicata*	SNR
Three-petaled Bedstraw	*Galium trifidum*	S5
Three-Toothed Cinquefoil	*Sibbaldiopsis tridentata*	S5
Tufted Vetch	*Vicia cracca*	SNA
Turion Duckweed	*Lemna turionifera*	S5
Virginia Rose	*Rosa virginiana*	S5
White Clover	*Trifolium repens*	SNA
Wild Radish	*Raphanus raphanistrum*	SNA
Wild Strawberry	*Fragaria virginiana*	S5

APPENDIX C
BIRD SPECIES OBSERVED NEAR THE LAA

Table C1 Bird Species Observed near the LAA (ACCDC and MBBA Records)

Common Name	Scientific Name	*SARA*	COSEWIC	ACCDC S-Rank	Data Source
Alder flycatcher	*Empidonax alnorum*			S5B	MBBA
American bittern	*Botaurus lentiginosus*			S4B	MBBA
American black duck	*Anas rubripes*			S5B,S4N	MBBA
American crow	*Corvus brachyrhynchos*			S5	ACCDC, MBBA
American goldfinch	*Carduelis tristis*			S5	MBBA
American kestrel	*Falco sparverius*			S5B	MBBA
American redstart	*Setophaga ruticilla*			S5B	MBBA
American robin	*Turdus migratorius*			S5B	ACCDC, MBBA
American wigeon	*Anas americana*			S5B	MBBA
Bald eagle	*Haliaeetus leucocephalus*			S4	MBBA
Bank swallow	*Riparia riparia*			S4B	ACCDC, MBBA
Barn swallow	*Hirundo rustica*	no schedule, no status	threatened	S3B	MBBA
Belted kingfisher	*Megaceryle alcyon*			S5B	MBBA
Black guillemot	*Cepphus grylle*			S2B	ACCDC, MBBA
Black-and-white warbler	*Mniotilta varia*			S5B	MBBA
Black-capped chickadee	*Poecile atricapilla*			S5	ACCDC, MBBA
Black-throated blue warbler	*Dendroica caerulescens*			S4B	MBBA
Black-throated green warbler	*Dendroica virens*			S5B	MBBA
Blue jay	*Cyanocitta cristata*			S5	MBBA
Blue-headed vireo	*Vireo solitarius*			S5B	MBBA
Blue-winged teal	*Anas discors*			S3S4B	MBBA
Bobolink	*Dolichonyx oryzivorus*	no schedule, no status	threatened	S3B	MBBA
Boreal chickadee	*Poecile hudsonica*			S4	MBBA
Brown-headed cowbird	*Molothrus ater*			S3B	MBBA
Canada warbler	*Wilsonia canadensis*	threatened, Schedule 1	threatened	S3B	MBBA
Cedar waxwing	*Bombycilla cedrorum*			S5B	MBBA

Table C1 Bird Species Observed near the LAA (ACCDC and MBBA Records)

Common Name	Scientific Name	*SARA*	COSEWIC	ACCDC S-Rank	Data Source
Chestnut-sided Warbler	*Dendroica pensylvanica*			S5B	MBBA
Chipping Sparrow	*Spizella passerina*			S5B	MBBA
Common Grackle	*Quiscalus quiscula*			S5B	ACCDC, MBBA
Common Raven	*Corvus corax*			S5	MBBA
Common Snipe	*Gallinago gallinago*				MBBA
Common Tern	*Sterna hirundo*		not at risk	S2B	MBBA
Common Yellowthroat	*Geothlypis trichas*			S5B	MBBA
Dark-eyed Junco	*Junco hyemalis*			S5	MBBA
Double-crested Cormorant	*Phalacrocorax auritus*			S5B	ACCDC, MBBA
Downy Woodpecker	*Picoides pubescens*			S5	MBBA
Eastern Wood-pewee	*Contopus virens*	no schedule, no status	special concern	S4B	MBBA
European Starling	*Sturnus vulgaris*			SNA	ACCDC, MBBA
Evening Grosbeak	*Coccothraustes vespertinus*			S2B,S4N	MBBA
Gadwall	*Anas strepera*			S4B	MBBA
Golden-crowned Kinglet	*Regulus satrapa*			S5	MBBA
Great Black-backed Gull	*Larus marinus*			S4B,S5N	ACCDC
Great Blue Heron	*Ardea herodias*			S4B	MBBA
Green-Winged Teal	*Anas crecca*			S5B	MBBA
Hairy Woodpecker	*Picoides villosus*			S5	MBBA
Hermit Thrush	*Catharus guttatus*			S5B	MBBA
Herring Gull	*Larus argentatus*			S3B,S5N	ACCDC, MBBA
House Sparrow	*Passer domesticus*			SNA	ACCDC, MBBA
Killdeer	*Charadrius vociferus*			S3B	MBBA
Magnolia Warbler	*Dendroica magnolia*			S5B	MBBA
Mallard	*Anas platyrhynchos*			S5B	MBBA
Mourning Dove	*Zenaida macroura*			S5	MBBA
Mourning Warbler	*Oporornis philadelphia*			S4B	MBBA
Nashville Warbler	*Vermivora ruficapilla*			S5B	MBBA

Table C1 Bird Species Observed near the LAA (ACCDC and MBBA Records)

Common Name	Scientific Name	*SARA*	COSEWIC	ACCDC S-Rank	Data Source
Nelson's Sparrow	*Ammodramus nelsoni*			S4B	MBBA
Northern Flicker	*Colaptes auratus*			S5B	MBBA
Northern Harrier	*Circus cyaneus*			S4B	MBBA
Northern Mockingbird	*Mimus polyglottos*			S2B	ACCDC, MBBA
Northern Parula	*Parula americana*			S5B	MBBA
Northern Shoveler	*Anas clypeata*			S3B	MBBA
Osprey	*Pandion haliaetus*			S5B	MBBA
Ovenbird	*Seiurus aurocapilla*			S5B	MBBA
Pied-billed Grebe	*Podilymbus podiceps*			S4B	MBBA
Pine Siskin	*Carduelis pinus*			S2S3B,S4N	MBBA
Purple Finch	*Carpodacus purpureus*			S5B	MBBA
Red-breasted Nuthatch	*Sitta canadensis*			S5	MBBA
Red-eyed Vireo	*Vireo olivaceus*			S5B	MBBA
Redhead	*Aythya americana*			SNA	MBBA
Red-winged Blackbird	*Agelaius phoeniceus*			S5B	MBBA
Ring-billed Gull	*Larus delawarensis*			S1B,S5N	ACCDC, MBBA
Ring-necked Duck	*Aythya collaris*			S5B	MBBA
Rock Pigeon	*Columba livia*			SNA	ACCDC, MBBA
Rose-breasted Grosbeak	*Pheucticus ludovicianus*			S3B	MBBA
Ruby-crowned Kinglet	*Regulus calendula*			S5B	MBBA
Ruby-throated Hummingbird	*Archilochus colubris*			S5B	MBBA
Savannah Sparrow	*Passerculus sandwichensis*			S5B	MBBA
Song Sparrow	*Melospiza melodia*			S5B	ACCDC, MBBA
Sora	*Porzana carolina*			S5B	MBBA
Swamp Sparrow	*Melospiza georgiana*			S5B	MBBA
Tree Swallow	*Tachycineta bicolor*			S4B	MBBA
Veery	*Catharus fuscescens*			S4B	MBBA
White-throated Sparrow	*Zonotrichia albicollis*			S5B	MBBA

Table C1 Bird Species Observed near the LAA (ACCDC and MBBA Records)

Common Name	Scientific Name	*SARA*	COSEWIC	ACCDC S-Rank	Data Source
Willet	*Tringa semipalmata*			S4B	MBBA
Winter Wren	*Troglodytes troglodytes*			S5B	MBBA
Wood Duck	*Aix sponsa*			S4B	MBBA
Yellow Warbler	*Dendroica petechia*			S5B	ACCDC, MBBA
Yellow-rumped Warbler	*Dendroica coronata*			S5B	MBBA
Note: SAR and SOCC are indicated in bold text.					