Environmental Impact Statement (EIS): Proposed Borden-Carleton Transmission Line Project

Job No. 121812508

Prepared for:

Maritime Electric Company, Limited
PO Box 1328, 180 Kent Street
Charlottetown PE C1A 7N2

Prepared by:

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

April 17, 2018

This document entitled Environmental Impact Statement (EIS): Proposed Borden-Carleton Transmission Line Project was prepared by Stantec Consulting Ltd. ("Stantec") for the account of Maritime Electric Company, Limited (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Approved by:

Matt Steeves

(signature)

Matt Steeves, B.Sc.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Abbreviations

%	Percent
°C	Degree Centigrade
ACONS	Atlantic Canada Nocturnal Owl Surveys
BBS	Breeding Bird Survey
BMP	Best Management Practices
CEAA	Canadian Environmental Assessment Act
cm	Centimetre
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
Line Y-109	Transmission Line from West Royalty, PE to Bedeque, PE
m	Metre
MBBA	Maritimes Breeding Bird Atlas
MBCA	Migratory Birds Convention Act, 1994
MCPEI	Mi’kmaq Confederacy of Prince Edward Island
Maritime Electric	Maritime Electric Company, Limited
mm	Millimetre
NTU	Nephelometric Turbidity Unit
PDA	Project Development Area
PEI	Prince Edward Island
PEI *EPA*	Prince Edward Island Environmental Protection Act
PEIDCLE	Prince Edward Island Department of Communities, Land, and Environment
PEITIE	Prince Edward Island Department of Transportation, Infrastructure, and Energy
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

This report is an environmental impact statement (EIS) for Maritime Electric Company, Limited's Borden-Carleton Transmission Line Project ("the Project").

The Proponent, Maritime Electric Company, Limited (Maritime Electric), a wholly-owned subsidiary of Fortis Inc., is proposing to:

i) build a 138 kilovolt (kV) overhead transmission line from Line Y-109 near Maple Plains, through Albany, terminating at Borden-Carleton substation, Prince County, PE; and

ii) rebuild or relocate the 69-kV overhead T-3 transmission line from the Borden substation to the Albany substation.

Two routes (one preferred and one alternate) have been developed for assessment of 138-kV Line to Y-109; both will fulfill the electrical requirements of Maritime Electric. The relocation or rebuild of T-3 is dependant on the route selected for Line Y-109. Should the preferred route for Line Y-109 be selected and approved, the existing T-3 line would be decommissioned and relocated adjacent to Y-109 into the preferred route right-of-way. Should the alternate route for Line Y-109 be selected and approved, the T-3 line would be rebuilt in its current location along the Trans-Canada Highway (TCH).

Completion of the proposed transmission line Project will increase reliability in the area and improve load sharing and system performance following the finalization of the PEI-NB Interconnection Project. The transmission line will also maintain electrical service to Islanders for domestic, commercial, institutional, and industrial purposes. The Project will allow Maritime Electric to continue to supply PEI with electricity safely and reliably, while reducing losses, replacing aged infrastructure, and accommodating for future load growth. The transmission line from the Borden-Carleton substation will decrease the load on the Bedeque substation, which is reaching capacity, in favor of transferring load to the recently upgraded substation in Borden-Carleton.

A summary of the activities related to the construction and operation and maintenance of the Y-109 transmission line along the two routes, and decommissioning and relocation of the T-3 line is described. A description of the existing environment is also provided. This description was prepared from information provided by Maritime Electric and through review of existing, publicly available data as well as field collected data for the project routes and surrounding environment.

1.1 PROJECT TITLE, PROJECT PROPONENT, AND AUTHOR OF EIS

The Project title and details of the Project Proponent and the environmental consultant hired by the Proponent to author this EIS are as follows:

Project Title:	Proposed Borden-Carleton Transmission Line Project
Project Proponent:	Maritime Electric Company, Limited PO Box 1328, 180 Kent Street Charlottetown, PE. C1A 7N2 Chief Executive Officer: Mr. John Gaudet
Proponent's Principal Contact Person:	Mr. Ken Sampson Superintendent, Operations Support/Standards Coordinator Tel: (902) 393-2353 Fax: (902) 629-3630 Email: sampsonkn@maritimeelectric.com
Environmental Consultant and Principal Person for this EIS:	Mr. Matt Steeves Project Manager, Environmental Services Stantec Consulting Ltd. 165 Maple Hills Avenue Charlottetown, PE. C1C 1N9 Tel: (902) 566-2866 Fax: (902) 566-2004 Email: matt.steeves@stantec.com

1.2 PROJECT OVERVIEW

The Project proposes the construction of a new section of 138-kV overhead transmission line along one of two identified routes. Maritime Electric has conducted assessments on both routes as options for the Project and proposed a preferred transmission route and one alternate route. Both routes are included for assessment in this EIA. Both routes originate from the Y-109 transmission line near Maple Plains and terminate at the Borden-Carleton substation. The proposed 138-kV line will connect directly to line Y-109 and no substation will be required in Maple Plains as part of this Project.

A secondary project component includes the rebuild of the 69-kV T-3 line, which would be in the budget application for 2019. The final route selection for Y-109 will determine the route of the T-3 line rebuild. This existing line would be decommissioned, and should the preferred Y-109 route be selected and approved, the T-3 line would be relocated to the preferred route right-of-way. Should the alternate Y-109 route be selected and approved, the T-3 line would be rebuilt in its current location along the TCH.

The proposed construction, if approved, is anticipated to commence in 2018, following the receipt of the environmental and construction permits. Regardless of the final route selection, the transmission lines will predominantly employ single wooden pole structures. Similar to other Maritime Electric transmission lines the proposed Project will be built and maintained to provide operation for several decades. While decommissioning or abandonment of the proposed Project is not currently envisioned, periodic replacement of components will increase the transmission line's lifespan. At the end of its useful service life the transmission line will be decommissioned, in accordance with the applicable standards and regulations current at that time.

1.3 PROJECT PURPOSE

Completion of the proposed Project will increase reliability in the area and improve load sharing and system performance following the finalization of the PEI-NB Interconnection Project. The transmission line will also maintain electrical service to Islanders for domestic, commercial, institutional, and industrial purposes. The Project will allow Maritime Electric to continue to supply PEI with electricity safely and reliably, while reducing losses, replacing aged infrastructure, and accommodating for future load growth. The transmission line from the Borden-Carleton substation will decrease the load on the Bedeque substation, which is reaching capacity, in favor of transferring load to the recently upgraded substation in Borden-Carleton. The transmission line from Borden-Carleton to Albany will replace aged infrastructure and improve reliability to the surrounding area supplied by the Albany Substation.

1.4 REGULATORY CONTEXT

There is no known trigger for the Project to require an environmental assessment under the *Canadian Environmental Assessment Act*, 2012 (CEAA 2012). The Project is not listed under the Regulations Designating Physical Activities under CEAA 2012, so an environmental assessment is not required under CEAA 2012. This project is; however, considered an undertaking under the PEI *Environmental Protection Act* (PEI *EPA*).

1.4.1 Provincial Environmental Assessment

The regulatory framework for conducting environmental impact assessments (EIAs) in PEI is set forth in Section 9 of the PEI *EPA* (the Act).

The interpretation of the Act is provided in Section 1. 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.

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”.

Furthermore, 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, submit an EIS, notify the public of the proposed undertaking, and to provide opportunity for the public to comment.

Section 9(3) of the Act states that “an environmental assessment and environmental impact statement shall have such content as the Minister may direct”.

Based on the PEI *EPA*, an EIA must be conducted for the Project, and an EIS must be presented to the Minister for approval of the undertaking. An EIA must be completed and the corresponding EIS prepared and submitted as to enable a review of the Project by the Technical Review Committee (TRC), comprised of provincial regulatory agencies as well as federal regulatory agencies, if required. The outcome of the EIA review process will determine if the Project should be approved, including any approval conditions.

A watercourse and wetland alteration permit, administered by the PEI Department of Communities, Land, and Environment (PEI CLE), may be required for the Project if work is to be conducted within 15 m of a watercourse or wetland.

1.4.2 Additional Permitting Requirements

If environmental approval is obtained for the proposed transmission line Project, an approval-to-proceed will be requested from the PEI Department of Transportation, Infrastructure, and Energy (PEITIE) for any project activities that will take place within the provincial right-of-way. Any required accesses or driveways from the provincial right-of-way on to lands located alongside the provincial right-of-way require an Entranceway Approval from PEITIE. Should there be a need to access or occupy provincial land, either temporarily or on a more permanent basis, PEITIE will be contacted to arrange any necessary approvals/agreements.

2.0 PROJECT DESCRIPTION

This section provides a preliminary description of the activities and infrastructure that comprise the proposed Project, based on the information available at the time of writing.

It is important to recognize that the project description, equipment, and layout described below may change with detailed engineering design and public consultation. To not understate the potential environmental consequences of the Project, the description presents an “outer envelope” or maximum footprint of the Project, so that the actual environmental effects of the Project as it is ultimately built would be expected to be within the envelope of what is being assessed herein.

This section describes the key aspects of the Project, as currently conceived, including descriptions of:

- project components, including the likely infrastructure, assets, and components associated with the Project;
- activities that will be carried out during construction, and operation and maintenance of the Project; and
- project-related emissions and wastes

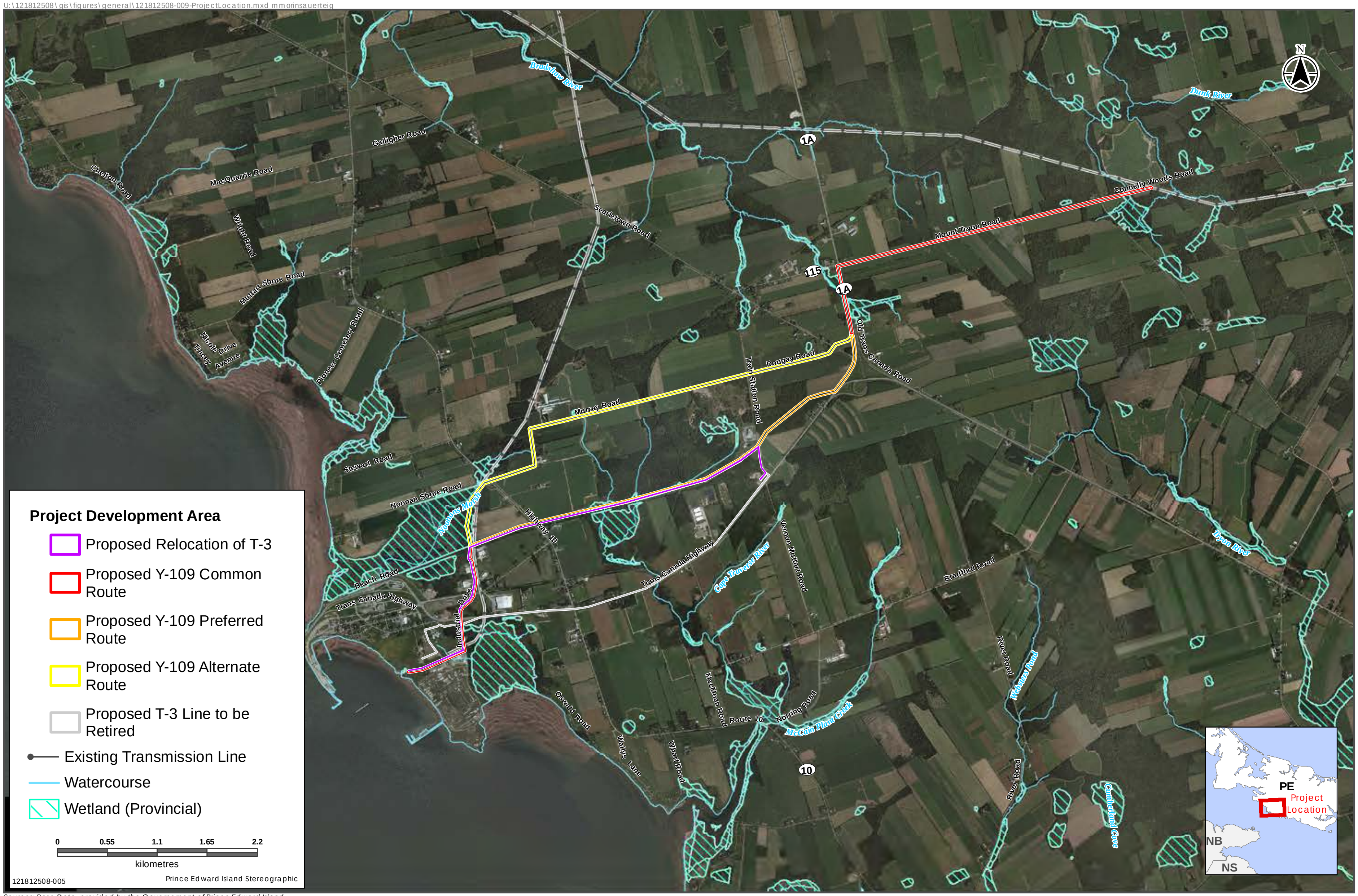
2.1 PROJECT LOCATION

The proposed preferred and alternate routes for the proposed Y-109 transmission and the T-3 line are shown in Figure 2.1, below. Both preferred and alternate routes start at Line Y-109 on Mount Tryon Road and end at the Borden-Carleton substation. The central sections of the proposed routes diverge, with the proposed preferred route following an undeveloped Prince Edward Island Transportation, Infrastructure, and Energy (PEITIE) right-of-way (RoW) and the proposed alternate route following local roads and highways within the PEITIE RoW. Additional details are provided below.

Both the preferred and alternate transmission line routes begin where Line Y-109 crosses Mount Tryon Road, from there it follows Mount Tryon Road for 3.5 km to Highway 1A. The route heads south along Highway 1A to Albany Corner (Figure 2.1 – Proposed Common Route). The proposed preferred transmission line route then follows an undeveloped section of PEITIE RoW southwest for 5.2 km to Industrial Drive (Figure 2.1 – Proposed Preferred Route). The route continues south along Industrial Drive to the Strait Crossing maintenance yard. At the southern end of Industrial Drive, the route heads west to the Maritime Electric property where it terminates at the substation in Borden-Carleton (Figure 2.1 – Proposed Common Route).

The alternate transmission line route, shown in Figure 2.1, follows the Mount Tryon Road to Albany Corner (Figure 2.1 – Proposed Common Route). From there the alternate route continues west along beside Dougay Road and Murray Road to Noonan Shore Road (Figure 2.1 – Proposed Alternate Route). The alternate route then turns south going cross-country from Noonan Shore Road to Industrial Drive following the existing Maritime Electric RoW in that area. From Industrial Drive both the alternate and preferred route follow a common route along the PEITIE RoW to the Borden-Carleton substation property (Figure 2.1 – Proposed Common Route).

U:\121812508\gis\figures\general\121812508-009-ProjectLocation.mxd mmorinsauerteig



Sources: Base Data provided by the Governement of Prince Edward Island.

Proposed Y-109 to Borden Substation Project Location

121812508 - MARITIME ELECTRIC COMPANY LIMITED

Figure 2.1

The existing T-3 line starts at the Borden-Carleton substation and follows along Read Road and Carleton Street before merging on to the Trans-Canada Highway. The current route ends at the Albany substation on the Train Station Road. If the preferred route is selected for Y-109 the rebuild of the T-3 line would start at the Borden-Carleton substation and follow the preferred route to the Train Station Road crossing and terminate at the Albany Substation, just south of Atlantic Beef Products Inc.

2.2 PROJECT COMPONENTS

A high voltage transmission line, such as the 138-kV Y-109 line or the 69-kV T-3 line, consists of a conductor used to transmit electricity, supported by ground structures located at intervals along the transmission line route. Various ground structure types and configurations exist to support the conductors. During the initial planning stages of a transmission line, an evaluation is carried out to determine the structure type to be used. Potential structure types include steel lattice, steel pole, wood H-frame, and single pole wooden structures.

It is anticipated that single pole wooden structures, approximately 17 to 20 m in height, and all-aluminum conductors will be used for this Project. Wooden poles used for construction are treated with a preservative, insecticide and herbicide and will be handled and disposed of according to the Industrial Treated Wood Users Guidance Document published by Environment Canada (2004) best management practices (BMPs). If single pole wooden structures are used, they are typically placed every 50 to 75 m along the transmission line. Helix (screw type) anchors (10 to 14 inches (25 to 35 cm) in diameter) may be used to anchor poles. Helix anchors are screwed into the ground and have a smaller installation footprint compared to other anchor configurations (i.e., log anchors). Synthetic insulators are typically attached to the top of the wooden poles to support the conductors as they result in a longer operational lifespan than traditional porcelain or glass insulators. As an example, a typical 138-kV line parallel to a public road in PEI is shown in Photo 1.

Photo 1 Typical 138-kV transmission line construction along a public road in PEI (left) and T-3 69-kV transmission line construction along the Trans-Canada Highway (right) (photos courtesy of Maritime Electric)

2.2.1 Transmission Line

The proposed transmission line will be created of the following components.

Structures

Structures are used to support the high voltage conductors and to ensure minimum clearance to the ground, to objects under the transmission line, and to vehicles at road crossings. The distances between structures (i.e., the spans) and their heights are determined by the topography of the area and the clearance requirements. Spans typically range between 50 to 75 m, while the height of poles used in structure design ranges from 17 to 20 m depending on the elevation and the clearance required. However, as-built dimensions may vary depending on actual conditions at the site of each pole (e.g., geotechnical soil conditions, key environmental features that require avoidance) or height clearance requirements. River and/or wetland crossing locations may require the spans to increase/decrease to minimize environmental concerns, or elevated roadways may require the pole height to increase. In the event pole installation is required in wetlands, poles may be installed inside aggregate filled culverts. All structures as part of the transmission line are engineered and designed to applicable Canadian Standards Association Standards (CSA C22.3 NO.1-10).

For this Project, single pole structures will be used. The single pole structures used to build this line will be pentachlorophenol-treated wood poles (referred to as “penta poles”). Other types of poles (e.g., steel) may be installed, if conditions require.

Penta poles are currently the most common construction material for transmission and distribution electrical lines in North America. Pentachlorophenol is a wood preservative currently authorized for use in Canada (Health Canada Pest Management Regulatory Agency 2006). Treatments protect the wood against fungi and insects, and provide extra protection against moisture content changes (Environment Canada and CITW 1999). Penta poles have greater wood stability and resistance to splitting, which increases the wood’s durability and substantially extends the service life of the wood. As such, the frequency of maintenance activities involving replacement of poles that may have deteriorated would be reduced. In addition, this type of treatment provides resistance to electrical currents and facilitates the climbing of poles by line maintenance staff (Environment Canada and CITW 1999).

The Industrial Treated Wood Users Guidance Document published by Environment Canada (2004) provides best BMPs and guides users of treated wood on purchasing, storage, use, disposal, and reuse. Maritime Electric will comply with the applicable BMPs in this document when handling and installing treated poles.

2.2.2 Conductors

Several types of conductors are available for use. The selection depends on several factors that are typically considered during the preliminary design phase. A 750 MCM (Flint) all aluminum stranded conductor will most likely be used for this Project. The diameter of large wires is expressed in thousands of circular mils (unit of area equal to one thousandth of an inch) and is typically given the abbreviation MCM.

2.2.3 Easement

An easement is defined as a non-possessory, registered interest acquired by one person in the land of another, permitting partial use of the other’s land for a specific purpose (LII 2015). To enable the proposed Project to be carried out, easements may be required on privately owned land. Construction, operation, and maintenance may be conducted in an existing Maritime Electric RoW along existing easements, such as along a section of the alternate route. Maritime Electric will not own the lands within the easements, but will develop usage rights with the associated landowners as per the easement agreements. In some areas, easements may be required where guy wire anchors are installed outside of the PEITIE corridor. The size of easement required for anchoring depends on the height of the pole, angle of the guy wire(s) and the type of anchoring used.

For the proposed preferred route Poles would be installed within the RoW owned by PEITIE and on Maritime Electric property. The alternate route would see poles installed within the PEITIE RoW, an existing Maritime Electric easement and Maritime Electric property. For the proposed transmission line routes small localized easements may be required where anchors are installed outside of the PEITIE RoW. Discussions with landowners will commence once engineering design and plotting of the poles has been carried out

2.3 DESCRIPTION OF PROJECT ACTIVITIES

2.3.1 Construction

Upon regulatory approval and completion of engineering design, construction of the Project would begin and involve the following activities:

- surveying and site preparation (including tree trimming and vegetation clearing)
- Installation of Project components
- clean-up/re-vegetation
- disposal of construction-associated wastes

2.3.1.1 Site Preparation

Surveying and site preparation for the proposed transmission line includes vegetation clearing/tree trimming and establishment of staging and access points. Upon receipt of environmental approvals, the transmission line corridor will be surveyed, and pole and anchor locations staked out.

2.3.1.1.1 Vegetation Clearing

The scope of vegetation clearing in the two routes will vary based on location and height of vegetation. No clearing is anticipated for the Maritime Electric Borden-Carleton property, or along active PEITIE RoWs in the Proposed Alternate Route (Figure 2.1); however, tree trimming and select cutting may be required to install project components.

Along the proposed preferred route (Figure 2.1 - Proposed Preferred Route), clearing of a 30-m wide corridor may be required in a portion of the undeveloped PEITIE RoW between Train Station Road and the Trans Canada Highway (Figure 2.1). Grubbing, or the removal of all surface vegetation, is not required for this section, or elsewhere along the route.

Along the alternate route (Figure 2.1 - Proposed Alternate Route), the cross-country portion between Noonan Shore Road and Industrial Drive would be located in the existing Maritime Electric RoW constructed for an existing transmission line. In this segment of the route the Project will parallel the existing transmission line in the Maritime Electric corridor. Like the proposed preferred route, grubbing is not required for the alternate route.

The breeding season for birds in the region is typically from April 8 to as late as August 28 (ECCC 2017c). Where possible, select clearing or cutting is proposed to take place outside of these breeding months. If clearing or cutting is required within the breeding bird season, a skilled and experienced observer will conduct a nest survey, to determine if nesting activity is occurring prior to commencement of works.

2.3.1.1.2 Establishment of Access Points and Staging

Access points will be required in some locations to allow transportation of construction equipment, materials, and personnel. The use of existing access points and roads will be maximized where feasible.

Staging of materials refers to the temporary placement of construction materials (i.e., poles and hardware) near the construction area so that crews may use those materials and install the poles. The staging areas will be situated to avoid environmentally sensitive areas, such as rare plants, wetlands, watercourses, and their buffers. They will be easily accessible, will minimize potential traffic hazards, and will be located away from developed areas to minimize noise and dust concerns. Sites requiring little or no modification, such as forestry landing areas or harvested fields, will be used for temporary staging areas. If staging areas are to be located on private property, agreements will be signed with the individual landowners. Fencing may be placed around the site for security reasons. Following construction, staging area sites will be returned to their pre-construction condition. For both the proposed preferred and alternate proposed routes, temporary soil platforms for construction purposes will only be used where there is not enough room on the shoulder of the road for line construction to be conducted in a safe and secure manner. The details of any potential staging area sites or temporary soil platforms will be established prior to construction, during project engineering.

2.3.1.2 Installation of Project Components

The installation of Project components is expected to include structure assembly, anchoring, conductor stringing, and inspection, as described below.

2.3.1.2.1 Structure Assembly

The assembly of structures involves the transportation of construction materials to the transmission line corridor, excavation of pole locations, pole placement, and backfilling of excavated material. Excavation is commonly carried out by mechanical auger or excavator depending on soil conditions. Wheeled equipment and/or tracked vehicles will be used to perform these activities. Tracked equipment would typically be used for any cross-country activities.

Typical installation of the single pole structures will require an excavation approximately 0.5 m in diameter and approximately 2.5 to 3 m deep (i.e., 10% of pole length plus 0.6 m). Based on these dimensions, there will be 2.0 to 2.4 cubic metres (m^3) of excavated material for each structure. Excavations will be augured where possible. Excavation with backhoes is unlikely and will be used as a contingency excavation method in soils that cannot be augured efficiently. The assembly of structures will take place on-site at the structure locations. The disturbance area at each structure site for construction equipment operation, structure assembly, and structure installation activities will be limited to approximately 5 m^2. Compacted excavated 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.

Exact structure locations have yet to be determined. They will be established after the plan and profile maps have been completed, prior to construction. Structure locations will avoid watercourses, wetlands, and any other environmentally sensitive areas to the extent practical. The Project design will be developed and refined during the planning phase in consideration of data collected during environmental field surveys. Tracked equipment will remain 15 m from watercourses unless approved by PEI CLE through a Watercourse, Wetland, and Buffer Zone Activity Permit.

A segment of the alternate route would be routed through a wetland between Noonan Shore Road and Industrial Drive. This section of the wetland is located within the existing 30 m wide Maritime Electric RoW. Maritime Electric has obtained a Watercourse, Wetland, and Buffer Zone Activity Permit for the existing transmission line, and, if required, an additional permit would be obtained prior to construction activities.

2.3.1.2.2 Anchoring

Although specific information regarding anchor requirements for guy wires at angled structures has yet to be determined, helix 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. 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 excavation spoils, and can be withdrawn and reused.

Log anchors may also be used as required. Log anchors will be installed in soft areas or at structure locations where the lines are under higher 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 before backfilling and compacting the area. As the transmission line routes are mostly along previously disturbed roadsides, log anchoring is not likely to be required at most locations. The segments outside the PEITIE RoW will utilize mostly helix anchors, if required; however, log anchoring may be required in some wet areas where the soil holding capacity is not sufficient.

2.3.1.2.3 Conductor Stringing

As poles are installed along the route, line stringing can commence. Typically, coils of conductor are loaded onto a reel-trailer and delivered to the construction site. At the designated section of the transmission line, the reel-trailer is pulled adjacent to the line (by truck), and conductor is strung for a given section of the transmission line. Using aerial work platforms (i.e., bucket truck), construction crews then hoist the section of line onto the running blocks (on the top of the poles), allowing the conductor to sag between poles. In areas where the transmission line crosses a road, rider poles will be temporarily installed on either side of the roadway for support to prevent the conductor from sagging. Although lasting only a short time, this sagging could affect traffic flow and pose safety concerns. Traffic control personnel will be on-site when needed to direct traffic during conductor stringing over roadways. After securing one end of the conductor to a pole, the conductor is brought to a specific tension by retrieving slack on the reel-trailer. Once at the specified tension, the line is manually clipped into position on each pole by construction crews operating out of the bucket truck.

It is anticipated that construction equipment will operate from existing roadways, old roadbeds (located in the undeveloped PEITIE RoW along the proposed preferred route) or existing Maritime Electric RoW and will not be required in wetlands or watercourses, or within their respective buffer zones. In areas where the transmission line crosses a wetland or watercourse, the conductor will be pulled across the area by rope. Equipment will not operate in watercourses or wetlands, except in accordance with the conditions of any watercourse, wetland and buffer zone activity permit that might apply.

2.3.1.2.4 Inspection

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

2.3.1.3 Clean-up and Re-vegetation

Clean-up and re-vegetation of disturbed areas, where applicable, are completed during the final stage of construction. The soil augured during pole placement is generally left at the base of the poles. In areas where soil disturbance due to construction may be eroded and cause sedimentation, such as steep gradients or around wetlands or watercourses, measures will be taken to stabilize the affected area. These measures may include leveling, mulching, seeding, and geotextile placement.

Erosion control used during construction will be maintained until the disturbed ground has been adequately stabilized with vegetation.

2.3.1.4 Emissions and Wastes

Few emissions and wastes are expected during construction. Emissions will be limited to releases of air contaminants from the operation of construction equipment, noise from heavy equipment operation, and potentially some small quantities of fugitive dust from excavation activities. The emissions and noise will remain largely confined to the transmission line corridor 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), the emissions will be short-lived and are not expected to cause a substantive nuisance to nearby residents.

Wastes will be minimal and limited to packaging and excess construction materials. Waste will be sorted as per the Island Waste Management Corporation sorting guides, and construction materials will be disposed of at approved construction and demolition disposal sites.

2.3.2 Operation

Once construction has been completed, Maritime Electric will oversee the operation of the transmission line, which is anticipated to be several decades or longer. Maintenance activities will be performed to ensure the reliability of the network. Activities expected during operation include the transmission of electricity, vegetation management, and maintenance of hardware. These activities are described in the following sections.

2.3.2.1 Energy Transmission

Following construction, the transmission line will be energized and will begin transmitting electricity. Routine inspections and maintenance will minimize interruptions to this activity.

2.3.2.2 Vegetation Management

As part of operation, Maritime Electric is responsible for providing safe and reliable electricity to homes, businesses, and industries. Uncontrolled vegetation can create fire and safety hazards, hinder routine line maintenance, and cause interruptions in electrical service when it grows into or falls onto electric power lines. For safety reasons and to avoid interruptions in electric service caused by overgrown or fallen vegetation, Maritime Electric restricts the growth of trees and brush along the lines. An integrated vegetation management program is conducted using various mechanical means to control vegetation along the transmission line corridor. The frequency of the program varies depending on the vegetation growth rate, but is carried out at appropriate intervals to control vegetation growth and minimize any interaction or contact with the power lines.

2.3.2.3 Infrastructure Inspection, Maintenance, and Repair

Maintenance staff will perform ground and aerial line inspections. These will be done on a regular basis to check for the deterioration of conductors, poles, hardware, and insulators, and identify maintenance requirements. These inspections will also assist in identifying any potential for weakened support structures and anchors, 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 Maritime Electric operational personnel who are responsible for planning and scheduling maintenance work.

2.3.2.4 Emissions and Wastes

Minimal routine Project-related emissions of air contaminants, noise or wastes are expected from the Project during operation. There may be some short-term emission of sound, dust, and exhaust from vegetation control machinery, but these are expected to be infrequent (every 3 to 5 years), transient and short-lived.

2.3.2.5 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).

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 to 300 Hertz, where power frequency is 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).

2.3.3 Decommissioning and Abandonment

2.3.3.1 Y-109 Transmission Line

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 transmission line corridor left to re-vegetate naturally.

The proposed Y-109 transmission line will be designed, built, and maintained to be in operation for several decades. While decommissioning or abandonment of Y-109 is not currently envisioned, the Project will at some point be decommissioned at the end of its useful service life, in accordance with the applicable standards and regulations that are current at that time.

As this Project is a partial transmission line build, a portion of the existing Y-109 line will be used in limited instances after the completion of this Project. The former section of Y-109 will remain in place and may be operated, if required. Line Y-111 runs in the same RoW as the existing Y-109 line and will continue to be used. Therefore, the RoW will be maintained until both transmission lines are decommissioned.

2.3.3.2 T-3 Transmission Line

The following section outlines the decommissioning activities for the existing T-3 transmission line if the preferred route for Y-109 is selected. If the alternate route for Y-109 is selected, T-3 will be rebuilt in the current location along the Trans-Canada Highway using the construction methods outlined in Section 2.3.1.

Wire and Hardware Removal

After the transmission line is de-energized, components such as conductors, overhead ground wires, and anchor wires will be disconnected.

Structure Disassembly

The sections that make up a structure will be disassembled in the reverse order they were assembled. For T-3, the cross arms will be removed and set on the ground. Helix anchors will be removed from the ground. The anchor wires will be removed from support poles and the support poles will be taken down by cutting them at ground level.

Clean-up/Re-vegetation

Areas where soil disturbance due to decommissioning may cause erosion, measures will be taken to stabilize the affected area. Such measures may include trimming and back blading, mulching, seeding, fabric placement, and silt fencing. Erosion control used during decommissioning will be maintained until the disturbed ground has been stabilized with vegetation.

2.4 ENVIRONMENTAL AND SAFETY MANAGEMENT SYSTEMS

The work on the Project will be conducted according to Maritime Electric'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. Maritime Electric will also follow their approved Environmental Protection Plan (EPP) for High Powered Transmission Construction in PEI (Stantec 2013), which includes Project-specific emergency response plans, prior to the initiation of construction activities. The EPP includes a Project-specific mitigation section that includes mitigation measures identified in the environmental assessment process.

Environmental protection procedures and measures will be observed and employed throughout the life of the Project. Maritime Electric will be responsible to ensure installation, maintenance, inspection and monitoring of environmental protection control measures of all project infrastructure. This includes, but is not limited to, vegetation management practices, spill response, watercourse, wetland, and wildlife protection measures, along with erosion and sediment control measures.

2.5 ALTERNATIVES TO AND ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

Alternatives to the Project are functionally different ways of achieving the same end. Alternatives to the Project include: the "do nothing" scenario (null alternative) and upgrades to existing infrastructure.

The null alternative to the Project would result in no increase in environmental effects in the area, as this alternative would result in no change of environmental features (*e.g.*, terrestrial environment) or the existing infrastructure (T-3). This alternative does not address the purpose of the Project (Section 1.3), to supply PEI with electricity safely and reliably, while reducing losses, replacing aged infrastructure, and accommodating for future load growth.

A preferred and alternative route has been proposed for the construction of the Y-109 transmission line by Maritime Electric and a rebuild and relocation option for T-3. The selection of these routes took into consideration common landowner concerns, such as the number of residential properties along the transmission line corridor, the proximity of residences to the corridor, the overall length of the route, access to the corridor, environmental impact, and technical requirements for installation of a transmission line. Both routes identified would suit the purposes of this project and are assessed in this EIS. The route chosen for the T-3 line will be dependent on the route selected for the Y-109 transmission line.

2.6 PROJECT SCHEDULE

If approved, the Project is expected to begin following the receipt of all necessary permits and authorizations, and the completion of detailed engineering design. Initial Y-109 transmission line construction could occur in summer 2018 in sections of the RoW where tree clearing is not required. To reduce potential interactions with breeding birds, RoW clearing, or trimming would occur in September 2018, after the peak nesting periods of migratory birds which is April 8 to Aug 28 for PEI (ECCC 2017c).

If the preferred route for Y-109 is selected and approved, the construction of T-3 along the shared RoW would occur after construction of Y-109 in summer 2019, if approved in the 2019 budget application. The existing T-3 line would not be decommissioned until the relocated line is operational, likely in 2019. If the alternate route for Y-109 is selected the T-3 line rebuild would also occur in 2019, along the Trans-Canada Highway.

3.0 SCOPE OF THE ASSESSMENT, METHODS, AND ENGAGEMENT

3.1 SCOPE OF THE ASSESSMENT

The scope of the Project to be assessed includes the construction and operation and maintenance. As mentioned in previous section and discussed further below decommissioning and abandonment phases are not included in this assessment. For this assessment, the scope of the Project includes the major activities described in Table 3.1.

Table 3.1 Description of Project Phases, Major Activities, and Physical Works

Project Phase	Activity Category	Major Project Activities and Physical Works
Construction	Site preparation	The Project-related activities associated with preparing the site for physical construction, including: • vegetation clearing • establishment of access points and staging
	Installation of project components	The physical construction or installation of project components, including: • structure assembly • anchoring • conductor stringing • inspection
	Clean-up and re-vegetation	Clean-up from installation of project components and re-vegetation, where applicable.
Operation and Maintenance	Energy transmission	The transmission of electricity during operation.
	Vegetation management	Mechanical vegetation management.
	Infrastructure inspection, maintenance, and repair	Periodic inspection and preventative maintenance of infrastructure.
Decommissioning (T-3 only)	Wires and hardware removal	The disconnection and removal of project components, including: • conductors • overhead ground wires • guy wires
	Structure disassembly	• Hardware removed from structures and transported off-site • Cross arms removed and transported off-site • Helix anchors removed from the ground • Wooden poles will be taken down by cutting them at ground level
	Clean-up and re-vegetation	Clean-up from removal of project components and re-vegetation, where applicable.

3.2 VALUED COMPONENT (VC) SELECTION

The EIS report will consider a variety of environment interactions that may arise from the Project components and activities, as well as from effects of the environment on the Project (Section 5.0) and accidents, malfunctions, and unplanned events

(Section 6.0). “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 EIS report considers these interactions in terms of their importance to ecological and social integrity. It is generally accepted that EIAs should be efficient and focused on those issues of greatest importance to the public, stakeholders, and resource managers. The primary focus of this report is concentrated on biophysical and socioeconomic elements of concern that may require special mitigation or consideration.

Based on the activities outlined in the Project Description (Section 2.0), the scope of the assessment (Section 3.1), and the EIA methods described in Section 3.3, the potential interactions between the Project and the environment are summarized in Table 3.2.

Table 3.2 Selection of Valued Components

Project Phases	Atmospheric Environment	Freshwater Environment	Current Use of Land and Resources for Traditional Purposes by Indigenous Persons	Terrestrial Environment	Groundwater Resources	Land Use	Heritage Resources
Construction	-	-	-	✓	-	-	-
Operation	-	-	-	✓	-	-	-
Decommissioning (T-3 only)	-	-	-	✓	-	-	-

Decommissioning of the T-3 line only is assessed in this EIA, as decommissioning and abandonment activities for Y-109 are not expected to occur until the end of life of the Project. It is not possible to determine with any certainty the potential environmental effects of decommissioning and abandonment activities for Y-109, nor the regulations and policies that might apply at that point in the future. Therefore, neither the decommissioning and abandonment phase for Y-109, nor potential activities to be conducted as a part of it, are assessed in detail as part of this EIA; it is expected that they will be assessed in accordance with regulations in place at that time.

Six VCs have been **excluded** from further assessment as there are no substantive interactions expected between the Project and the VCs. These VCs include:

- atmospheric environment
- freshwater environment
- current use of land and resources for traditional purposes by Indigenous persons
- groundwater resources

- land use
- heritage resources

The following Table 3.3 provides rationale for not including selected valued components for further assessment.

Table 3.3 Rationale for Not Including Selected Valued Components

Valued Component	Basis for Inclusion or Exclusion as a VC	VC Determination
Atmospheric Environment	There is predicted to be a minor interaction with air quality due to exhaust emissions from Project vehicles and equipment. Project-related air emissions are expected to be consistent with air emissions currently generated by existing vehicles near the proposed transmission line corridor. Given that Project-related air emissions are anticipated to be temporary, localized, and incremental to current emissions in the PDA, they are considered unlikely to result in a measurable change in existing ambient air quality. In the context of EMFs from overhead electrical transmission health risks resulting from exposure have not been established and there is insufficient evidence relating exposure to EMFs with adverse health effects (Health Canada 2009). In consideration of existing regulatory frameworks, legislation, and policies in PEI, substantive interactions between the Project and the atmospheric environment are not expected and is not considered as a VC for this assessment.	Excluded from assessment
Freshwater Environment	Provincial mapping indicates that four watercourse crossings are within the proposed preferred and alternate transmission line corridors. No in-stream work will occur. The transmission line will span the watercourses and associated 15 m buffer zone. Equipment will not ford watercourses; equipment crossing will be conducted at existing road crossings. Accordingly, there are no expected substantive interactions between the Project and the freshwater environment in the Project Area. In consideration of existing regulatory frameworks, legislation, and policies in PEI, substantive interactions between the Project and the freshwater environment are not expected, and will not be carried forward for further assessment.	Excluded from assessment
Current Use of Land and Resources for Traditional Purposes by Indigenous Persons	The Project Area is located on land considered to be within traditional Mi'kmaq territory. If archaeologically significant resources are present within the Project footprint, they could potentially be subject to disturbance, damage, or destruction as a result of Project activities. As part of fulfilling the Crown's duty to consult, PEI CLE will conduct Indigenous consultation for the Project via the Mi'kmaq Confederacy of Prince Edward Island. The purpose of this consultation is to ensure that, with mitigation (as required) the Project could be carried out without impeding the rights of the province's Indigenous Community. This consultation will occur regardless of the inclusion or exclusion of the VC in the assessment. Maritime Electric has submitted a description of the Project to the Mi'kmaq Confederacy of Prince Edward Island and will continue to engage the Mi'kmaq Confederacy of Prince Edward Island on this Project.	Excluded from assessment

Table 3.3 Rationale for Not Including Selected Valued Components

Valued Component	Basis for Inclusion or Exclusion as a VC	VC Determination
	Maritime Electric will continue to discuss the Proposed Project with the Mi'kmaq Confederacy of Prince Edward Island to understand any concerns or comments on the Project. If current land use or traditional resources are identified within the project area during Project consultation or arises from the provincial government's duty to consult, this VC will be updated and reassessed accordingly.	
Groundwater Resources	A wellfield protection plan does not currently exist for the Town of Borden-Carleton, in the interim a 0.5 km radius around the principal sources of drinking water was imposed. The Project will involve construction and installation of poles within 0.5 km of the Town of Borden-Carleton wellfield, with the nearest pole placed approximately 150 m from the nearest well. Leaching of preservatives associated with treated poles may occur after installation and occur through the operation life of the Project. Generally, concentrations of pentachlorophenol decrease significantly within the first 20 centimetres from the pole (ANR 2015). Based on the tendency for pentachlorophenol to adsorb to soil and, combined with the moderately rapid degradation of the compound in the environment, contamination of groundwater caused by migration of pentachlorophenol from treated utility poles is not likely to occur in most situations with subsurface groundwater tables. (ANR 2015). In consideration of the existing land use and potential sources of contamination within 500 m of the current wellfield (I.e. roadways, industrial sites, agricultural lands), the best management practices for handling and disposal of treated poles (Environment Canada 2004) and the results of peer reviewed studies, substantive interactions between the Project and groundwater resources are not expected and is not considered as a VC for the purpose of this assessment.	Excluded from assessment
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. The proposed preferred route for Y-109 will follow existing roadways and will be located within the PEITIE RoW. The project corridor contains a mixture of transportation (52.1%), forest (35.1%) and agricultural (7.8%) properties. There are no residences within the proposed corridor of the proposed preferred route. The majority of the land along the proposed alternate route for Y-109 is transportation (84.6%) with sections of wetland (5.3%), forest (5.2%) and agricultural (4.9%). There are no residences within the proposed corridor of the alternate route. The relocation of T-3 will follow the proposed preferred route for Y-109. Up to the Train Station Road. The T-3 project corridor contains a mixture of transportation, forest, and agricultural properties like that of the Y-109 corridor. 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. Therefore, land use is not considered as a VC for the purpose of this assessment.	Excluded from assessment
Terrestrial	An analysis of potential Project effects on species of special	Included in the

Table 3.3 Rationale for Not Including Selected Valued Components

Valued Component	Basis for Inclusion or Exclusion as a VC	VC Determination
Environment	concern, including those that have been designated as at risk to some degree by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and/or the federal *Species at Risk Act* (*SARA*) will be undertaken. Activities may result in direct and indirect effects to wetlands and vegetation within or immediately adjacent to the transmission line corridor. Wetlands and plant species at risk are valued resources, protected by the PEI *Environmental Protection Act* and *Wildlife Conservation Act*.	assessment (Section 4.0)
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 include consideration of historical, archaeological, and built heritage resources. The PEI Aboriginal Affairs Secretariat has indicated that there are no known sites of historic or cultural importance within the PDA. The PEI the Department of Education, Early Learning and Culture has indicated that the proposed transmission line corridor does not overlap with any registered significant historic sites along either the proposed preferred or alternate route. The Albany Little Zion Baptist Cemetery is approximately 3 km to the southeast of the proposed preferred route where it bypasses Albany Corner, while the North Carleton Pioneer Cemetery is approximately 2 km northwest of the proposed alternate route where it intersects Highway 10. There are no registered significant historic sites within 5 km of the T-3 rebuild corridor. The Project is not expected to result in the unauthorized disturbance to, or destruction of, a heritage resource. In consideration of the lack of identified heritage resources within the project area, heritage resources are not expected to be substantive and will not be carried forward for further assessment.	Excluded from assessment

3.3 ENVIRONMENTAL ASSESSMENT METHODS

An overview of the methods used to conduct the environmental impact assessment (EIA) of the Project is provided in this section. The EIA has been completed using the methodological framework developed by Stantec to meet the requirements of EIAs in federal and provincial jurisdictions in Canada, including the requirements of the PEI *EPA*. 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, Indigenous persons, resource managers, scientists, and/or the public. VCs are selected based on:

- 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 and stakeholders
- the scope of factors to be considered in the EIA as determine by regulatory authorities
- the professional judgment of the study team

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 VCs relate to ecological, social, or economic systems that comprise the environment.

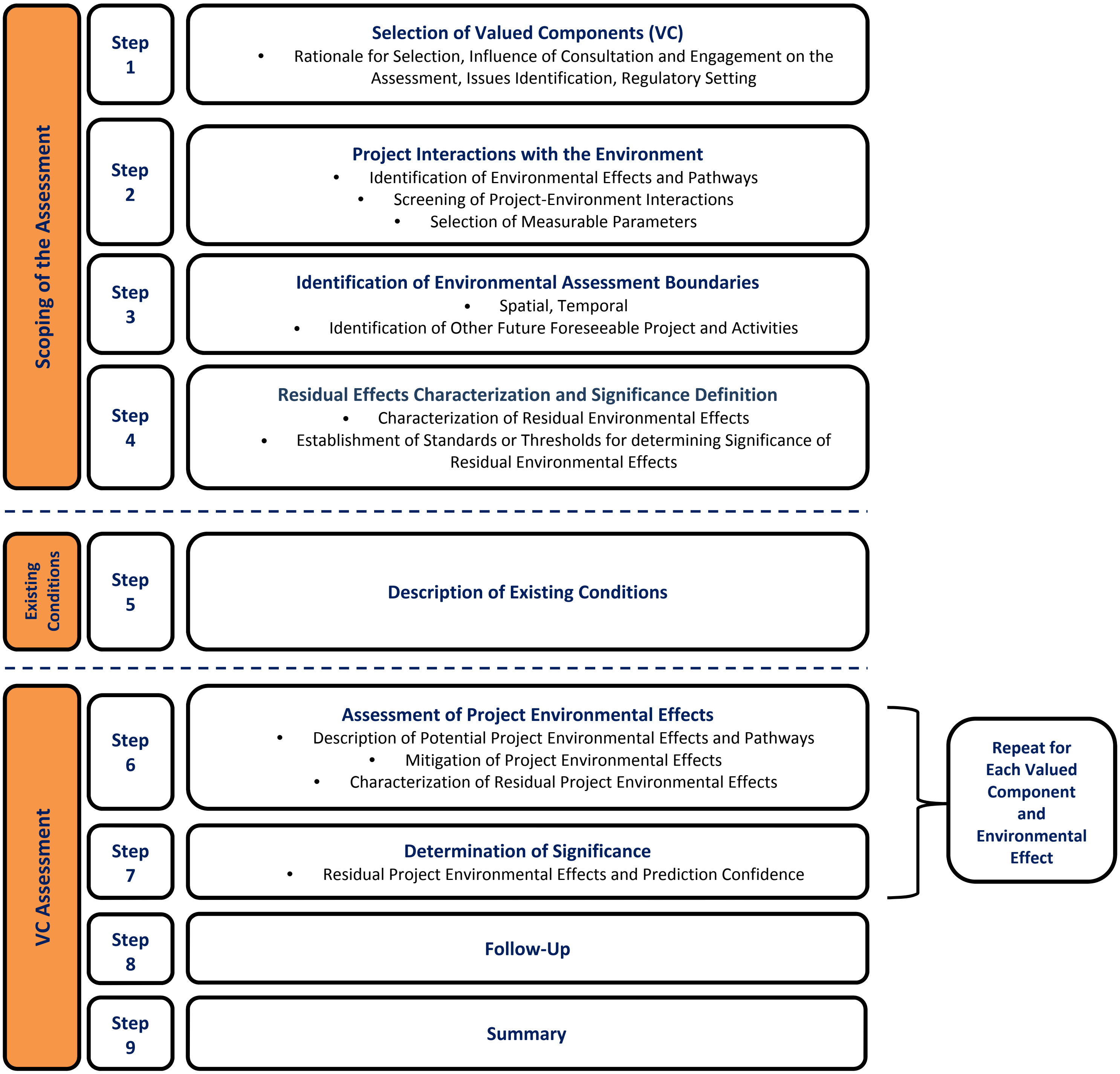


Figure 3.3 Environmental Impact Assessment Flow Chart

3.4 PUBLIC AND STAKEHOLDER ENGAGEMENT

3.4.1 Regulatory Consultation

Regulatory consultation has been conducted with several regulatory agencies throughout the course of the environmental assessment. Meetings were held with the PEI CLE to discuss the project and the scope of the EIS. Discussions were held with the Aboriginal Affairs Secretariat regarding the routing. Maritime Electric submitted a summary of the proposed project to Mi'kmaq Confederacy of Prince Edward Island to review the proposed routes.

Follow-up meetings will be held with PEI CLE and Mi'kmaq Confederacy of Prince Edward Island as part of the environmental assessment process and Maritime Electric will continue to engage and consult with all stakeholders as the Project progresses.

3.4.2 Public and Stakeholder Engagement

Stakeholders and the public will be invited to participate in the environmental assessment process of the Project in several ways. The Proponent is planning to hold a public open house to present information on the Project, answer questions, and collect comments and feedback. The open house will be held no less than 15 days after the EIS is registered with the PE ICLE. A report summarizing the open house, including all comments and questions received, will be prepared, and submitted to PEI CLE. The EIS will be posted on the website of the government of PEI (www.gov.pe.ca) along with other Project-related information. A copy of the EIS will also be available for public review at the Charlottetown office of PEI CLE, which is located on the fourth floor of the Jones building at 11 Kent Street.

3.5 INDIGENOUS ENGAGEMENT

The Project is planned within the traditional territory of the Mi'kmaq. As part of fulfilling the Crown's duty to consult, PEI CLE will conduct Indigenous consultation for the Project via the Mi'kmaq Confederacy of Prince Edward Island. The purpose of this consultation is to ensure that, with mitigation (as required) the Project could be carried out without impeding the rights of the province's Indigenous Community. Maritime Electric submitted a project description to Mi'kmaq Confederacy of Prince Edward Island to review the proposed routes. "Maritime Electric will continue to discuss the Proposed Project with the Mi'kmaq Confederacy of Prince Edward Island to understand any concerns or comments on the Project. If current land use or traditional resources are identified within the project area during Project consultation or arises from the provincial government's duty to consult, this EIA will be updated and reassessed accordingly.

4.0 ASSESSMENT OF ENVIRONMENTAL EFFECTS ON THE TERRESTRIAL ENVIRONMENT.

The Project has the potential to interact with the terrestrial environment along both the proposed preferred and alternate transmission line corridors. Construction, and operation activities have the potential to change the terrestrial environment through alteration and loss of terrestrial habitats (including wetlands), and increased risk of sensory disturbance or mortality to wildlife through construction, and operation and maintenance. If required, the decommissioning of line T-3 has the potential to change the terrestrial environment through changes in vegetation and sensory disturbance to wildlife.

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. The Terrestrial Environment has therefore been selected as a valued component (VC) based on potential interactions between the Project and vegetation and wildlife, including wetlands, and flora and fauna species at risk (SAR) and species of conservation concern (SOCC).

The assessment of the Terrestrial Environment considers the importance of terrestrial habitats as ecosystem components, the associated regulatory protections, and social importance. This section defines and describes the scope of the assessment of potential environmental effects on Terrestrial Environment, the regulatory and policy setting, and the boundaries of the assessment. The environmental effects and their pathways are identified along with the measurable parameters and the significance criteria for the evaluation of environmental effects on the Terrestrial Environment.

4.1 REGULATORY AND POLICY SETTING

4.1.1 Vegetation and Wildlife Species

With respect to wildlife and vegetation, this VC focuses on SAR and SOCC. Species listed as *extirpated*, *endangered*, *threatened*, or *special concern* under the federal *Species at Risk Act* (*SARA*) or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) are considered SAR.

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.

On lands under provincial authority, *SARA* goals are typically enacted through provincial legislation, policy, and guidelines. In PEI, SAR are protected under the provincial *Wildlife Conservation Act*. The provincial act lists “offenses” that are like *SARA*, and as there are currently no associated regulations, the act applies to those species listed by the federal act. The above definition of SAR also includes those species listed by COSEWIC that are candidates for further review and may become protected within the timeframe of this Project.

Species which are considered rare in Prince Edward Island, but which are not protected or listed by any legislation are considered SOCC. SOCC are here defined to include species which are not SAR, but are ranked *S1* (critically imperiled), *S2* (imperiled), or *S3* (vulnerable) in Prince Edward Island by the Atlantic Canada Conservation Data Centre (AC CDC) (AC CDC 2017a). These species have no protection under federal or provincial legislation, but are included in this VC as a precautionary measure. These species can offer important indications of biodiversity of the surrounding area and general ecosystem health, as SOCC can indicate the presence of sensitive and uncommon habitats. Protecting SOCC can confer protection on these sensitive and uncommon habitats and any co-existing species.

The PEI *Natural Protected Areas Act* restricts management activities that can take place in designated Natural Protected Areas, preserving the natural features for which the Natural Protected Areas were selected. There are no Natural Protected Areas within the PDA and LAA for the Terrestrial Environment. The PEI *Wildlife Conservation Act* designates wildlife management areas, which are maintained for the protection, management, and conservation of wildlife and wildlife habitat. This act and its associated regulations restrict the hunting, fishing, and trapping of wildlife within wildlife management areas as described in the *Wildlife Management Areas Regulations*.

In Canada, the *Migratory Birds Convention Act* (*MBCA*) protects and conserves migratory bird populations, individuals, and their nests. Only certain bird families are excluded from the protection of the *MBCA* (e.g., cormorants, pelicans, grouse, quail, pheasants, ptarmigan, hawks, owls, eagles, falcons, kingfishers, crows, and jays). 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. 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 (ECCC 2017a)) are available to facilitate compliance with the *MBCA*.

4.1.1.1 Wetlands

Consistent with federal and provincial policies on wetland conservation (Government of Canada 1991; PEIDFAE 2003), in this assessment, wetlands are defined as land submerged or saturated by water near the soil surface, for a length of time that the area maintains aquatic processes. Aquatic processes include supporting plants that are adapted to saturated soil conditions, maintaining wet or poorly drained soils, and other biotic conditions found in wet environments.

Although there are no associated federal acts or regulations, the Federal Policy on Wetland Conservation (Government of Canada 1991) provides a federal mandate for wetland conservation. Policy goals are intended to apply to federal lands and waters, 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 this project. The only Ramsar site in PEI is Malpeque Bay (The Ramsar Convention Secretariat 2014). No net loss of wetlands and wetland function is also promoted under the provincial policy, A Wetland Conservation Policy for Prince Edward Island (PEIDFAE 2003), which outlines a mitigation approach favouring avoidance, minimization, and then compensation.

Under the Prince Edward Island *EPA*, the *Watercourse and Wetland Protection Regulations* requires a Watercourse, Wetland and Buffer Zone Activity Permit before a person is permitted to perform several designated activities that could disturb a watercourse or wetland. In addition, many activities are also prohibited within a 15-m buffer zone of a watercourse or wetland without a Watercourse, Wetland, and Buffer Zone Activity Permit.

4.2 POTENTIAL ENVIRONMENTAL EFFECTS, PATHWAYS, AND MEASURABLE PARAMETERS

Activities and components associated with the Project could potentially interact with the terrestrial environment and result in adverse environmental effects on vegetation, wildlife, and wetlands. The assessment of Project-related environmental effects on the terrestrial environment is therefore focused on the following potential environmental effects:

- change in vegetation or wildlife
- change in wetland area or function

The effect pathways and measurable parameters for the assessment of this environmental effect are provided in Table 4.1.

Table 4.1 Potential Environmental Effects, Effect Pathways, and Measurable Parameters for the Terrestrial Environment

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in vegetation or wildlife	Vegetation clearing and ground disturbance along the transmission line, for pole placement, and for line maintenance may influence vegetation and wildlife SAR/SOCC, if they are present, and will change vegetation communities and habitat for wildlife (e.g., through fragmentation). Sensory disturbance related to noise and emissions from 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 (ha).
	Collisions with transmission lines are a cause of mortality for avian species.	• Mortality of wildlife.
Change in wetland area or function	Vegetation clearing within the RoW and excavation for pole placement, and vegetation maintenance during operation may change wetland area and function.	• Loss of wetland area (ha). • Change in wetland function.

4.3 BOUNDARIES

4.3.1 Spatial Boundaries

The spatial boundaries for the Terrestrial Environment VC have been divided into three assessment areas. The Project Development Area (PDA), the Local Assessment Area (LAA), and the Regional Assessment Area (RAA) are defined below.

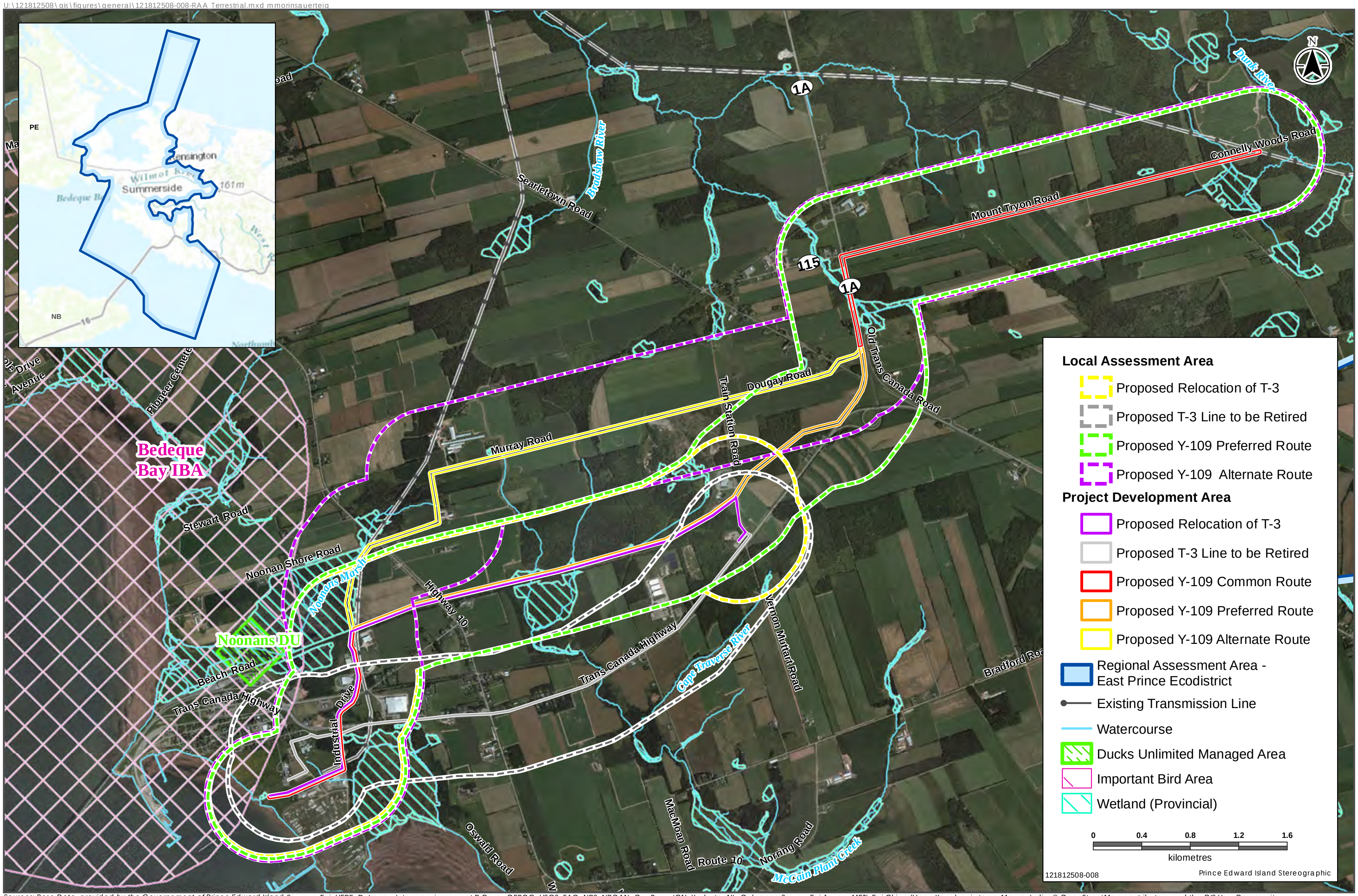
The PDA comprises the immediate area of physical disturbance associated with the construction, and operation and maintenance of the Project. The PDA includes a 30-m wide RoW which is wide enough to encompass both Y-109 and T-3, if required. The PDA includes the proposed preferred route which is 11.3 km long and the alternate route which is 11.5 km long; if the proposed preferred route is selected T-3 will be relocated into the Y-109 corridor for 5.3 km from Borden-Carleton to the Train Station Road. The proposed preferred PDA encompasses the majority of the T-3 line relocation except for a 400-m section along the Train Station Road. As the field work for the Y-109 RoW was completed prior to proposed relocation of T-3, this section was not visited during field surveys. Aerial interpretation and existing resources were utilized in this section.

The LAA encompasses the maximum area where Project-related environmental effects can be measured or predicted with a reasonable degree of accuracy. The LAA for the Terrestrial Environment is the Y-109 PDA plus an additional 500 m buffer. This distance is a conservative estimate of the maximum distance that construction noise could potentially influence wildlife. Edge effects are believed to extend into forested landscapes up to 300 m, though they are most pronounced closer to the edge (Batáry and Báldi 2004). For direct interactions with vegetation and wetlands, the distance for potential direct or indirect effects is much smaller and likely limited to the PDA. The LAA for the decommissioning of T-3 encompasses the maximum area where Project-related environmental effects can be measured or predicted with a reasonable degree of accuracy. As the potential environmental effects from sensory disturbance for decommissioning is similar to construction a 500-m buffer has been included as the decommissioning LAA for T-3.

The RAA accommodates a wider geographic area for ecological context. For the Terrestrial Environment, the RAA is defined as the East Prince Ecoregion.

The PDA, LAA, and RAA (Figure inset) for the terrestrial environment VC are illustrated in Figure 4.1.

U:\121812508\gis\figures\general\121812508-008-RAA_Terrestrial.mxd mmorinsauerteig



Sources: Base Data provided by the Governement of Prince Edward Island. Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Assessment Areas of the Terrestrial Environment for the Preferred and Alternate Route

Stantec

121812508 - MARITIME ELECTRIC COMPANY LIMITED

Figure 4.1

4.3.2 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects on the terrestrial environment include:

- construction – scheduled to begin for Y-109 in the summer of 2018 and be completed by then end of 2018 (if the preferred route is selected the relocation of T-3 will begin in fall or winter 2019)
- operation and maintenance – operation of Y-109 scheduled to begin in late 2018 and continue for the useful service life of the transmission line, (If the preferred route is selected operation of T-3 will begin in 2019)
- Decommissioning (T-3 only if preferred route is selected) - scheduled to begin after the completion of T-3 relocation component in 2019.

Decommissioning and abandonment for Y-109 will occur following the useful service life of the transmission line, and will be carried out in accordance with regulations in place at that time.

4.3.3 Residual Environmental Effects Description Criteria

Descriptors used to characterize residual environmental effects for the assessment of terrestrial environment are defined in Table 4.2.

Table 4.2 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 environmental effect.	**Positive**—a residual environmental effect that moves measurable parameters in a direction beneficial to the Terrestrial Environment relative to baseline. **Adverse**—an environmental effect that moves measurable parameters in a direction detrimental to the Terrestrial Environment relative to baseline.
Magnitude	The amount of change in the Terrestrial Environment relative to baseline existing conditions.	**Negligible**—no measurable change from baseline conditions in the Terrestrial Environment. **Low**—a measurable change from baseline conditions is anticipated, 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 interact with those of other projects in the RAA.
Frequency	Identifies when the residual environmental effect occurs and how often during the Project or in a specific phase.	**Single event**—occurs only once during the life of the project. **Multiple irregular events**—occurs more than once at no set schedule. **Multiple regular events**—occurs more than once at regular intervals. **Continuous**—occurs continuously.

Table 4.2 Characterization of Residual Environmental Effects on the Terrestrial Environment

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
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 environmental effect restricted to the construction or operation and maintenance phase of the Project. Includes effects to the Terrestrial Environment of less than 1 year. **Medium-term**—residual environmental effect restricted to the construction or operation and maintenance phase of the Project. Includes effects to the Terrestrial Environment of between 1 and 50 years. **Long-term**—residual environmental effect extends beyond the life of the project (i.e., beyond decommissioning and abandonment). **Permanent** – residual environment effect does not end.
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases.	**Reversible**—the environmental effect will cease during or after the Project is complete, the results of the effect will allow the Terrestrial Environment to recover to baseline. **Irreversible**—the environmental effect will persist after the life of the Project, even after mitigation measures are enacted. The Terrestrial Environment will not recover to baseline.
Ecological and Socioeconomic Context	Existing condition and trends in the area where environmental effects occur.	**Undisturbed**—the 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.

4.4 SIGNIFICANCE DEFINITION

4.4.1 Change in Vegetation or Wildlife

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

- alteration of the terrestrial habitat in such a way as to cause decline in the distribution or abundance of a viable population of SAR/SOCC
- direct mortality of individuals or communities of SAR/SOCC such that long-term survival within the RAA is substantially reduced as a result
- a non-permitted contravention of any of the prohibitions stated in Sections 32-36 of *SARA*
- any non-compliance with the management plans (developed as a result of Section 65 of *SARA*) currently in place for any SAR
- direct mortality of individuals such that long-term survival of wildlife populations within the RAA is substantially reduced as a result
- a reduction in wildlife dispersal or migration such that long-term survival of wildlife populations within the RAA is substantially reduced as a result
- an effect on 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

4.4.2 Change in Wetland Area or Function

For wetland area and function, a significant adverse residual environmental effect on the Terrestrial Environment is one that results in one or more of the following:

- an unauthorized permanent net loss of wetland area
- the loss of wetland function (i.e., one that would result in a significant effect on species that rely upon wetlands) provided by wetlands that cannot be avoided or mitigated, which is observed at a RAA level

4.5 EXISTING CONDITIONS FOR THE TERRESTRIAL ENVIRONMENT

4.5.1 Existing Information Sources

The following sources of records for vegetation, wildlife, and sensitive areas occurring within the LAA and surrounding area were investigated:

- AC CDC
- North American Breeding Bird Survey (BBS)
- Maritimes Breeding Bird Atlas (MBBA)
- Atlantic Canada Nocturnal Owl Surveys (ACNOS)

4.5.1.1 Atlantic Canada Conservation Data Centre

The AC CDC 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.” (AC CDC 2016). AC CDC data, including SAR, SOCC, and managed areas, were obtained for the area within 5 km of the Project (AC CDC 2017b).

4.5.1.2 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 (ECCC 2017b) was conducted to obtain records of bird species observed near the PDA. The nearest route, #75009 – Bedeque, crosses over the proposed transmission line. This route runs from Tryon to Bedeque and has been surveyed 43 times since 1967. Data were obtained from this breeding bird route.

4.5.1.3 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 each 10 km by 10 km area (known as an “atlas square”). Data is obtained from Bird Studies Canada from the NatureCounts website (BSC 2016). The proposed transmission lines fall into two atlas squares, which are coded as 20MS42 and 20MS52. Data were obtained for both atlas squares.

4.5.1.4 Atlantic Canada Nocturnal Owl Surveys

ACONS were 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 ACONS database from Bird Studies Canada, accessed via the NatureCounts website (BSC 2016), provides basic information about the presence of owl species detected from specific points on survey routes (called "survey stops") in each year. This database was searched; however, there were no records of owl surveys being conducted within 5 km of the Project.

4.5.2 Field Methods

Field surveys were conducted within the LAA of both the proposed preferred route and the alternate route to support the assessment of potential effects of the Project on the Terrestrial Environment.

4.5.2.1 Vegetation and Wetlands

Vegetation and wetland surveys were conducted simultaneously over four days from July 10 to 13, 2017. Surveys were conducted within a study corridor which ranged in width from 20 to 50 m. The narrower corridor was established along existing roads where poles would be positioned within the existing road right-of-way. The wider corridor was established along portions of the route where no roads were present. A vascular plant species list was compiled for the entire Project (i.e., both the preferred and alternate routes). Vascular plant data were recorded using a Trimble Geo-7X data logger that was capable of sub-metre GPS accuracy. All vascular plant species encountered along the route were identified and recorded along with the location where they were recorded. Common vascular plant species were recorded only once when they were first encountered. Vascular plant SAR or SOCC observed during the field surveys were recorded each time they were encountered to provide information regarding their abundance and distribution within the PDA. In instances where several plants were observed within a radius of 5 m, a single point was used to mark the location of the plants and an abundance measure was provided. The abundance measure used varied by species. In most instances, the number of shoots was counted. For species growing in dense patches, the number of patches was recorded and where possible, the size of the patches was recorded. The habitat of SOCC and SAR species was also documented.

Wetlands within the PDA were delineated using principles outlined in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987), and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0) (U.S. Army Corps of Engineers 2012). Wetlands were classified using the Canadian Wetland Classification System (CWCS; NWGG 1997) into wetland classes (i.e., bog, fen, swamp, marsh, and shallow water), and wetland types which distinguish wetland communities based on dominant vegetation. Wetlands which demonstrated exceptional examples of important wetland functions which could be adversely affected by a change in vegetation cover (*e.g.,* those which support SAR, numerous SOCC, or sensitive ecological communities), were noted, if present. Additional wetland area within the LAA but outside of the PDA was interpreted using available aerial imagery. Wetland delineation data sheets documenting hydrology, soil, and vegetation conditions were completed for representative wetland classes present in the PDA.

The proposed preferred PDA encompasses the majority of the T-3 line rebuild with the exception of a 400-m section along the Train Station Road. As the field work for the Y-109 RoW was completed prior to proposed relocation of T-3, this section was not visited during field surveys. Aerial interpretation and existing literature and resources were utilized in the assessment of this section.

4.5.2.2 Wildlife

On June 6 and 7, 2017, breeding bird surveys were conducted to provide an overview of bird species present in the LAA. Survey stations were chosen to represent the diversity of habitats within the PDA. A minimum distance of 250 m was established between each survey station to lower the incidence of double-counting individual birds. Where possible, points were placed 50 m from roads to reduce the influence of traffic noise and to access different habitat types.

Survey stations were visited once during the field program, where observers conducted a 10-minute point count survey. Point counts were based on a modified fixed-radius point count sampling procedure (Bibby *et al.* 2000). Point count surveys were conducted in suitable environmental conditions (light winds, no precipitation), and began near dawn, and continued until approximately 10:00 am each survey day. Data collected included date, time, and environmental conditions (precipitation, cloud cover, wind condition).

Common nighthawk surveys were completed July 12, 2017. Surveys were conducted at locations with suitable breeding habitat for this species. Common nighthawk habitat is diverse, but generally includes open areas such as clear-cuts, barrens, agricultural lands, and other open disturbed areas. Nighthawk surveys followed the CWS nighthawk protocol (2016), and began approximately 30 minutes before sunset continued until up to two hours after sunset. As weather conditions can greatly influence the level of nighthawk activity, and may also affect the ability of observers to detect them, surveys were delayed or suspended if sustained wind was above Beaufort 3 (>20 km/h) or if there was any precipitation. Eight common nighthawk surveys were completed.

Incidental observations of other (i.e., non-bird) wildlife species or signs of their presence were noted during all field surveys, including vegetation and wetland surveys.

The proposed preferred PDA encompasses the majority of the T-3 line relocation except for a 400-m section along the Train Station Road. As the field work for the Y-109 RoW was completed prior to proposed relocation of T-3, this section was not visited during field surveys. Breeding bird surveys were conducted in the vicinity of the Train Station Road and two breeding bird survey locations were positioned within 500 m of the Train Station Road. Additionally, survey stations representative of the land use around the Train Station Road were conducted in other sections of the proposed Y-109 RoWs.

4.5.3 Vegetation Communities, Wildlife Habitat, and Wetlands

4.5.3.1 Vascular Plants

During field surveys, 301 species of vascular plant were identified in the PDA for the route options (i.e., both the proposed preferred and alternate routes) (Table B.1, Appendix B). Of these, 115 (38%) of these species are not native to Prince Edward Island. The proportion of non-native species is high in the PDA compared to other areas in the region; however, this is to be expected since most of the PDA is located in highly disturbed areas including roadside ditches, agricultural land, regenerating rights of way, and developed commercial properties.

Six vascular plant SOCC were observed within the proposed preferred route PDA, including staghorn sumac (*Rhus typhina*), fox sedge (*Carex vulpinoidea*), Bebb's sedge (*Carex bebbii*), Vermont blackberry (*Rubus vermontanus*), Canada hawkweed (*Hieracium canadense*), and pinesap (*Monotropa hypopithys*). Additional vascular plant SOCC were observed within or near the alternate route PDA, these included including staghorn sumac, fox sedge, Bebb's sedge, Vermont blackberry and Canada hawkweed which were found along the preferred route PDA, and one species not observed along the preferred route PDA Macoun's cudweed (*Pseudognaphalium macounii*). The figures in Appendix A presents the distribution of these species in the PDA.

Staghorn sumac is listed as *S1S2* by the AC CDC indicating that there is some uncertainty regarding the population status of this species in Prince Edward Island which ranges between critically imperiled and imperiled. It is listed as *may be at risk* by the Canadian Endangered Species Conservation Council (CESCC). This species is generally found at the edges of forests in dry or rocky soils as well as along roadsides or in open areas on hillsides (Roland and Zinck (1998). A small patch of staghorn sumac approximately 10 m by 10 m in size was found on an existing power line RoW in an area where fill had been dumped. This site was located near the western end of the route which is a section included in both the preferred and alternate PDA. Staghorn sumac is often grown as an ornamental and it is possible that the plants found at this location were discarded ornamentals.

Fox sedge is typically found on wet shores and in ditches, clearings, and meadows on seasonally saturated soils (Hinds 2000). This species was found at five locations in the preferred route PDA. All sites were in roadside ditches along Mount Tryon Road and Connelly Woods Road at the eastern which is a section included in both the preferred and alternate PDA. The AC CDC general status rank for fox sedge ranges between vulnerable and imperiled (*S2S3*) while the CESCC rank the Prince Edward Island population as *sensitive*.

Bebb's sedge is listed as vulnerable (*S3*) by the AC CDC and *sensitive* in Prince Edward Island by the CESCC. This species is found on damp open areas typically on alkaline soils. This species was found within the proposed preferred and alternate PDAs in damp disturbed areas under an electrical transmission line and at the edge of a wetland. It was recorded at locations in both the proposed preferred and alternate PDA. Bebb's sedge was found at three locations near the eastern end of the proposed preferred PDA. A fourth record was a small patch of Bebb's sedge found on the northern side of the PEITIE RoW at the edge of Wetland 7. All the observations along the alternate route were in roadside ditches along Mount Tryon Road and Connelly Woods Road at the eastern end of the alternate PDA.

Vermont blackberry is listed as S1S2 by the AC CDC indicating that its provincial population status is somewhat uncertain, ranging from imperiled (*S2*) to critically imperiled (*S1*). The CESCC general status rank for this species in Prince Edward Island is *undetermined* indicating that no population status rank has been assigned to it yet. The uncertainty surrounding the population status of this species is probably attributable to the fact that this species is difficult to identify. Species within the genus *Rubus* are often similar in appearance and frequently hybridize making identification challenging. Vermont blackberry is typically found in thickets and clearings (Hinds 2000). It was found within the proposed preferred PDA in overgrown ditches and in open areas at the edges of thickets. This species was encountered at 16 locations common to both the proposed preferred and alternate PDA. Nine of these records representing 96% of the 350 Vermont blackberry shoots encountered during the survey were present at the western end of the route along Industrial Drive. The highest densities of Vermont blackberry were recorded around the margin of the turn around at the northern end of Industrial Drive. Two hundred and seventy shoots were found at this location. Six patches of Vermont blackberry totaling 13 shoots were found at the eastern end of the route near the junction of the Mount Tryon Road and the Connelly Woods Road in roadside ditches.

Canada hawkweed is listed as vulnerable (*S3*) on Prince Edward Island by the AC CDC and is listed as status *undetermined* by the CESCC. The *undetermined* status is likely attributable to the fact that this species is difficult to identify, and the taxonomy is in a state of flux. This species is typically found on disturbed ground, in thickets and in clearings (Hinds 2000). Canada hawkweed was recorded at 24 locations within the proposed preferred PDA and the alternate PDA with an estimate of 630 shoots. Canada hawkweed occurred in three clusters near the center of the proposed preferred PDA along approximately 700 m of the PEITIE RoW to the west of Train Station Road. Nine patches were recorded in this area with a total of 260 shoots recorded. This represents 42% of the Canada hawkweed shoots recorded along both PDA's. In the proposed preferred PDA, Canada Hawkweed was found in shrubby areas on the PEITIE RoW as well as in adjacent forest. To the east of the Train Station Road, the proposed preferred PDA runs through a forested area. Three Canada hawkweed records each consisting of one plant were found scattered through this area. These plants were found along old woods roads and in small clearings in the forest. Canada hawkweed was found near the center of the alternate PDA along approximately 300 m of Murray Road. In this area, Canada hawkweed was found growing in a hedgerow between the road and an agricultural field as well as in the roadside ditches. Twelve patches were recorded in this area with a total of 370 shoots recorded. This represents 58% of the Canada hawkweed shoots recorded along both PDAs

Pinesap is listed as vulnerable (*S3*) on Prince Edward Island by the AC CDC; however, the population is listed as *secure* on Prince Edward Island by the CESCC. Pinesap is parasitic on soil fungi and is non-photosynthetic. It is typically found in coniferous forest (Hinds 2000); however, in the PDA it was found in hardwood forest. Pinesap was found at three locations along the proposed preferred PDA to the east of Train Station Road. A total of five shoots were present.

Macoun's cudweed is considered imperiled (*S2*) by AC CDC and the CESCC lists it as *may be at risk*. This species is found in clearings and disturbed areas (Hinds 2000). A small patch of Macoun's cudweed was found within a section common to both the proposed preferred and alternate PDA along an overgrown access road to the existing transmission line near Wetland 12 (Noonan's Marsh).

4.5.3.2 Wetlands along the Proposed Preferred Route

The proposed preferred route for the Y-109 Project lies within the RoW of existing roadways, along an undeveloped PEITIE RoW and through forest and agricultural lands. The proposed preferred route is described in Section 2 and illustrated in Figure 2.1

The most abundant land types in the PDA of the proposed preferred route in descending order are anthropogenic (52.1%), hardwood forest (21.8%), mixed wood forest (12.9%), and agricultural land (7.8%). Together these land types constitute 95% of the PDA. A comparison of the relative abundances of these land types in the PDA with that in the LAA reveals that the anthropogenic and forest land types are represented proportionally more in the PDA than in the LAA, while the relative abundance of agricultural land is proportionally lower in the PDA than in the LAA (Table 4.3). This pattern is attributable to the fact that the proposed preferred route mostly follows existing roads or previously cleared PEITIE RoW with a portion of the route passing through or adjacent to hardwood and mixed wood forest.

Table 4.3 Land Classification within the PDA and LAA for the Y-109 Proposed Preferred Route

Land classification	PDA		LAA	
	Hectares	%	Hectares	%
Agricultural	2.3	7.8	575.2	51.5
Forest	11.1	35.1	220.7	19.8
Clearcut	0.1	0.4	1.1	0.1
Shrub	0.01	0.01	7.6	0.7
Hardwood	6.3	21.8	170.2	15.2
Mixed wood	4.7	12.9	16.1	1.4
Softwood	0.01	0.01	25.7	2.3
Wetland	1.4	4.9	127.7	11.4
Shallow Water Wetland	-	-	10.7	1.0
Freshwater Marsh	0.1	0.2	21.7	1.9
Brackish Marsh	-	-	7.0	0.6
Coastal Marsh	-	-	19.5	1.7
Bog	-	-	1.5	0.1
Shrub Swamp	0.4	1.4	24.9	2.2
Hardwood Treed Swamp	0.9	3.2	39.2	3.5
Mixed wood Treed Swamp	0.03	0.1	2.0	0.2
Softwood Treed Swamp	-	-	1.2	0.1
Anthropogenic	15.1	52.1	193.3	17.3
Total	**29.0**	**100.0**	**1,116.9**	**100.0**
Data from the PEI Corporate Land Use Inventory 2000, PEI Department of Environment, Energy & Forestry				

A total of 11 wetlands were encountered within the preferred route PDA, six of which are also within the alternate route PDA (Appendix A Sheets 1 to 8)). A variety of wetland types were present in these wetlands including hardwood treed swamp, mixed wood treed swamp, shrub swamp, freshwater marsh, and shallow water wetland.

Hardwood treed swamp was present in three of the wetlands (Wetlands 1, 7, and 13). The vegetation in these wetlands typically consists of an open tree canopy composed largely of red maple (*Acer rubrum*) and paper birch (*Betula papyrifera*). There is a moderately dense shrub understory composed of a mixture of speckled alder (*Alnus incana*), mountain maple (*Acer spicatum*) and stunted red maple as well as common winterberry (*Ilex verticillata*), Virginia rose (*Rosa virginiana*), and pussy willow (*Salix discolor*). The ground vegetation layer is generally dominated by spotted jewelweed (*Impatiens capensis*) and sensitive fern (*Onoclea sensibilis*) along with cinnamon fern (*Osmunda cinnamomea*), dwarf red raspberry (*Rubus pubescens*), water avens (*Geum rivale*), and blue-joint reed grass (*Calamagrostis canadensis*).

Mixed wood treed swamp is found in Wetland 15 (Appendix A – Sheet 1). The relatively sparse tree canopy of this wetland is composed of tamarack (*Larix laricina*), paper birch and red maple. The shrub understory is relatively sparse and is composed largely of common winterberry and pussy willow. The ground vegetation layer is well-developed and consists of a mixture of spotted jewelweed, spotted water-hemlock (*Cicuta maculata*), purple-stemmed aster (*Symphyotrichum puniceum*), and sensitive fern.

Shrub swamp occurs in Wetlands 2, 4, and 6 (Appendix A – Sheets 2 and 3). These wetlands are characterized by a dense cover of tall shrubs including speckled alder, green alder (*Alnus viridis*), Bebb's willow (*Salix bebbiana*), pussy willow, cottony willow (*Salix eriocephala*), and stunted red maple. Tree cover is very sparse and consists of scattered white spruce, large Bebb's willow, and pussy willow. Sensitive fern, hairy flat-top white aster (*Doellingeria umbellata*), spotted jewelweed, dwarf red raspberry, and fowl manna-grass (*Glyceria striata*) are the most abundant species of the ground vegetation understory.

Freshwater marshes were scattered throughout the PDA (Wetlands 2, 3, 5, 11, 12, 14, and 16), mostly in areas where basins had been created by human activities or where such activities have altered wetland hydrology. Species composition in these freshwater marshes is variable although most freshwater marshes supported broad-leaved cat-tail (*Typha latifolia*), sensitive fern, and reed canary grass (*Phalaris arundinacea*). Other commonly encountered ground vegetation species include narrow-leaved cat-tail (*Typha angustifolia*), blue-joint reed grass, creeping bentgrass (*Agrostis stolonifera*), spotted jewelweed, quack grass (*Elymus repens*), black-girdled bulrush (*Scirpus atrocinctus*), and New York aster (*Symphyotrichum novi-belgii*). Patchy shrub cover consisting of speckled alder, green alder, and sweet gale (*Myrica gale*) is generally present in these wetlands. Tree cover is very sparse, consisting of a few tamarack and white spruce.

Shallow water wetland occurs as small inclusions in Wetlands 2 and 7 (Appendix A – Sheets 2 and 3). Vegetation cover is composed mainly of submerged aquatic plants such as marsh water starwort (*Callitriche palustris*) and floating leaved aquatic plants such as turion duckweed (*Lemna turionifera*).

4.5.3.2.1 Wetland Functions

Wetlands found along the proposed preferred route can be expected to provide a variety of wetland functions and services. The landscape in which the PDA is situated has been heavily modified by human activity including agriculture, residential development, industrial development, and construction of transportation infrastructure. Most arable land has been used for agricultural production. Much of the land that has not been developed is occupied by wetland. These wetlands are often surrounded by agricultural land and serve as the headwaters for watercourses. As such, they can be expected to play an important role in maintenance of water quality in these water courses and help to regulate stream flow. Because much of the residual undeveloped land is occupied by wetlands, these wetlands provide much of the available habitat for local wildlife. Wetland functions and services provided by the wetlands present along the proposed preferred transmission line route are discussed in the following text.

Wetland 1 is a wetland complex composed of a mixture of hardwood treed swamp and tall shrub swamp. It is located near the headwaters of the Dunk River (Appendix A – Sheet 1). Agricultural land surrounds this wetland, so it is likely that it would aid in the retention of sediment and nutrients derived from the surrounding fields. It could also be expected to augment stream flow and contribute to the cooling of the streams that pass through the wetland. Wetland 1 can be expected to provide habitat for song birds, terrestrial mammals, and fish.

Wetland 2 is a wetland complex composed of shrub swamp, freshwater marsh, and shallow water wetland and a tributary to the Bradshaw River (Appendix A – Sheet 2). The wetland is bisected by the Trans-Canada Highway and the two halves are connected by a culvert. Agricultural land surrounds wetland 2, so it is likely that it plays a role in removing sediment and nutrients from drainage from these disturbed areas. During periods of high flow, the dense vegetation in the wetland can be expected to slow the flow of water through the wetland. Wetland 2 provides habitat for song birds, water birds, terrestrial mammals, semi-aquatic mammals, amphibians, and fish.

Wetland 3 is a small anthropogenic freshwater marsh that has developed in a low spot on the PEITIE RoW (Appendix A – Sheet 3). One side of the wetland is frequently disturbed by ATV traffic on the RoW. There is no apparent outflow for the wetland so there is some potential that it may contribute to groundwater recharge. The small catchment area for the wetland appears to receive heavy ATV traffic which results in the generation of sediment laden water which drains into the wetland allowing the sediment to settle out and remain on site. Most of the wetland is covered by standing water during the spring and early summer which would provide ideal breeding habitat for ephemeral pool breeding amphibians such as spring peeper (*Pseudacris crucifer*), wood frog (*Lithobates sylvestris*), and yellow-spotted salamander (*Ambystoma maculata*).

Wetland 4 is a narrow linear anthropogenic shrub swamp that has developed along a small road that runs along the flank of the PEITIE RoW (Appendix A – Sheet 3). This wetland has limited wetland functions. It provides habitat for song birds and the wetland vegetation likely prevents erosion along the sloping road.

Wetland 5 is a small anthropogenic freshwater marsh that has developed in a depression on the PEITIE RoW (Appendix A – Sheet 3). ATVs and the heavy traffic extensively use the wetland has resulted in the loss of much of the vegetation that would normally occupy a wetland of this type. The wetland is perched above the surrounding landscape and there is no apparent outflow which may indicate that the wetland contributes to groundwater recharge. The wetland would also serve as a settling pond allowing the retention of sediments mobilized by ATV activity and precipitation. Wetland 5 would also provide good breeding habitat for pond breeding amphibians although frequent ATV traffic through the wetland may result in high rates of mortality for amphibian eggs, larvae, and adults.

Wetland 6 is a tall shrub swamp that has developed at the confluence of two streams (Appendix A – Sheet 3). It appears that the wetland was partially infilled when the PEITIE RoW was constructed. A large culvert conveys the merged streams to the south side of the PEITIE RoW. This wetland is expected to perform several wetland functions. The dense shrub cover of the wetland along the stream banks would help to cool stream water as would groundwater discharge along the length of the wetland. The groundwater discharge would also augment stream flow. At the western end of the wetland, at the point where the two streams merge, the stream water leaves the channel and flows through the shrub thicket. This configuration would provide a rough flow path which would help to slow down stream flow and alleviate flooding during periods of high flow. The wetland provides habitat for song birds, amphibians, and fish.

Wetland 7 is a wetland complex composed of hardwood treed swamp, mixed wood treed swamp, freshwater marsh, and shallow water wetland. This wetland has been bisected by construction of the PEITIE RoW (Appendix A – Sheet 3). The two halves of the wetland are linked hydraulically via a large culvert. The construction of the PEITIE RoW has altered the hydrology of the wetland. The northern upstream portion of the wetland retains water resulting in patchy tree mortality and the development of interlinked pools. On the southern downstream half of the wetland, tree cover is dense and there is little surface water. The wetland is bordered by agricultural lands at several locations, so it is likely that it helps to settle sediment and retain nutrients lost from these disturbed areas. The Cape Traverse River flows through the wetland. The heavy tree canopy in the southern half of the wetland would help to cool the water in the stream. Groundwater discharge into the wetland would help to augment stream flow. During high flow periods stream water would overflow into the wetland basin and flow through the heavy cover of trees and shrubs which would slow the flow of water and help to alleviate flooding. The wetland provides habitat for song birds, water birds, terrestrial mammals, semi-aquatic mammals, amphibians, and fish. It also provides habitat for Bebb's sedge (*Carex bebbii*), a vascular plant SOCC which was found at one location along the southern margin of the northern half of the wetland.

Wetland 13 is a wetland complex composed of shallow water wetland, tall shrub swamp, and hardwood treed swamp. The eastern tip of the wetland through which the PDA passes is composed entirely of hardwood treed swamp (Appendix A – Sheet 4). Prior to construction of the PEITIE RoW, this wetland was part of Wetland 12 (Noonan's Marsh). Wetland 13 can be expected to settle sediment from adjacent disturbed areas and would provide habitat for song birds, water birds, terrestrial mammals, semi-aquatic mammals, amphibians, and fish. Ducks Unlimited Canada have modified this wetland to enhance it as waterfowl habitat. The portion of Wetland 13 that is crossed by the PDA would provide a subset of these functions including settling of sediment and provision of habitat for song birds and terrestrial mammals.

Wetland 14 is part of a large wetland complex (Amherst Cove Marsh; Appendix A – Sheet 4) that includes freshwater marsh, brackish marsh, salt marsh, tall shrub swamp, and softwood treed swamp. The portion of the wetland traversed by the PDA is freshwater marsh. The large wetland complex that Wetland 14 can be expected to perform a wide variety of wetland functions including settling sediment and capturing nutrients from adjacent agricultural lands, export of organic matter from the salt marsh to adjacent nearshore marine waters, protection of coastal shorelines as well as the provision of habitat for song birds, water birds, terrestrial mammals, and fish. The portion of the wetland complex through which the PDA passes would provide fewer wetland functional benefits including the settling of sediment from adjacent disturbed areas and the provision of habitat for song birds and terrestrial mammals.

Wetland 15 is a small mixed wood treed swamp. It appears to have once been connected to Wetland 14 and the Amherst Cove salt marsh; however, construction of Industrial Drive has severed this connection and there is no evidence of a culvert maintaining hydraulic connectivity between the two wetlands (Appendix A – Sheet 4). The construction activity has altered the hydrology of Wetland 15 resulting in heavy tree mortality and changes in plant species composition. Wetland functions for this wetland are limited. The wetland likely receives sediment-laden water from adjacent disturbed areas and detains this water allowing the sediment to settle out of the water. Wetland 15 also provides some habitat for song birds.

Wetland 16 is a freshwater marsh that is at least partially of anthropogenic origin. It is located at the boundary between a sports field and a commercial property (Appendix A – Sheet 4). A large berm on the southern side of the wetland prevents surface water from the commercial property from entering the wetland. Drainage from the sports field and adjacent disturbed areas drains into the wetland and it is likely that Wetland 16 settles out sediment from the disturbed areas. The wetland may also capture excess nutrients lost from the sports field if it is regularly fertilized. The vegetation of Wetland 16 consists of a dense graminoid sward with very little open water. It provides limited habitat for song birds and small mammals but has little value as habitat for amphibians, water birds, fish, or semi-aquatic mammals.

4.5.3.3 Wetlands along the Proposed Alternate Route

The alternate route for the Project lies largely within the RoW of existing roadways although it does pass through some wetland and abandoned agricultural and industrial land. Approximately 6 km of the alternate route follows the same path as the proposed preferred route (Figure 4.1). The existing environment is described for the complete alternate route including the sections which overlap with the proposed preferred route.

The most abundant land types in the PDA of the alternate route in descending order are anthropogenic (84.6%), agricultural land (4.9%), hardwood forest (3.9%), and shrub swamp (3.3%). Together these land types constitute 97% of the PDA. A comparison of the relative abundances of these land types in the PDA with that in the LAA reveals that the anthropogenic land type is represented proportionally more in the PDA than in the LAA, while the relative abundance of other land types apart from shrub swamp are proportionally lower in the PDA than in the LAA (Table 4.4). This pattern is attributable to the fact that the PDA is located in the PEITTIE RoW and the alternate route LAA includes forested sections set back from the agricultural fields nearest the road.

Table 4.4 Land Classification within the PDA and LAA for the Alternate Route

Land classification	PDA		LAA	
	Hectares	%	Hectares	%
Agricultural	1.3	4.9	674.6	56.5
Forest	1.3	5.2	207.8	17.4
Clear cut	0	0	1.7	0.1
Shrub	0.02	0.1	10.1	0.8
Hardwood	1.0	3.9	121.2	10.1
Mixed wood	0.3	1.2	50.5	4.2
Softwood	0.01	0.04	24.3	2.0
Wetland	1.4	5.3	141.5	11.8
Shallow Water Wetland	0	0	9.6	0.8
Freshwater Marsh	0.07	0.3	28.8	2.4
Brackish Marsh	0	0	7.0	0.6
Coastal Marsh	0	0	19.5	1.6
Bog	0	0	1.5	0.1
Shrub Swamp	0.9	3.3	36.4	3.0
Hardwood Treed Swamp	0.4	1.6	35.3	3.0
Mixed wood Treed Swamp	0.03	0.1	2.0	0.2
Softwood Treed Swamp	0	0	1.4	0.1
Anthropogenic	22.1	84.6	170.1	14.25
Total	**26.1**	**100.0**	**1194.2**	**100.0**
Data from the PEI Corporate Land Use Inventory 2000, PEI Department of Environment, Energy & Forestry				

A total of 11 wetlands were encountered within the Alternate Option PDA, six of which are also common to the proposed preferred route. A variety of wetland types were present in these wetlands including hardwood treed swamp, mixed wood treed swamp, shrub swamp, freshwater marsh, and shallow water wetland. The five wetlands distinct to the alternate route (8,9,10,11, and 12) are summarized by wetland type.

Hardwood treed swamp was present in three of the wetlands along the alternate route (Wetlands 9, 10, and 12 – Appendix A – Sheets 5,7, and 8). The vegetation in these wetlands typically consists of an open tree canopy composed largely of red maple (*Acer rubrum*) and paper birch (*Betula papyrifera*). There is a moderately dense shrub understory composed of a mixture of speckled alder (*Alnus incana*), mountain maple (*Acer spicatum*) and stunted red maple as well as common winterberry (*Ilex verticillata*), Virginia rose (Rosa virginiana), and pussy willow (*Salix discolor*). The ground vegetation layer is generally dominated by spotted jewelweed (*Impatiens capensis*) and sensitive fern along with cinnamon fern (*Osmunda cinnamomea*), dwarf red raspberry (*Rubus pubescens*), water avens (*Geum rivale*), and blue-joint reed grass (*Calamagrostis canadensis*). In Wetlands 9 and 10, the tree overstory is composed of a non-native willow (*Salix X rubens*) rather than red maple and paper birch.

Shrub swamp is present in two wetlands along the alternate route (8 and 12 - Appendix A Sheets 6 and 7). Wetland 12 is a tall shrub swamp. These wetlands are characterized by a dense cover of tall shrubs including speckled alder, green alder

(*Alnus viridis*), Bebb's willow (*Salix bebbiana*), pussy willow, cottony willow (*Salix eriocephala*), and stunted red maple. Tree cover is very sparse and consists of scattered white spruce, large Bebb's willow and pussy willow. Sensitive fern, hairy flat-top white aster (*Doellingeria umbellata*), spotted jewelweed, dwarf red raspberry, and fowl manna-grass (*Glyceria striata*) are the most abundant species of the ground vegetation understory. Wetland 8 is a low shrub swamp. This wetland is characterized by a heavy but patchy cover of red osier dogwood (*Cornus sericea*). Gaps in the red osier dogwood canopy are filled by tall grasses such as reed canary grass (*Phalaris arundinacea*) and smooth brome (*Bromus inermis*) as well as New York aster (*Symphyotrichum novi-belgii*).

Freshwater marshes are present along the alternate route in Wetlands 11 and 12, (Appendix A Sheet 6). They are typically found in areas where basins had been created by human activities or where such activities have altered wetland hydrology. Species composition in these freshwater wetlands is variable although most freshwater marshes supported broad-leaved cat-tail (*Typha latifolia*), sensitive fern and reed canary grass. Other commonly encountered ground vegetation species include narrow-leaved cat-tail (*Typha angustifolia*), blue-joint reed grass, creeping bentgrass (*Agrostis stolonifera*), spotted jewelweed, quack grass (*Elymus repens*), black-girdled bulrush (*Scirpus atrocinctus*), and New York aster. Patchy shrub cover consisting of speckled alder, green alder and sweet gale (*Myrica gale*) is generally present in these wetlands. Tree cover is very sparse, consisting of a few tamarack and white spruce.

4.5.3.3.1 Wetland Functions

A total of 11 wetlands were encountered within the Alternate Option PDA, six of which are also within the proposed preferred route. The function of the five wetlands distinct to the alternate route are described below.

Wetland 8 is a linear low shrub swamp that is the headwater for a tributary of the Cape Traverse River which eventually flows through Wetland 6 and Wetland 7 (Appendix A – Sheet 7). Part of the wetland is located adjacent to agricultural lands, so it is likely that this wetland retains sediment and nutrients in surface run-off. Wetland 8 also provides habitat for song birds.

Wetland 9 is a hardwood treed swamp that is the headwaters for the Cape Traverse River that flows through Wetland 7 (Appendix A – Sheet 7). The center of the wetland is occupied by a large pond which may be manmade. This wetland is located adjacent to a hog operation and agricultural fields and can be expected to aid in the retention of sediment and nutrients from these disturbed areas. Wetland 9 provides habitat for song birds, water birds, terrestrial mammals, semi-aquatic mammals, and amphibians and may also provide habitat for fish.

Wetland 10 is a wetland complex composed of hardwood treed swamp, freshwater marsh and shrub swamp that is the headwaters for the stream that flows through Wetland 12 (Appendix A – Sheet 7). This wetland is located adjacent to a farm yard and agricultural fields and can be expected to aid in the retention of sediment and nutrients from these disturbed areas. Wetland 10 provides habitat for song birds, terrestrial mammals and amphibians and may also provide habitat for fish.

Wetland 11 is a small anthropogenic freshwater marsh located near the Noonan's Shore Road (Appendix A – Sheet 7). It may play a small role in settling sediment and retaining nutrients from adjacent disturbed upland areas and it may augment the flow in a nearby stream during low flow periods.

Wetland 12 (Noonan's Marsh) is a large wetland complex composed of freshwater marsh, brackish marsh, salt marsh, shallow water wetland, tall shrub swamp, and hardwood treed swamp. The PDA passes through the eastern end of the wetland which contains tall shrub swamp and freshwater marsh (Appendix A – Sheet 7). This wetland supports a wide variety of wetland functions. Agricultural fields butt up against the edge of the wetland, so it is likely that the wetland helps to settle out sediment and retain nutrients that leave these fields. Much of the eastern end of the wetland is occupied by tall shrub swamp and hardwood treed swamp which would shade and cool the stream that runs through the wetland. The wetland would also likely augment the flow of this stream during low flow periods and slow the flow of water during high flow periods. The salt marsh portion of the wetland would be expected to export organic matter to adjacent nearshore waters and provide coastal shoreline protection. The wetland provides habitat for water birds, song birds, terrestrial mammals, semi-aquatic mammals, amphibians, and fish. It also provides habitat for several plant and animal species of conservation concern including halberd-leaved tearthumb (*Polygonum arifolium*), tree swallow (*Tachycineta bicolor*), bank swallow (*Riparia riparia*), nesting herring gulls (*Larus argentatus*), and salt marsh copper (*Lycaena dospassosi*). The western end of the wetland is situated within the Bedeque Bay IBA and part of the wetland has been modified by Ducks Unlimited Canada to enhance the wetland as waterfowl habitat. The portion of Wetland 12 through which the PDA passes would provide fewer wetland functions. This portion of the wetland could be expected to settle sediment and retain nutrients, augment stream flow during low flow periods, slow stream flow during peak flow periods, cool stream water, and provide habitat for song birds and terrestrial mammals. This portion of the wetland is not managed by Ducks Unlimited Canada and is not located within the Bedeque Bay IBA.

4.5.4 Bird Species

A review of the available information sources including the AC CDC, MBBA, BBS, and Stantec field data indicate the presence of 135 species of birds recorded in or near the route options (i.e., within 5 km of the proposed preferred route or alternate route or within the MBBA squares crossed by either PDA). A list of all the species reported by the various data sources below can be found in Appendix B. Based on the proximity of both routes and the mobility of these bird species the list is considered inclusive for both routes and the T-3 relocation route. A summary of the data provided by each information source is provided below with the eight SAR and 38 SOCC species listed in Table 4.5.

Atlantic Canada Data Conservation Centre

A list of species and observations within a 5km radius of the PDA was generated by the AC CDC. In total, 46 bird species were reported, including eight SAR.

Maritimes Breeding Bird Atlas

During the most recent atlas period (2006-2010), a total of 103 species of bird were recorded across the squares 20MS42 and 20MS52 which are crossed by the PDA. Of these species, 44 were recorded as confirmed breeders, 29 were recorded as probable breeders, and 30 were recorded as possible breeders.

Breeding Bird Surveys

A review of the BBS database (ECCC 2017b) identified the nearest route, #75009 – Bedeque, crosses over the proposed transmission line. This route runs from Tryon to Bedeque. In total, 44 bird species were reported, including five SAR.

Field Surveys

Field surveys focused on breeding birds were conducted within the LAA and surrounding area to characterize use of the area by birds and other wildlife, and to facilitate an assessment of potential environmental effects of the Project on wildlife and wildlife habitat. Breeding bird surveys conducted on June 6th and 7th, 2017 identified the presence of 43 species along the proposed preferred route.

Bird Species Potentially Present Within Either Route

Birds are highly mobile, and could move between either route option, given their proximity. As such, the list of birds with the potential to occur near the Project includes observations collected within the PDA or LAA of both routes.

A review of the available information sources including the AC CDC, MBBA, BBS, and Stantec field data indicate the presence of 131 species of birds recorded in or near the LAA (i.e., within 5 km of the proposed preferred or alternate PDAs, or within the MBBA squares crossed by the PDAs). A list of all the species reported by the various data sources below can be found in Appendix B (Table B.2). A list of the 8 SAR and 40 SOCC species common to both routes can be found in Table 4.5.

Table 4.5 SAR and SOCC Observed Near the Proposed Preferred and Alternate Route LAAs (AC CDC, MBBA, BBS, and Stantec Field Observations)

Common Name	Scientific Name	SARA	COSEWIC	AC CDC S-Rank	Data Source
bank swallow	***Riparia riparia***	**-**	***Threatened***	***S2S3B***	***MBBA, BBS, AC CDC***
barn swallow	***Hirundo rustica***	**-**	***Threatened***	***S2B***	***Field, MBBA, BBS, AC CDC***
bobolink	***Dolichonyx oryzivorus***	**-**	***Threatened***	***S2B***	***MBBA, BBS, AC CDC***
Canada warbler	***Wilsonia canadensis***	***Threatened***	***Threatened***	***S2B***	***MBBA, BBS, AC CDC***
common nighthawk	***Chordeiles minor***	***Threatened***	***Threatened***	***S1B***	***Field***
eastern wood-pewee	***Contopus virens***	**-**	***Special Concern***	***S3B***	***MBBA, BBS, AC CDC***
evening grosbeak	***Coccothraustes vespertinus***	**-**	***Special Concern***	***S1S2B, S2S3N***	***MBBA, AC CDC***
olive-sided flycatcher	***Contopus cooperi***	***Threatened***	***Threatened***	***S2B***	***AC CDC***
American golden-plover	*Pluvialis dominica*	-	-	*S2S3M*	*AC CDC*
bay-breasted warbler	*Dendroica castanea*	-	-	*S2B*	*BBS, AC CDC*
boreal chickadee	*Poecile hudsonica*	-	-	*S3*	*MBBA, BBS, AC CDC*
black-bellied plover	*Pluvialis squatarola*	-	-	*S3M*	*AC CDC*
blue-winged teal	*Anas discors*	-	-	*S3B*	*MBBA, BBS, AC CDC*
black guillemot	*Cepphus grylle*	-	-	*S2B*	*MBBA, AC CDC*
black-billed cuckoo	*Coccyzus erythropthalmus*	-	-	*S3B*	*MBBA, AC CDC*
brown-headed cowbird	*Molothrus ater*	-	-	*S1S2B*	*MBBA, BBS, AC CDC*
Cape May warbler	*Dendroica tigrina*	-	-	*S3B*	*BBS*
common loon	*Gavia immer*	-	*Not at Risk*	*S1B, S4M*	*BBS, AC CDC*
common tern	*Sterna hirundo*	-	*Not at Risk*	*S1B*	*MBBA, AC CDC*
eastern kingbird	*Tyrannus tyrannus*	-	-	*S2B*	*MBBA, AC CDC*
gray catbird	*Dumetella carolinensis*	-	-	*S3B*	*MBBA, BBS, AC CDC*
great black-backed gull	*Larus marinus*	-	-	*S2S3B, S5N*	*BBS, AC CDC*
greater yellowlegs	*Tringa melanoleuca*	-	-	*S3S4M*	*AC CDC*
herring gull	*Larus argentatus*	-	-	*S2B, S5N*	*Field, BBS, AC CDC*
Killdeer	*Charadrius vociferus*	-	-	*S2S3B*	*MBBA, BBS, AC CDC*
least sandpiper	*Calidris minutilla*	-	-	*S3M*	*AC CDC*

Table 4.5 SAR and SOCC Observed Near the Proposed Preferred and Alternate Route LAAs (AC CDC, MBBA, BBS, and Stantec Field Observations)

Common Name	Scientific Name	SARA	COSEWIC	AC CDC S-Rank	Data Source
lesser yellowlegs	*Tringa flavipes*	-	-	*S3M*	*AC CDC*
northern mockingbird	*Mimus polyglottos*	-	-	*S1B*	*MBBA, AC CDC*
northern pintail	*Anas acuta*	-	-	*S1S2B*	*AC CDC*
northern shoveler	*Anas clypeata*	-	-	*S2B*	*MBBA, AC CDC*
pine siskin	*Carduelis pinus*	-	-	*S2S3B, S4N*	*AC CDC*
rose-breasted grosbeak	*Pheucticus ludovicianus*	-	-	*S2S3B*	*MBBA, BBS, AC CDC*
ring-billed gull	*Larus delawarensis*	-	-	*S1B, S5M*	*MBBA, BBS, AC CDC*
ruby-crowned kinglet	*Regulus calendula*	-	-	*S3B*	*MBBA, BBS, AC CDC*
ruddy turnstone	*Arenaria interpres*	-	-	*S3M*	*AC CDC*
semipalmated sandpiper	*Calidris pusilla*	-	-	*S3M*	*AC CDC*
semipalmated plover	*Charadrius semipalmatus*	-	-	*SHB, S3M*	*AC CDC*
short-billed dowitcher	*Limnodromus griseus*	-	-	*S3M*	*AC CDC*
spotted sandpiper	*Actitis macularius*	-	-	*S2S3B*	*MBBA, AC CDC*
Tennessee warbler	*Vermivora peregrina*	-	-	*S2B*	*MBBA, AC CDC*
tree swallow	*Tachycineta bicolor*	-	-	*S3S4B*	*MBBA, BBS, AC CDC*
Veery	*Catharus fuscescens*	-	-	*S3B*	*MBBA, AC CDC*
Wilson's snipe	*Gallinago delicata*	-	-	*S3B*	*MBBA, BBS, AC CDC*
white-breasted nuthatch	*Sitta carolinensis*	-	-	*S1*	*AC CDC*
white-winged crossbill	*Loxia leucoptera*	-	-	*S3*	*MBBA, AC CDC*
yellow-bellied flycatcher	*Empidonax flaviventris*	-	-	*S3B*	*MBBA, AC CDC*

Note: Species at risk are indicated **in bold**.
- Indicates no status assessment has been conducted

Bird Species at Risk Descriptions

Based on data provided by the AC CDC, MBBA, BBS, and on field surveys conducted in June 2017, eight SAR have been identified to have the potential to be found within the LAA on the proposed preferred route.

Bank Swallow

The bank swallow (*Riparia riparia*) is a small, colonial which feeds primarily on aerial insects (COSEWIC 2013). This species occurs on every continent except Antarctica and Australia. In North America, this species breeds in every province apart from

Nunavut (COSEWIC 2013). Bank swallow is ranked as *threatened* by COSEWIC, and has no *SARA* status or schedule. The AC CDC ranks the Prince Edward Island population of bank swallows as S2SB.

Bank swallows breed in a wide variety of natural and anthropogenic sites including riverbanks, aggregate pits, road cuts, and vertical sand banks or stock piles of soil. Nesting sites are generally situated adjacent to open terrestrial habitat used for aerial foraging (COSEWIC 2013). No bank swallows were observed in the LAA during field surveys in 2017.

The BBS (EC 2017b) reports that this species is in decline in Canada and at the province level in NB. The main factors thought to be responsible for the decline of this species includes the loss of breeding and foraging habitat, and the loss of food sources through the widespread use of pesticides (COSEWIC 2013).

Barn Swallow

The barn swallow (*Hirundo rustica*) is a mid-sized aerial insectivore 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 S2B by the AC CDC. It currently has no *SARA*.

The barn swallow shifted from nesting in caves and on ledges to nesting largely in man-made structures following European settlement of North America. This insectivorous species prefers open habitats for foraging such as agricultural fields, shorelines, and cleared rights-of-way.

The BBS (EC 2016) 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 make up the main diet of this species.

Bobolink

The bobolink (*Dolichonyx oryzivorus*) 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 AC CDC, indicating that the breeding population of this species is considered vulnerable in Prince Edward Island. It currently has no *SARA* rank.

Bobolink originally nested in the tall-grass prairie of the mid-western U.S 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 2010a). 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. No bobolinks were observed during 2017 field surveys.

The BBS (EC 2017b) indicates that this species is in decline at a Canada-wide and province-wide level. The main threats to this species include land-use change, especially the loss of meadows and hay fields, and the early mowing of hay fields in which the species is nesting.

Canada Warbler

The Canada warbler (*Cardellina canadensis*) 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 COSEWIC, and S3B by the AC CDC, indicating the breeding population is vulnerable in Prince Edward Island.

Canada warblers breed in a wide range of forest types, including deciduous, coniferous, and mixed wood 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. No Canada warblers were observed during field surveys in the LAA.

The BBS (EC 2017b) reports that this species is in decline Canada-wide and at a province-wide level. Key threats to this species are unclear, but loss of primary forest in the wintering grounds in South America is a potential cause.

Common Nighthawk

The common nighthawk (*Chordeiles minor*) is a medium-sized crepuscular bird in the nightjar family. This species has a wide distribution in Canada and is found in all provinces except Newfoundland, as well as in Yukon and the Northwest Territories. Common nighthawks are listed as *threatened* under SARA, and has an AC CDC general status rank of S1B in PEI.

Common nighthawks breed in open areas, including gravel pits, clear-cuts, burnt over areas, barrens, and pastures. They sometimes nest on gravel rooftops. Eggs are laid directly on exposed ground, and no actual nest is made. No common nighthawks were observed during the dedicated common nighthawk survey on July 12. However, two incidental observations of these species were recorded in the PDA during terrestrial field surveys on July 10, 2017. It is possible that both observations were of the same individual.

The BBS (EC 2017b) reports that common nighthawks are in decline at both a Canada-wide and province-wide scale. Although the reasons for this decline are not completely understood, it is believed that reductions in insect prey, habitat loss and alteration, and the reduction of gravel covered rooftops may play a role (COSEWIC 2007a).

Eastern Wood-pewee

The eastern wood-pewee (*Contopus virens*) is a small song bird which breeds in much of Canada from Saskatchewan to the Maritimes provinces (COSEWIC 2012). This species is ranked as *special concern* by COSEWIC. The AC CDC ranks this species as S3B, indicating that the breeding population of this species is considered apparently secure in Prince Edward Island.

During the breeding period, the eastern wood-pewee is generally associated with the mid-canopy layer within forest clearings and edges of hardwood and mixed forest stands (COSEWIC 2012). In migration periods this species utilizes a variety of habitats including edges, and clearings (COSEWIC 2012). Suitable habitat for this species is found within the PDA and LAA. No eastern wood-pewees were observed in the LAA during field surveys conducted in 2017.

The BBS (EC 2017b) reports that this species is in decline at a Canada-wide and province-wide level. The main factors thought to be responsible in the decline of the eastern wood-pewee have not been clearly identified, due largely, to a lack of research. Possible threats include loss of habitat, and degradation of habitat quality, changes in availability in flying-insect prey, and changes in forest structure due to white-tailed deer over-browsing (COSEWIC 2012).

Evening Grosbeak

The evening grosbeak is a finch that can be found in PEI year-round. This species is listed as *special concern* under COSEWIC, but has no SARA listing at this time. It has an AC CDC s-rank of S1S2B, S2S3N, indicating that the breeding population is critically imperiled to imperiled, and the non-breeding population ranges from vulnerable from imperiled.

Evening grosbeaks are typically found in coniferous, northern forests. They breed in mature or second growth conifer or mixed wood forests. This species can be found in high numbers during forest insect outbreaks, and spruce budworms are a preferred food during the breeding season. They often form large feeding flocks. Evening grosbeaks nest in both hard and softwood trees, as well as in large shrubs.

The BBS (ECCC 2017b) indicates that evening grosbeak populations have been steadily declining for the past 40 years at a Canada wide level. The trend for PEI and Nova Scotia (presented together), is less clear, and shows an increase in population from approximately 1990 to 2004. Threats to the evening grosbeak include decreasing availability of mature mixed wood and conifer forests, window collisions, and mortality associated with feeding on road salt and grit in winter (COSEWIC 2017).

Olive-sided Flycatcher

The olive-sided flycatcher (*Contopus cooperi*) is a medium-sized insectivore which breeds in scattered locations throughout most of forested Canada (COSEWIC 2007). This species is listed as *threatened* under Schedule 1 of SARA. The AC CDC lists the olive-sided flycatcher as S2B, indicating that the breeding population of this species is considered vulnerable in Prince Edward Island.

Olive-sided flycatchers are most often associated with open areas, where they are found foraging for flying insects, and perching in tall live trees (COSEWIC 2007b). No olive-sided flycatchers were observed during field surveys in 2017.

The BBS (EC 2017b) reports that this species is in decline at a Canada-wide and province-wide level. The main factors thought to be associated with the decline of olive-sided flycatchers are habitat loss and alteration (COSEWIC 2007). Declining insect populations on breeding and wintering grounds may also be a contributing factor.

4.5.5 Bird Habitat Surveyed

Species richness is defined as the number of different species recorded within a habitat type. It is important to note that level of effort varied between habitat types, and as such, species richness is not directly comparable between habitats. Due to the highly-fragmented habitat within the LAA, species were often recorded in a different habitat type than the location of the observer. As such, number of point counts completed does not provide a true picture of level of effort by habitat type. In calculating species richness, birds that were observed as fly-bys were excluded, as there was no evidence that they were using the habitat type in which they were seen. Species richness was calculated for each of the habitat types sampled within the LAAs during the field surveys, the species richness is listed in Table 4.6 for each habitat type encountered.

Table 4.6 Habitat Types Sampled During 2017 Field Surveys, and Species Richness

Habitat Type	Number of Point Counts Completed (Both Routes)	Species Richness* (Inclusive of Both Routes)	Area (ha) of Habitat Type in LAA – Proposed Preferred Route	Area (ha) of Habitat Type in LAA – Proposed Alternate Route
Agricultural	13	24	575.2	674.6
Anthropogenic	3	24	193.3	170.7
Bog	-	-	1.5	1.5
brackish marsh	-	-	7.0	7.0
clear cut	-	-	1.1	1.7
coastal marsh	-	-	19.5	19.5
coniferous treed swamp	-	-	0.4	0.4
freshwater marsh	1	7	21.7	28.8
hardwood treed swamp	4	19	39.2	35.3
mature hardwood	1	8	55.8	16.4
mature mixed wood	1	4	11.6	8.5
mature softwood	-	3	3.0	0
mixed wood treed swamp	-	1	2.0	2.0
regenerating hardwood	-	-	0.4	0.4
regenerating softwood	-	-	1.3	1.3
shallow water wetland	-	-	10.7	9.7
Shrub	1	11	7.6	10.1
shrub swamp	2	16	24.9	36.4
softwood treed swamp	-	-	0.88	0.99
Waterbody	-	-	33.72	33.72
young hardwood	5	21	114	104.41
young mixed wood	1	18	53.8	42.03
young softwood	2	11	21.46	23.04

* Richness values were calculated based upon the habitat in which each individual bird was observed. Due to the fragmented nature of the habitat present in the Study Area, some birds were observed within habitats different than that in which the observer was located during the point count surveys. This resulted in some birds being recorded within habitats in which no point count was centered.

- Indicates no observations

Important Bird Habitat

Two wetlands of importance to waterfowl exist along the proposed preferred and alternate routes. Both occur near the Town of Borden-Carleton adjacent to a section of the transmission line corridor common to both proposed routes.

Noonan's Marsh is located just north of the foot of the confederation bridge, and has both freshwater and saltwater components. Ducks Unlimited Canada (DUC) has conducted a restauration project at a 63-acre portion of Noonan's Marsh. The DUC project included the construction of an earthen dike, a concrete water control structure, a culvert and tidal gate, as well as a plastic fish ladder (DUC 2012). Noonan's Marsh is an important stopover site for migrating waterfowl and shorebirds. This marsh is located near both the proposed preferred and alternate routes; however, the alternate route passes through the eastern section of the wetland. The alternate route is located several hundred meters east of the DUC-managed portion of the wetland (Appendix A - Sheet 1).

Bird observation data were collected at Noonan's Marsh in 1993 and 1994 as a part of the Northumberland Strait Crossing Project (Jacques Whitford Environment Limited 1995). Monitoring occurred in both the salt marsh and freshwater marsh portions of the wetland, and included the spring migration, breeding season, and fall migration periods. A summary of these monitoring data for the freshwater marsh indicated that the highest numbers of birds occur during the fall migration period. Table 4.7 presents that number of birds observed per hectare per 20-minute observation period. For both years of data, the number of birds observed were much higher in the fall migration than either of the spring migration or breeding season. The 1993 data showing particularly high numbers, with a total of 84.04 birds/hectare/20-minute observation period observed, compared to 5.31 birds/hectare/observation period during the spring migration, and 9.56 birds/hectare/observation period during the breeding season. While this trend does not occur for all species, it is clear for certain species and groups of birds. For example, the average number of green-winged teal (*Anas carolinensis*) observed per hectare per observation period was less than 1 during spring migration for both years of data, was 0.78 and 1.45 for 1993 and 1994, and during fall migration was 15.69 and 9.92 for 1993 and 1994, respectively. Sandpipers were not observed during the spring migration or breeding season, but were observed an average of 12.19 and 7.99 times per observation period in 1993 and 1994, respectively. Other species observed in the freshwater marsh with highest number for the fall migration period included greater yellowlegs (*Tringa melanoleuca*), American black duck (*Anas rubripes*), great blue heron (*Ardea herodias*), and semipalmated plover (*Charadrius semipalmatus*). In general, shorebirds were observed most commonly in the freshwater marsh during fall migration. Three species, including semipalmated plover, black-bellied plover (*Pluvialis squatarola*) and pectoral sandpiper (*Calidris melanotos*), were only observed in the freshwater marsh during fall migration. These data indicate that the freshwater portion of Noonan's marsh is used as a staging area during the fall migration by waterfowl and shorebirds.

In the saltwater portion of Noonan's Marsh, species abundance does not seem to be as variable among seasons (Table 4.7). American black duck, American wigeon and ring-necked duck, for example, were observed in relatively similar abundances in the spring migration, breeding season, and fall migration. Green winged teal were more commonly observed in the spring and fall migration periods, in comparison to the breeding season. Although shorebirds (including yellow legs sp., sandpipers, willets (*Tringa semipalmata*) and Hudsonian godwit (*Limosa haemastica*)) were observed in the saltwater marsh in all observation periods, they were never observed in as high abundances as they were seen in the freshwater marsh.

Amherst Cove Marsh is a saltwater marsh located at Amherst Cove, near the western portion of the route that follows Industrial Drive and is common to both route options (Appendix A- Sheet 1). Data were also collected at Amherst Cove for the Northumberland Strait Project in 1993 and 1994 (Jacques Whitford Environment Limited 1995). In general, species were observed in the highest numbers during the spring migration. This trend is particularly obvious for herring gulls (*Larus argentatus*), ring-billed gulls (*Larus delawarensis*) and American black duck. Generally, the number of birds observed during the fall migration period was relatively low. One exception to this trend was the great blue heron, which was most abundant during the fall migration period. This data indicates that this marsh is likely not an important staging area for fall migrations, but may be important for some species during the spring migration.

To provide context for the data for average number of birds observed at Noonan's Marsh and Amherst Cove Marsh, data is compared to a known area of bird importance: Cape Jourimain National Wildlife Area in New Brunswick. Cape Jourimain is located directly across the Confederation Bridge, approximately 15 km away from Borden-Carleton. This wetland was also surveyed as a part of the Northumberland Strait Crossing project in the mid-1990s (Jacques Whitford Environment Limited 1996). During surveys, the marsh was split into 4 areas: brackish marsh 1 and 2, and salt water marsh 1 and 2. Results are presented as the number of birds observed/ha/20-minute watch count, and can be directly compared to the results for Noonan's Marsh and Amherst Cove Marsh. Data is presented in Table 4.7.

This comparison indicates that the numbers of birds observed in the freshwater portion of Noonan's Marsh during fall migration period is relatively high. Results for Cape Jourimain ranged from 2.22 to 24.38 birds/hectare/observation period during the fall migration period, whereas the results for Noonan's fresh marsh were 84.04 and 34.89 birds/hectare/observation period in 1993 and 1994, respectively. Both years of data suggest that Noonan's freshwater marsh has been an important fall migration staging area for many species. Both Noonan's Marsh (fresh marsh and salt marsh) had relatively high numbers of birds during the spring migration period as well. The highest values recorded during the spring migration periods were for Noonan's fresh marsh in 1994 (18.75 birds/hectare/observation period), and for Amherst Cove Marsh in 1993 (15.6 birds/hectare/observation period). Both Noonan's Marsh and Amherst Cove have supported an average to high number of birds during the breeding season.

Table 4.7 Number of Birds Recorded/Hectare/20-Minute Observation Period

Year	Noonan's Marsh – Freshwater[1]		Noonan's Marsh - Salt Marsh[1]		Amherst Cove Marsh[1]		Cape Jourimain NWA – Brackish Marsh 1[2]		Cape Jourimain NWA – Brackish Marsh 2[2]		Cape Jourimain – Salt Marsh 1[2]		Cape Jourimain – Salt Marsh 2[2]	
	1993	**1994**	**1993**	**1994**	**1993**	**1994**	**1993**	**1995**	**1993**	**1995**	**1993**	**1995**	**1993**	**1995**
Spring Migration	5.31	18.75	8.32	13.66	15.60	13.35	10.56	7.70	6.94	5.22	5.31	3.72	3.45	3.63
Breeding Season	9.56	16.14	8.94	5.89	6.04	1.51	6.17	5.28	2.53	1.53	3.10	2.21	3.23	2.86
Fall Migration	84.04	34.89	7.35	18.53	1.16	2.17	24.38	15.47	13.46	20.17	14.64	5.12	3.05	2.22

Sources: [1] Jacques Whitford Environment Limited 1995
[2] Jacques Whitford Environment Limited 1996

4.5.5.1 Other Wildlife

A variety of wildlife species occur in or adjacent to the proposed routes. A red fox (*Vulpes vulpes*) was observed on the Borden-Carleton substation site, which is a common species in PEI and has an S-rank of S5 (secure) and a general status rank of secure. Other non-bird wildlife expected to occur along either of the proposed routes incudes eastern chipmunk (*Tamias striatus*), American red squirrel (*Tamiasciurus hudsonicus*), northern raccoon (*Procyon lotor*) and striped skunk (*Mephitis mephitis*). A variety of amphibians and reptiles (e.g. green frog (*Lithobates clamitans*), common gartersnake (*Thamnophis sirtalis*)), are also expected to occur in suitable habitat. Two of the commonly occurring mammals, northern raccoon and striped skunk, are exotic to PEI and have AC CDC status ranks of SNA (not applicable).

Three species of bats are known to be occur in PEI: little brown bat (*Myotis lucifugus*), northern myotis (*M. septentrionalis*) and hoary bat (*Lasiurus cinereus*) (Henderson et al. 2009). Of these, the two *myotis* species are federally listed as *endangered,* and have experienced large population declines as a result of white-nose syndrome, which was first observed in PEI in the winter of 2012-2013. Northern myotis roost primarily in mature deciduous stands (Vonhof and Wilkinson 1999) which contain a variety of large snags in varying stages of decay (Cline et al. 1980). The majority of forest stands intersecting either route are not mature enough to support maternal roosting sites, and no appropriate roosting trees or snags were observed along either route during the avifauna surveys. Summer roosting habitat is not believed to be limiting for myotis species in Canada (COSEWIC 2013). The vegetation clearing associated with the project will be conducted during the months of January to March, which would avoid interactions with breeding migratory birds and bats.

4.6 PROJECT INTERACTIONS WITH THE TERRESTRIAL ENVIRONMENT

Potential Project interactions with Terrestrial Environment are presented in Table 4.8. These interactions are indicated by check marks, and are discussed in Section 4.7 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 4.8 Potential Project-Environment Interactions and Effects on the Terrestrial Environment

Project Components and Physical Activities	Potential Environmental Effects	
	Change in Vegetation or Wildlife	Change in Wetland Area or Function
Construction		
Site Preparation	√	√
Installation of Project Components	√	√
Clean-up and Re-vegetation	√	√
Emissions and Wastes	√	-
Operation		
Energy Transmission	√	-
Vegetation Management	√	√
Infrastructure Inspection, Maintenance, and Repair	-	-
Emissions and Wastes	-	-
Decommissioning		
Wires and hardware removal	-	-
Structure disassembly	√	-
Clean-up and re-vegetation	√	-

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

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

During operation, infrastructure inspection, maintenance, and repair will occur over a short period of time within areas that were previously disturbed during construction activities. Therefore, no interactions are expected between this Project activity and the Terrestrial Environment.

During operation, emissions and wastes are also not anticipated to interact with the terrestrial environment in a substantive way. Although air contaminants or sound and vibration emissions could interact with wildlife, predicted infrequency and low levels of these emissions and wastes during these phases will limit any interaction with the Terrestrial Environment.

Decommissioning of Line T-3, if required, is unlikely to result in environmental interactions with the wetland area or function. Based on aerial interpretation and a site visit, the structures are located within the upland portion of the PEI TIE RoW. Although surface runoff could interact with wetland function, standard erosion control measures used on all Maritime Electric construction projects will limit this potential interaction. Therefore, no interactions are expected between this Project activity and the Terrestrial Environment.

4.7 ASSESSMENT OF RESIDUAL ENVIRONMENTAL EFFECTS ON THE TERRESTRIAL ENVIRONMENT

This section describes the interactions between the Project and the Terrestrial Environment (those potential interactions identified in Section 4.6). Interactions between the Project and the Terrestrial Environment that could result in a change in vegetation or wildlife or a change in wetland area or function were assessed for each Project phase using the identified analytical assessment techniques. Accidents, Malfunctions, and Unplanned Events are discussed separately in Section 6.0.

Project activities that have the potential to interact with the Terrestrial Environment will utilize avoidance or mitigation measures to manage environmental effects during construction and operation. The use of standard mitigation measures and an EPP will assist in managing environmental effects. Using the mitigation measures, temporal avoidance, and Best Management Practices (BMPs) described in the EPP the Proponent will reduce residual environmental effects on the Terrestrial Environment.

During construction, it is anticipated that interaction will occur between the terrestrial environment from surveying and site preparation, installation of project components, clean-up and re-vegetation of the transmission corridor, and emissions and wastes. During operation, interaction with the terrestrial environment is anticipated through energy transmission and vegetation management.

4.7.1 Analytical Assessment Techniques

The assessment of potential environmental effects on the Terrestrial Environment was conducted using both field data and desktop information. Vegetation and wetlands field surveys were conducted within the PDA and surrounding area during 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 qualified avian biologists who conducted point counts in the PDA and surrounding habitats.

4.7.2 Change in Vegetation or Wildlife

A change in vegetation or wildlife may result from interactions between the Terrestrial Environment and the Project during construction, and operation. The assessment of change in vegetation or wildlife defines the Project environmental effect pathways for each phase of the Project, the mitigation measures to be put in place to reduce environmental effects on vegetation and wildlife or wetland area or function and the resulting residual environmental effects, whether the effects are positive or negative.

4.7.2.1 Project Environmental Effects Pathways

Construction

Construction activities have the potential to result in adverse environmental effects which could result in the loss of vascular plant or wildlife SAR and SOCC, a change and/or loss of vegetation communities and wildlife habitat (including wetland), mortality of wildlife from collision with construction equipment, and sensory disturbance to wildlife species which could result in habitat avoidance by those species.

Vegetation clearing during surveying and site preparation has the potential to cause a direct loss of vascular plant SOCC, as well as vegetation communities and wildlife habitat (including wetlands). Clearing will remove trees and shrubs within the PDA, and clearing equipment may cause damage to understory vegetation. No grubbing is planned for the Project. Excavation for pole placement during the installation of Project components will remove soil and the associated seed bank layer, and depending on the machinery used and seasonal timing of the work, may result in soil compaction. Soil compaction and excavation can change habitat quality for vegetation which may regenerate in disturbed areas. During the breeding bird season (mid-April through August in Prince Edward Island, ECCC 2017c) clearing and excavation could result in the direct loss of eggs and unfledged birds.

Edge effects resulting from vegetation clearing can have indirect effects on the LAA, adjacent to the PDA. Edge effects—changes in abiotic factors such as light availability, wind, temperature, and humidity—can influence the success of species that inhabit the area, and can change community dynamics through the introduction of exotic or invasive species. Native species may be outcompeted and lost following the introduction of invasive and exotic plants, which are strong competitors that have been known to thrive in disturbed (i.e., cleared) habitats.

Changes to indirect and direct mortality through herbivory or predation, and increased nest parasitism can result following vegetation clearing, as herbivores and predators can more easily access habitat from newly created edges. Nest predators and parasites (e.g., brown-headed cowbirds) are more abundant near forest edges (Lloyd et al. 2005).

Sensory disturbance to wildlife species may be caused by light and noise of construction equipment during site preparation and excavation for pole placement. This sensory disturbance could result in reduced breeding in rearing success through reduced productivity or nest abandonment. Some species may experience temporary habitat loss through avoidance (Bayne et al. 2008). Small mammal and herpetile species may experience increased mortality through predation upon leaving cover in response to construction noise.

Additional clearing may be required for access and staging on the alternate route. Existing roads and trails may need to be widened, graded, or surfaced with additional gravel. In addition, culverts and cross-drainage may need to be installed, where necessary. The areas where these activities may occur have not yet been identified; however, they will presumably result in minor changes to vegetation communities and wildlife habitat, including wetlands.

Clean-up and revegetation will result in a neutral interaction with the Terrestrial Environment. Disturbed areas will return to natural vegetation communities through mulching and seeding activities. Cleaned up and revegetated areas will represent a change of vegetation communities and wildlife habitat from pre-Project conditions rather than a loss.

Operation and Maintenance

Operation and maintenance activities could result in adverse environmental effects which could lead to the loss of vascular plant and wildlife SAR or SOCC, a change to vegetation communities and wildlife habitat (including wetland), sensory disturbance, habitat avoidance, and mortality of wildlife from collision with transmission infrastructure.

Operation includes energy transmission and the ongoing presence of transmission lines which can pose an increased risk of mortality for wildlife through collisions and electrocutions. Calvert *et al.* (2013) recently estimated collision with transmission lines to be the third leading cause of human-related bird mortality in Canada. Generally, nocturnal migrants (*i.e.,* most passerines) migrate at a high altitude, and are at low risk of suffering a collision with unlighted transmission lines during migration. Birds with the highest vulnerability to collisions include waterfowl, grebes, shorebirds, and cranes (Rioux *et al.* 2013). Waterfowl and waterbirds are at the greatest risk of collisions with transmission line infrastructure due to their higher wing loading (body weight relative to wing area), which limits their reaction time and manoeuverability in the air (APLIC 2012; Bevanger 1998; Rioux *et al.* 2013). The design of transmission lines, including the spacing between components can influence bird mortality. Lines with inadequate spacing between energized conductors or between energized conductors and grounded hardware (often found on medium-voltage distribution lines) cause more electrocutions to birds than transmission lines with adequate spacing between components.

Noonan's Marsh contains both fresh and salt water marsh, and is located near the western end of the Project area. The freshwater marsh portion of Noonan's Marsh is a staging area for migrating waterfowl and shorebirds during the fall migration period. Bird activity is high during this time, which could lead to interactions with the Project. The proposed alternative route passes through portions of Noonan's Marsh that are occupied by tall shrub swamp and coniferous treed swamp. The nearest area of open water where waterfowl and shorebirds would tend to congregate is approximately 200m to the west of the proposed alternative route. Amherst Cove Marsh is also located near the west end of the project area, near Industrial Drive. Amherst Cove Marsh does not appear to be as important as Noonan's Marsh during fall migration; however, it may be important during the spring migration period. Both marshes provided habitat for birds year-round. Bird abundance at Noonan's marsh and Amherst Cove marsh are discussed in section 4.5.3.4.

The proximity of bird take-off and landing sites to transmission lines can affect the risk of collision. Quinn et al. (2011) found that no bird carcasses were recovered from electrical transmission lines that were situated more than 500 m from open water. They also noted that the frequency of collision related mortality decreased greatly at distances greater than 60 m. At both Noonan's marsh and Amherst Cove Marsh, areas of open water are located within 500 m (200 m at Noonan's Marsh, 300 m at Amherst Cove Marsh) indicating that there is potential for waterfowl and water birds to collide with the transmission line. However, these areas are more than 60 m from the proposed transmission line suggesting that the rate of collision related mortality for these high-risk species is not high.

Vegetation management during the operation and maintenance phase could result in further changes to vegetation communities, and wildlife habitat (including wetland) previously disturbed during construction. Some bird species may nest within the vegetation within the PDA; therefore, if vegetation management is conducted during the breeding bird season, a Project-related loss of unfledged birds may result.

Decommissioning

Decommissioning and abandonment of Line T-3, if required, is unlikely to result in substantial environmental interactions with vegetation or wildlife. Based on aerial interpretation and a site visit, it was determined the poles are located within the PEI TIE RoW and are accessible via existing roads. Road access for decommissioning reduces the potential for disturbance to vegetation.

It is possible that birds may build nests on or in Project components such as transmission line poles. In these cases, decommissioning poles may interact with nesting birds. Similar to construction, decommissioning activities may result in sensory disturbance to wildlife species. Temporary habitat loss because of reduced habitat effectiveness may result if species avoid the area. Additionally, breeding and rearing success of some wildlife species may be decreased by sensory disturbance (Bayne et al. 2008).

Reclamation activities following decommissioning will result in a modest increase in native vegetation communities and wildlife habitat over time, potentially offsetting the future effects from the relocation of T-3.

4.7.2.2 Mitigation

The following section outlines proven mitigation, and industry best management practices. The following measures will be implemented to reduce the environmental effects of the interactions between the Project and the Terrestrial Environment during all stages of the Project:

- flag and avoid known locations of individuals of SAR, when possible
- the EPP includes general construction BMPs, a spill management plan and an erosion and sediment control plan. All employees and contractors working on the Project will be trained on the EPP prior to starting work
- clearing activities will be avoided when possible during the normal breeding season for migratory birds. According to the “General nesting periods of migratory birds in Canada” (ECCC 2017c), approximately 95% of migratory birds in Zone C3 (which extends over the southern 2/3 of New Brunswick, all of Prince Edward Island, the northern half of Nova Scotia, and parts of Ontario) breed between approximately April 8 to August 28
- If clearing is required within the normal breeding bird season Maritime Electric will employ qualified wildlife biologists to undertake nest searches to identify and flag setbacks around active nests within the PDA, in cleared areas where additional construction activities (such as grubbing, excavation, or pole placement) cannot be avoided during breeding bird season (April through August). Apply species specific setbacks (minimum 30 m) to active nests discovered to protect them from disturbance until the young have fledged
- use approved noise arrest mufflers on equipment to reduce potential environmental effects of noise
- where possible, the transmission line poles will be shifted so that limited tree clearing in forested areas is required
- poles will be placed to minimize the number of plants lost to construction activities
- confine clearing and grubbing (if it occurs) to PDA footprint
- reduce grading in vegetated areas
- all equipment must arrive 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 revegetation when possible, and when not possible, use a native seed mix for revegetation
- restrict vegetation management to necessary areas
- where feasible, avoid conducting vegetation management during the breeding bird season for migratory birds
- install avian avoidance devices near open water features, where transmission lines are located within 100 m of a waterfowl staging area
- in areas near waterfowl staging areas where the proposed transmission line runs parallel to an existing transmission line, adjust the height of the new transmission line such that the conductors on the two lines are situated at the same height above ground to reduce the probability of bird strikes
- restore temporarily disturbed areas to pre-construction conditions

Maritime Electric will reduce the potential for interactions between the Project and the Terrestrial Environment during the decommissioning of Line T-3 by adhering to best management practices. In addition to any applicable construction and operation and maintenance mitigation outlined above, the following well-established practices will be implemented during decommissioning of Line T-3:

- Machinery used to remove poles, to reduce soil compaction, rutting, and other ground disturbance will remain in the PEI TIE RoW.
- Nesting platforms will be provided during and following decommissioning if any bird species are found be nesting on poles.

4.7.2.3 Characterization of Project Residual Environmental Effects of a Change in Vegetation or Wildlife

Residual Project environmental effects on the Terrestrial Environment from construction, and operation and maintenance are anticipated to occur during initial site clearing and vegetation management.

Construction

During construction, vegetation clearing will be required in all forested areas, within treed and tall shrub swamp wetlands, and possibly within unclassified areas. Within the PDA of the proposed preferred route, this will result in a change of a minimum of 12.4 ha of vegetation communities and wildlife habitat on the proposed preferred option and 2.6 ha of vegetation communities and wildlife habitat on the alternate option. The amount of habitat cleared through construction activities represents approximately 42.9% of the PDA and 1.1 % of the LAA for the proposed preferred option, and approximately 10.1% of the PDA and 0.23% of the LAA for the alternate option. Transmission line pole placement will also result in the permanent loss of vegetation communities and wildlife habitat; up to 2 m^2 of habitat is expected to be lost within the footprint of each pole structure. The exact number of poles for each route is not currently known.

No vascular plant SAR were identified within either the proposed preferred route or alternate route. There are; however, six vascular plant SOCC within the PDA of the proposed preferred route, and seven vascular plant SOCC within the PDA of the alternate route. Site preparation and excavation could potentially adversely affect plant SOCC's present along the route; however, the application of appropriate mitigative measures will eliminate or greatly reduce these potential adverse affects.

On the proposed preferred route, where possible, the transmission line poles will be shifted so that limited tree clearing in forested areas is required. If this is not feasible, forest clearing will occur during the winter months when the ground is frozen to minimize ground disturbance and damage to the plants. Poles will be placed to minimize the number of plants lost to construction activities.

Operation and Maintenance

Operation and maintenance activities, such as vegetation maintenance, will result in the regular disturbance of vegetation communities and wildlife habitats that will have previously been disturbed during construction activities. Herbaceous vascular plant SOCC that were flagged and avoided during construction activities will continue to be avoided during operation and maintenance.

The presence of the transmission line during operation and maintenance may result in wildlife mortality through avian collisions. The Project is located near two waterfowl staging areas (Noonan's Marsh and Amherst Cove Marsh). The proposed transmission line is located between 200 and 300 m from areas where waterfowl would be expected to congregate. According to Quinn et al. (2011) this is within the zone where collisions with wires can be expected to occur (500 m from open water) but outside of the zone where high frequencies of collisions can occur (<60 m from open water). The implementation of mitigation such as line marking to increase visibility, changes in line configuration to place all wires at the same height, will minimize the incidence of bird collisions.

Decommissioning

If the proposed preferred route is selected for Y-109 and decommissioning of the T-3 line occurs, decommissioning is unlikely to result in adverse environmental effects on the Terrestrial Environment. Access for decommissioning would occur via the adjacent existing roadways and no additional clearing would be required to decommission the T-3 structures, thus reducing the potential for disturbance to vegetation. Vascular plants along the PEITIE RoW currently inhabit disturbed habitats and the minor disturbance to roadside vegetation during decommissioning is not anticipated to result in a loss of vascular plant SOCC.

While it is possible that birds, may build nests on or in Project components such as transmission line poles, there is no evidence of osprey nests on T-3 poles, and the proximity of poles to the Trans-Canada highway reduces the likelihood that the poles are being used by woodpeckers. Maritime Electric will reduce the potential for interactions between the Project and the Terrestrial Environment during the decommissioning of Line T-3 by adhering to best management practices such as the mitigation measures outlined for construction and operation and maintenance phases of the Project, including avoiding peak breeding bird seasons. These mitigation measures, combined with the fact that the decommissioning will occur adjacent to an existing highway in disturbed habitats, are anticipated to reduce the potential environmental effects on wildlife from sensory disturbance.

After the structures are decommissioned, Maritime Electric will allow for natural revegetation when possible, and when not possible, use a native seed mix for revegetation. These reclamation activities will result in an increase in native vegetation communities and wildlife habitat in time, offsetting the environmental effects from the relocation of T-3.

4.7.3 Change in Wetland Area or Function

A change in wetland area or function may result from interactions between the Terrestrial Environment and the Project during construction, and operation. The assessment of change in wetland area or function defines the Project environmental effect pathways for each phase of the Project, the mitigation measures to be put in place to reduce environmental effects on wetland area or function and the resulting residual environmental effects, whether the effects are positive or negative.

4.7.3.1 Project Environmental Effects Pathways

Construction

During construction activities such as site preparation, vegetation clearing will be required in treed and tall shrub swamp wetlands. This will cause a change in community composition within these wetlands, and will change their wetland type.

During site preparation and the installation of Project components, compaction or removal of wetland soils during pole installation in wetlands can result in changes to wetland hydrology. As described in Section 4.7.2.1 for all vegetation communities, wetland communities could also change as a result of edge effects resulting from vegetation clearing. The potential influx of invasive and exotic plants is often exacerbated in wetland habitats.

Wetlands will be avoided during pole placement, where and if feasible. If avoidance of wetlands is not feasible, poles placed in wetlands will result in the permanent loss of wetland area within the pole footprint.

Operation and Maintenance

As with other vegetation communities, vegetation maintenance could result in the regular disturbance of wetland habitats that will have previously been disturbed during construction activities. Herbaceous vascular plant SOCC in wetlands and on wetland edges that were flagged and avoided during construction activities will continue to be avoided during operation and maintenance.

4.7.3.2 Mitigation

The following section outlines proven mitigation, and industry best management practices, most of which is included in. The following measures will be implemented to reduce the environmental effects of the interactions between the Project and the Wetland Area and Function during all stages of the Project:

- pole placement within wetlands will be avoided where feasible and the placement of ground-based infrastructure such as poles, anchors and substation components will be placed in locations to not detract from wetland function
- employ minimum 15 m buffer zone around wetlands (i.e., PEIDCLE buffer zone setback) will be implemented, where feasible
- poles placed in wetlands will require authorization under the Watercourse, Wetland and Buffer Zone regulations and compensation according to the Wetland Conservation Policy for Prince Edward Island
- employ standard erosion and sedimentation control measures to avoid silt laden runoff entering wetlands
- restrict travel through wetlands for inspection or maintenance activities
- implement standard dust control measures to avoid siltation of wetlands
- manage invasive species through minimizing operation activities in wetland areas and clean equipment before entering a wetland

4.7.3.3 Characterization of Project Residual Environmental Effects for Wetland Area and Function

Construction

During construction, vegetation clearing will be required in treed and tall shrub swamp wetlands. Within the PDA of the proposed preferred route, this will result in a change of 0.4 ha of tall shrub swamp, 0.9 ha of hardwood treed swamp and 0.03 ha of mixed wood treed swamp for a total of 1.33 ha of wetland. The alternate route would also result in change to 1.33 ha of wetland including 0.9 ha of shrub swamp, 0.4 ha of hardwood treed swamp and 0.03 ha of mixed wood treed swamp

If, during pole placement, avoidance of wetlands is not feasible, poles placed in wetlands will likely require compensation according to the Wetland Conservation Policy for Prince Edward Island. Each pole could result in the permanent loss which is typically less than 2 m^2 of wetland habitat.

Operation and Maintenance

Operation and maintenance activities, such as vegetation maintenance, will result in the regular disturbance of vegetation within wetlands that will have previously been disturbed during construction activities.

4.7.4 Summary of Residual Project Environmental Effects

The residual Project environmental effects for the Terrestrial Environment described above are summarized in Table 4.9.

Table 4.9 Summary of Project Residual Environmental Effects on the Terrestrial Environment

Residual Environmental Effect	Residual Environmental Effects Characterization							
	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological and Socioeconomic Context
Change in Vegetation or Wildlife (Proposed preferred Route)	C	A	L	LAA	MT	S	R	D
	O	A	L	PDA	LT	R/C	R	D
	D	A	L	LAA	ST	S	R	D
Change in Vegetation or Wildlife (Alternate Route)	C	A	L	LAA	MT	S	R	D
	O	A	L	PDA	LT	R/C	R	D
Change in Wetland Area or Function (Proposed preferred Route)	C	A	L	LAA	MT	S	R	D
	O	A	L	PDA	LT	R/C	R	D
Change in Wetland Area or Function (Alternate Route)	C	A	L	LAA	MT	S	R	D
	O	A	L	PDA	LT	R/C	R	D

KEY
See Table 4.2 for detailed definitions.
Project Phase:
C: Construction
O: Operation
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
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

4.8 DETERMINATION OF SIGNIFICANCE

The construction phase of the Project will result in temporary and permanent disturbance to the vegetation communities and wildlife habitat (including wetlands) within the PDA of both the proposed preferred route, and to a lesser extent, the alternate route. The total amounts of habitat that will be changed within the PDA are relatively low relative to the amounts of these habitats within the LAA, particularly for the alternate route. The implementation of mitigation is expected to allow the plant SOCC populations identified in the proposed preferred route and alternate route to persist. The Project is not expected to have any permanent interactions with populations of vascular plant SOCC within the Project LAA for either route. Any permanent loss of wetland resulting from pole placement within wetlands (if it occurs) will be compensated for; therefore, no permanent loss of area or net loss of function is expected. The operation and maintenance phase of the Project will result in limited changes to vegetation, wildlife, and wetlands, through vegetation clearing and some soil disturbance (during pole removal) of previously disturbed areas. Decommissioning of T-3, if required, will result in temporary alteration of vegetation adjacent to the Trans-Canada highway and local roads. Based on the disturbed ecological context in which the T-3 line currently exists, additional disturbance to wildlife is not expected, with the exception to birds using the T-3 structures to nest, which is unlikely. With the mitigation and environmental protection measures provided, the residual Project environmental effects on the Terrestrial Environment from the Project in both the proposed preferred and alternate transmission line routes and the decommissioning of T-3 are predicted to be not significant.

4.8.1 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.

4.9 FOLLOW-UP AND MONITORING

No additional follow-up or monitoring is required.

5.0 ASSESSMENT OF 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 of nature associated with weather, climate, climate change, seismic activity, or forest fires. 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 economic viability.

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. Maritime Electric will monitor any observed effects of the environment on the Project, and act, as necessary, to repair and upgrade Project infrastructure and modify operations to permit the continued safe operation of the facility.

5.1 REGULATORY POLICY AND SETTING

Effects of the environment on the Project is included in the assessment based on professional judgement and experience with other similar recent projects in PEI. In addition, the assessment includes a discussion relating to future climate conditions to address previous requests from the PEI CLE that such conditions be considered by proponents.

5.2 POTENTIAL EFFECTS AND PATHWAYS

Potential effects of the environment relevant to conditions potentially found in PEI include:

- climate and climate change considerations, including severe weather as measured by parameters including air temperature, precipitation, winds, and extreme weather events (e.g., ice storms, electrical storms, hurricanes)
- flooding
- seismic activity
- forest fire(s) from natural causes

These natural forces may result in the following effects of the environment on the Project:

- reduced visibility and inability to maneuver construction equipment;
- delays in receipt of construction materials or in carrying out construction activities
- increased structural loading and damage to infrastructure
- combustion of wooden structures, perhaps weakening structures and potentially leading to malfunctions or inability to transfer power to the grid

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

- change in Project schedule
- damage to infrastructure

5.3 BOUNDARIES

5.3.1 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, the spatial boundaries for effects of the environment on the Project are limited to the Project, as defined in Section 2.0.

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 adverse effects of the environment (e.g., from spills or other releases to the environment) are addressed in Section 6.0.

5.3.2 Temporal Boundaries

The temporal boundaries for the assessment of the potential effects of the environment on the Project include:

- construction – scheduled to begin for Y-109 in the summer of 2018 and be completed by then end of 2018 (if the preferred route is selected the relocation of T-3 will begin in fall or winter 2019)
- operation and maintenance – operation of Y-109 scheduled to begin in late 2018 and continue for the useful service life of the transmission line, (If the preferred route is selected operation of T-3 will begin in 2019)
- Decommissioning (T-3 only if preferred route is selected) - scheduled to begin after the completion of T-3 relocation component in 2019.

Decommissioning and abandonment for Y-109 will occur following the useful service life of the transmission line, and will be carried out in accordance with regulations in place at that time.

5.4 SIGNIFICANCE DEFINITION

A significant adverse residual environmental 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)
- damage to the Project infrastructure resulting in a substantial increase in a health and safety risk to the public
- damage to the Project infrastructure (e.g., a road washout or a structure failure) resulting in an unscheduled interruption
- damage to the Project infrastructure resulting in repairs that could not be technically or economically implemented

5.5 EXISTING CONDITIONS FOR EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Existing conditions are described for climate (including weather), seismic history, and forest fire activity. Climate change is discussed in Section 5.6.1.

5.5.1 Climate

Climate is defined as the statistical average (mean and variability) of weather conditions over a substantial period of time (typically 30 years), and an accounting of the variability of weather during that period (Catto 2006). Climate change is an acknowledged change in climate that has been documented over two or more periods, each with a minimum of 30 years (Catto 2006). The relevant parameters used to characterize climate are most often surface weather variables such as temperature, precipitation, and wind, and others such as storm frequency.

The current climate conditions are generally described by the conditions of the most recent 30-year period (1981 to 2010) for which the Government of Canada (2017a) 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, is also used to supplement information on regional conditions.

5.5.1.1 Air Temperature and Precipitation

The average monthly temperature in Summerside has ranged between -7.7 °C (January) and 19.2 °C (July). Extreme maximum temperature ranges from -29.9 °C (January 1982) to 33.3 °C (July 1963 and August 1964) (Government of Canada 2017a).

Summerside averages 1,072.9 mm of precipitation per year, of which, approximately 809.1 mm falls as rain and 277.9 cm as snow. 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 2017a).

Table 5.1 Air Temperature and Precipitation Climate Normals, 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)	Extreme Temperature (°C)				Snowfall (cm)		Rainfall (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 2017a, 2017b

5.5.1.2 Wind

Monthly average wind speeds measured at the Charlottetown weather station range from 13.3 (August) to 18.6 km/h (December). 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-southwest from May to September (Government of Canada 2017b).

Maximum hourly wind speeds measured at the Summerside weather station range from 64 km/h (July) to 121 km/h (January), while maximum gusts for the same period range from 98 km/h to 145 km/h (Government of Canada 2017a). Occurrences of extreme winds are uncommon on PEI; over the last three decades, at Charlottetown 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 2017b).

Figure 5.1 Predominant Monthly Wind Direction, Maximum Hourly, and Maximum Gust Wind Speeds (1981 to 2010) at Summerside, PE

5.5.1.3 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 across PEI (University of Prince Edward Island 2015).

Tornadoes are rare, but do occur in PEI. According to the National Research Council 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 can sustain or strengthen thunderstorms as they travel across the Strait to PEI (NAV CANADA 2000).

5.5.1.4 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).

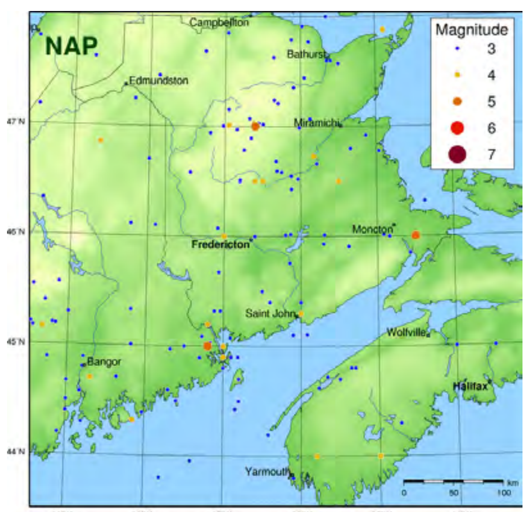
The province of PEI is vulnerable to coastal flooding from storm surges and sea level rise (NRCan 2014). On January 21, 2000, a storm surge in conjunction with a high tide produced water levels of 4.23 m above chart datum in Charlottetown. There was damage to wharves, a lighthouse was removed from its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

5.5.2 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 (NRCan) 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.

The closest seismic zone to the Project is the Northern Appalachians seismic zone (see Figure 5.2) (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.

PEI does not lie within a seismic zone (Government of PEI 2010); therefore, seismic activity is not further assessed.



Source: NRCan 2013

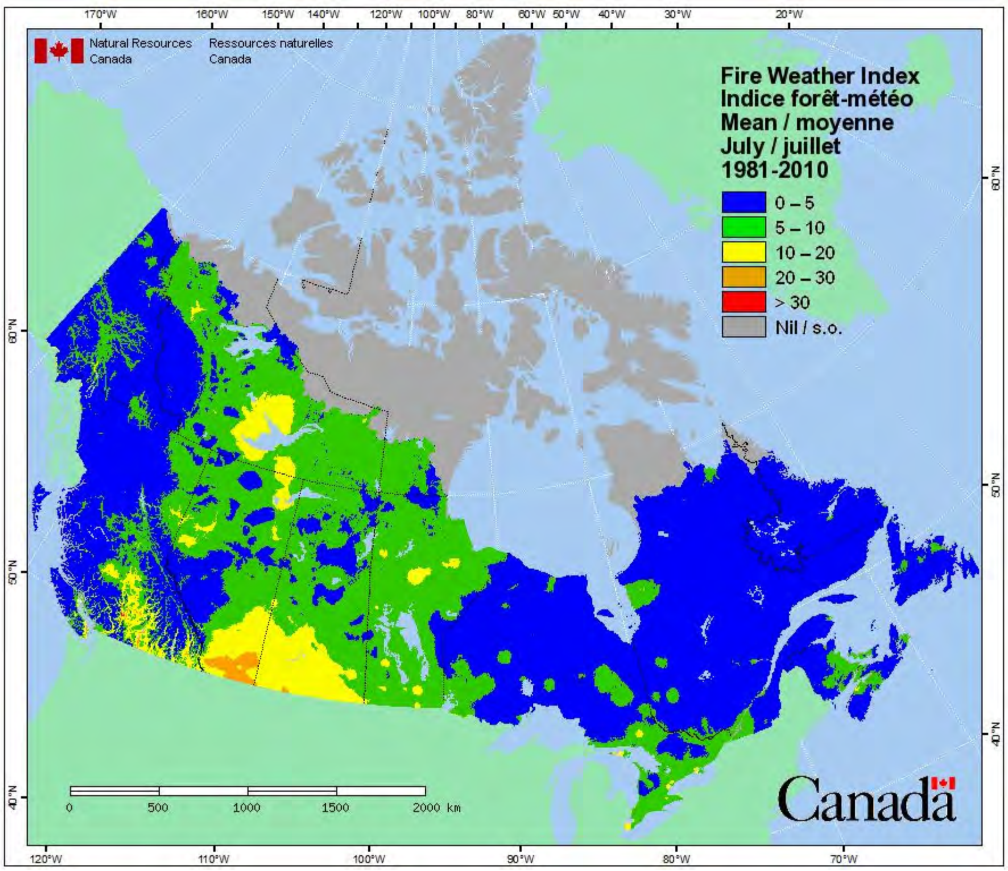
Figure 5.2 Northern Appalachians Seismic Zone

5.5.3 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 (NRCan 2017).

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 (PEI CLE 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 5.3). This is in the lower range of possible risk which, at the highest range, can exceed 30 on the Fire Weather Index (NRCan 2017).



Source: Natural Resources Canada 2017

Figure 5.3 Average Fire Weather Index for the Month of July (1981-2010)

The province of PEI has 40 fire departments (Government of PEI 2007). The Summerside station is directed by a Deputy Chief and has 38 firefighters; there is also a small fire department located in Borden-Carleton.

5.6 ASSESSMENT OF RESIDUAL EFFECTS OF THE ENVIRONMENT ON THE PROJECT

5.6.1 Effects of Climate on the Project

In assessing the potential effects of the environment on the Project, both current climate and climate change must be considered.

As discussed in Section 5.5.1, while climate is defined as average weather conditions over 30 years, climate change is the change in climate over two or more 30-year periods (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.

A combination of observed trends, theoretical understanding of the climate system, and numerical modeling demonstrates that global warming is increasing the risk of extreme weather events today (Huber and Gulledge 2011). Numerous climate-related conditions, linked primarily to global warming, have been observed across Atlantic Canada and globally. Many believe that these changes to the climate regime will accelerate over the next century, as has occurred with global temperatures over the past two decades (IPCC 2007). For example, increased temperatures, and changing precipitation patterns and intensity, could lead to more storm events, increasing storm intensity, rising sea levels, storm surges, and coastal erosion and flooding, all of which could affect infrastructure. Those most relevant to the Project over the next 50 to 100 years are changing precipitation patterns, and increased number and intensity of extreme storms (Vasseur and Catto 2008).

Predicting the future environmental effects of climate change for a specific area using global data sets is problematic due to generic data and larger scale model outputs that do not consider local climate. The Canadian Climate Change Scenarios Network (CCCSN) combined data from 24 international climate models to calculate new projections for Canada (CCCSN 2009). This ensemble approach (multi-model means/medians) has been demonstrated to likely provide the best projections for climate change because using a mean or median of many models reduces the uncertainty associated with any individual model. The mean monthly temperature and precipitation values were predicted for three levels of projected climate change (low, moderate, and high) for the period of 2041-2070 compared to the baseline period of 1961-1990 (CCCSN 2009).

The overall mean annual maximum temperature increases projected, under the ‘high’ scenario, for PEI between years 2041 and 2070 range from 2.4°C to 2.7°C. The projected increases in average summer and winter temperatures for the Borden-Carleton area are 2.4°C and 3.1°C, respectively (CCCSN 2009).

The overall mean changes in annual average precipitation (% increase) projected, under the ‘high’ scenario, for PEI between years 2041 and 2070 range from 2.66% to 5.11% increase. The projected increases in average summer and winter precipitation for the Borden-Carleton area are 0.97% and 6.92%, respectively (CCCSN 2009).

Climate change predictions include increased temperature, and precipitation, changes in seasonal patterns, along with the possible increase in magnitude and frequency of extreme weather events (Government of New Brunswick 2017). PEI has already been affected by increased temperatures and extreme weather events, and will continue to be affected in the future as today’s trends continue.

Considering the potential pathways of effects related to current climate and climate change, and based on the data reviewed, the most relevant and important pathways to assess here are the effects of severe weather on the Project.

5.6.1.1 Project Pathways for Effects of Climate on the Project

The potential effects of climate and climate change, or more specifically severe weather, must be considered during infrastructure development. Extreme temperatures and severe precipitation, fog and visibility, winds and extreme weather events could potentially cause:

- reduced visibility and inability to manoeuvre 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 malleability 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. 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 Section 6.0.

During operation, the PDA could experience heavy rain, snowfall and freezing rain events that can cause an interruption of services such as highway closure, or a delay in travel.

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 may arise in electrical systems, potentially resulting in danger to personnel and damage to infrastructure. This 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 Section 5.5.3 for a discussion of fire as an accidental event).

Effects of climate on the Project during decommissioning of T-3 is anticipated to be similar to effects encountered during construction. Including low temperatures, snow/ice loading, precipitation, and wind storm events.

5.6.1.2 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 effects of severe weather will be further mitigated through:

- careful and considered design in accordance with factors of safety, best engineering practice, and adherence with standards and codes
- engineering design practices that will consider predictions for climate and climate change
- inspection and maintenance programs that will reduce the deterioration of the infrastructure and will help to maintain compliance with applicable design criteria and reliability of the transmission system

Further to responsible design and construction of the Project, and ongoing inspection and maintenance, the selection of materials that are able to withstand temperatures and loads will more than adequately address climate concerns. The selection of materials that withstand potential environmental stressors related to climate will include engineering specifications that contain design specific provisions, such as:

- critical structures (e.g., power lines, transmission structures, guy wires) will be constructed with resilient materials to prevent brittle fracture at low ambient temperature conditions
- critical structures, to the extent possible, will be constructed to withstand the structural loading expected with high winds and weight associated with ice and snow
- winterization and freeze protection

5.6.1.3 Residual Environmental Effects of Climate on the Project

The potential effects of climate and climate change on the Project during the construction, operation and maintenance, and decommissioning phases will be considered and incorporated in the planning and design of Project infrastructure. This will be done to reduce the potential for a change in Project schedule, or damage to infrastructure, by considering predictions for climate change in the region and considering 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 line. Significant residual adverse effects of climate on the Project, or interruption to the Project schedule, are not anticipated.

5.6.2 Effects of Forest Fires on the Project

5.6.2.1 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 manoeuvre 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 reduced visibility at night

5.6.2.2 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. If a forest fire were to break out in direct proximity to the Project, emergency measures would be in place during construction, and operation and maintenance to quickly control and extinguish the flames prior to contact any flammable structures (i.e., wood). Project personnel would conduct an immediate assessment of the fire scene and risks associated with containing any spread, and extinguishing the fire. If deemed safe, site personnel would attempt to contain and extinguish the fire. Even if Project 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).

5.6.2.3 Residual Environmental Effects of Forest Fires on the Project

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, significant residual adverse effects of forest fires on the Project, or interruption to the Project schedule, are not anticipated.

5.7 DETERMINATION OF SIGNIFICANCE

The effects of the environment on the Project are considered in all infrastructure decisions, including the design, construction, operation and maintenance and decommissioning of the Project. The Project will be designed, constructed, and operated to maintain safety, integrity, and reliability in consideration of existing and reasonably predicted environmental forces in PEI. Given the mitigation measures described above, 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

Maritime Electric 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.

6.0 ACCIDENTS, MALFUNCTIONS, AND UNPLANNED EVENTS

This section provides an assessment of selected accidents, malfunctions, and unplanned events potentially associated with Project components and activities that, if they occurred, could result in adverse environmental effects.

6.1 APPROACH

Based on knowledge of the Project, past experiences, and studies, the assessment of accidents, malfunctions, and unplanned events focuses specifically on credible accidents that have a reasonable probability of occurrence, and for which the resulting environmental effects could potentially be significant.

The general approach to assessing the potential environment effects of the selected events involves the following:

- consideration of the potential event that may occur during the life of the Project, including its likelihood of occurrence
- description of the safeguards established to protect against such occurrences
- consideration of the contingency or emergency response procedures applicable to the event if it did occur
- significance determination of potential residual adverse environmental effects

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 criteria and definitions are the same as those for each VC.

6.2 IDENTIFICATION OF KEY 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
- hazardous materials spill
- vehicle accident
- erosion prevention and/or sediment control failure

The VCs in Section 3.2 with reasonable potential to interact with these scenarios causing adverse environmental effects include:

- freshwater environment
- groundwater resources
- terrestrial environment
- heritage resources
- current use of land and resources of traditional purposes by Indigenous persons
- socioeconomic environment

Table 6.1 Potential Interactions between Project Activities and Accidents, Malfunctions, or Unplanned Events

Accident, Malfunction, or Unplanned Event	Freshwater Environment	Groundwater Resources	Terrestrial Environment	Heritage Resources	Current Use of Land and Resources for Traditional Purposes by Indigenous Persons	Socioeconomic Environment
Fire			✓			
Hazardous Materials Spill	✓	✓	✓			✓
Vehicle Accident			✓			✓
Erosion Prevention and/or Sediment Control Failure	✓		✓			
Major Loss of Electricity						✓
Discovery of a Heritage Resource				✓	✓	

Interactions between Project activities and selected accidents, malfunctions, and unplanned events are not expected to occur for other VCs.

While not assessed here, the discovery of heritage resources on site during construction is discussed in the EPP for High Powered Transmission Construction in PEI. A contingency plan for the discovery of a heritage resource is included in the EPP.

6.3 FIRE

6.3.1 Potential Fire Event

There is potential that fire could occur during construction or operation; however, the probability is considered low. A fire affecting Project components would likely involve Project infrastructure or a vehicle or other heavy equipment used during construction, maintenance and decommissioning activities, and result in effects on the atmospheric, terrestrial, and socioeconomic environments.

Naturally occurring forest fires are considered an effect the environment could have on the Project and are addressed in Section 6.5.3.

6.3.2 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

In the unlikely event that a fire does occur, Project staff will contact emergency response services immediately.

6.3.3 Potential Environmental Effects and their Significance

If fire were to occur, there is potential for an effect on the atmospheric environment, terrestrial environment, and socioeconomic environment through smoke and destruction of habitats and resulting runoff, and any loss of infrastructure or equipment may influence the socioeconomic environment.

In consideration of planned mitigation and response procedures, the residual adverse environmental effects of a fire are rated as not significant for all potentially affected VCs, given the known and proven techniques and response procedures to be implemented to respond to a fire. However, in the unlikely event that a fire was widespread, there is potential to result in wildlife mortality or destruction of sensitive habitats or public and private infrastructure, which could be considered a significant environmental effect on the terrestrial and socioeconomic environment if species at risk or buildings were to be affected. A significant effect arising from this possibility is considered unlikely.

6.4 HAZARDOUS MATERIALS SPILL

6.4.1 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 and maintenance of Project components 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 transformer.

6.4.2 Risk Management and Mitigation

Response to a hazardous material spill will be carried out as outlined in the Maritime Electric EPP for High Powered Transmission Construction in PEI (Maritime Electric 2013). An Emergency Response Plan (ERP) consistent with those used at Maritime Electric’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 and heavy equipment 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 PEI CLE as per Maritime Electric 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 conducted as required.

6.4.3 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 influence the socioeconomic environment (e.g., demand for emergency services). 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 are rated as not significant for potentially affected VCs.

6.5 VEHICLE ACCIDENT

6.5.1 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 occur irregularly during maintenance operations therefore vehicle accidents are not considered likely. The potential for vehicle-to-vehicle collisions, vehicle accidents with surrounding Project infrastructure, or vehicle collisions with wildlife are again present during the decommissioning of T-3, if required.

If a vehicle accident were to occur, loss or damage to a vehicle, equipment or Project infrastructure could influence 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.

6.5.2 Risk Management and Mitigation

Response to a vehicle accident will be carried out as outlined in the Maritime Electric EPP for High Powered Transmission Construction in PEI (Maritime Electric 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

6.5.3 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 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 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.

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.

6.6 EROSION PREVENTION AND/OR SEDIMENT CONTROL MEASURE FAILURE

6.6.1 Potential Event

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, this would most likely result in the release of sediment-laden runoff to the surrounding environment, with potential adverse environmental effects on freshwater fish and fish habitat, and wetland quality. The terrestrial environment could also be adversely affected by such a failure in terms of soil erosion.

6.6.2 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 Maritime Electric EPP for High Powered Transmission Construction in PEI (Maritime Electric 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

These measures will be reviewed during the detailed engineering phase of Project design. Chosen measures will be installed as per the EPP 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, the dispersion of sediment would be controlled to isolate the affected area from unaffected habitat prior to repairing the source of the failure.

6.6.3 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 an erosion prevention and/or sediment control failure are rated to be not significant for potentially affected VCs.

6.7 MAJOR LOSS OF ELECTRICITY

6.7.1 Potential Event

Loss of transmission line would result in loss of electricity for central PEI. A major loss of electricity has the potential to affect the socioeconomic environment through lost time for employers.

6.7.2 Risk and Mitigation

Maritime Electric will implement risk management and mitigation procedures for the Project to avoid loss of electrical transmission. Periodic line inspections will be conducted to reduce the probability of damage to the transmission lines and an associated loss of electricity to central PEI.

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 central PEI:

- vegetation management activities will be carried out within the transmission line corridor to prevent damage to lines from falling trees
- 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 Maritime Electric system
- comply with North American Electric Reliability Corporation (NERC) Reliability Standards

If a major loss of electricity were to occur, Maritime Electric would make use of other infrastructure and reroute electrical supplies to provide power to customers until damage could be repaired.

6.7.3 Potential Environmental Effects and their Significance

A disruption in electricity service could have important socioeconomic consequences for central PEI residents depending on the length of the outage. The use of other existing infrastructure would likely reduce the length of any outage. These electricity sources would be in place until repairs 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.

6.8 DISCOVERY OF A HERITAGE RESOURCE

6.8.1 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.

6.8.2 Risk Management and Mitigation

Field staff will be trained to respond to the discovery of a heritage resource as per the Maritime Electric EPP for High Powered Transmission Construction in PEI (Maritime Electric 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 Maritime Electric immediately. Work in the area will 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.

6.8.3 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. In the event that a heritage resource is discovered, Project work will cease in the immediate area of the discovery and the socioeconomic environment may be affected as a result.

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.

6.9 DETERMINATION OF SIGNIFICANCE

Maritime Electric has developed environmental protection plans, contingency plans, and emergency response plans 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.

7.0 SUMMARY

In this EIS, Stantec conducted an EIA of the Proposed Line Y-109 Borden-Carleton Substation Transmission Line Project (the "Project") proposed by Maritime Electric Company, Limited (Maritime Electric). The Project involves re-routing a 138 kilovolt (kV) overhead transmission line from Line Y-109 near Maple Plains, through Albany, terminating at Borden-Carleton, Prince County, PE. Two route options have been developed for assessment. Both route options were assessed in this EIS. If the proposed route for Y-109 is selected, Maritime Electric proposes to relocate line T-3 into the Y-109 RoW and decommission the existing T-3 line which runs along the Trans-Canada Highway. Should the alternative option be selected for Y-109, line T-3 would be rebuilt in place along the Trans-Canada Highway

7.1 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

An EIA of the Project components and activities 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 and maintenance of the Project, but excluded the end uses of the electricity. Environmental effects were assessed for each phase of the Project (i.e., construction, and operation), 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

The terrestrial environment was the one VC identified for detailed assessment. This was identified by the study team (based on experience and professional judgment) as being the key VC 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.

It was concluded that the potential environmental effects of the Project on the Terrestrial Environment would be not significant during each phase of the Project and for the activities to be conducted as part of the Project. This conclusion was 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 this environmental assessment, it is concluded that, with planned mitigation, the residual environmental effects from the proposed preferred and alternate routes are rated not significant, though environmental effects will be further limited in selecting the alternate route. Both routes have different potential effects to the environment. The proposed preferred route is shorter in length than the alternate route (11.3 km vs. 11.6 km) and passes by fewer residences, through the use of an unused PEITIE RoW. The alternate route lies mostly within existing roadways and Maritime Electric property. This results in less vegetation clearing in forested areas and therefore less change in vegetation communities and wildlife habitat as compared to the proposed preferred route (2.7 ha vs. 12.4 ha). Both transmission line routes would span watercourses encountered within the project footprint with access along both routes provided via the existing roadways or watercourse crossings. The use of existing access would reduce the amount of riparian vegetation removal required. No heritage resource (archaeological) monitoring has been suggested for either route indicating a low potential for heritage resources to be identified during construction.

8.0 CLOSING

This report has been prepared by Stantec Consulting Ltd. (Stantec) for the sole benefit of Maritime Electric Company, Limited (Maritime Electric). The report may not be relied upon by any other person or entity, other than for its intended purposes, without the express written consent of Stantec and Maritime Electric.

This report was undertaken exclusively for the purpose outlined herein and was limited to the scope and purpose specifically expressed in this report. This report cannot be used or applied under any circumstances to another location or situation or for any other purpose without further evaluation of the data and related limitations. Any use of this report by a third party, or any reliance on decisions made based upon it, are the responsibility of such third parties. Stantec accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

Stantec makes no representation or warranty with respect to this report, other than the work that was undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. Any information or facts provided by others and referred to or used in the preparation of this report were assumed by Stantec to be accurate. Conclusions presented in this report should not be construed as legal advice.

The information provided in this report was compiled from existing documents and data provided by Maritime Electric and by applying currently accepted industry standard mitigation and prevention principles. This report represents the best professional judgment of Stantec personnel available at the time of its preparation. Stantec reserves the right to modify the contents of this report, in whole or in part, to reflect any new information that becomes available. If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

9.0 REFERENCES

AC CDC (Atlantic Canada Conservation Data Centre). 2016. About the AC CDC. Available at: http://AC CDC.com/en/about-us.html. Accessed: August 26, 2016.

AC CDC. 2017a. Understanding Ranks. Available at: http://www.AC CDC.com/en/rank-definitions.html. Accessed: September 20, 2017.

AC CDC. 2017b. Data Report 5856: Borden, PE. Prepared: May 19, 2017.

Agency of Natural Resources Vermont. 2015. Pentachlorophenol Report. Response to PSB Docket #8310.

APLIC (Avian Power Line Interaction Committee). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.

Avery, M., P.F. Springer, and J.F. Cassel. 1976. The effects of a tall tower on nocturnal bird migration-a portable ceilometer study. The Auk 93(2): 281-291.

Batáry and Báldi. 2004. Evidence of an Edge Effect on Avian Nest Success. Conservation Biology. Volume 18, No. 2, April 2004. Available at: http://www.okologia.mta.hu/sites/default/files/Batary%20Baldi_Conserv%20Biol%202004.pdf. Accessed: September 20, 2017.

Bernier, N., J. MacDonald, J. Ou, H. Ritchie, and K. Thompson. 2006. Storm surge and meteorological modelling. In Impacts of Sea Level Rise and Climate Change on the Coastal Zone of South Eastern New Brunswick, (ed.) R. Daigle, D. Forbes, G. Parkes, H. Ritchie, T. Webster, D. Bérubé, A. Hanson, L. DeBaie, S. Nichols and L. Vasseur, Environment Canada, 613 pp.

Bevanger, K. Biological and conservation aspects of bird mortality caused by electricity power lines: a review. Biol. Conserv. 86:67-76.

Bibby, C.J., N.D. Burgess, D.A. Hill, and S. Mustoe. 2000. Bird Census Techniques. Second Edition. Academic Press, London.

Bindoff, N.L., J. Willebrand, V. Artale, A, Cazenave, J. Gregory, S. Gulev, K. Hanawa, C. Le Quéré, S. Levitus, Y. Nojiri, C.K. Shum, L.D. Talley and A. Unnikrishnan. 2007. Observations: Oceanic Climate Change and Sea Level. In Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Avery, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Available online at http://ipcc-wg1.ucar.edu/wg1/wg1- report.html.

Bird Nature. Nd. Migration Flyways: Atlantic Flyway. Available at: http://birdnature.com/upperatlantic.html. Accessed: July 30, 2015.

BSC (Bird Studies Canada). 2016. NatureCounts Website. Available at: www.birdscanada.org/birdmon/. Accessed: August 26, 2016.

BSC (Bird Studies Canada). 2016. NatureCounts Website. Available at: www.birdscanada.org/birdmon/. Accessed: August 26, 2017.

Calvert, A. M., C. A. Bishop, R. D. Elliot, E. A. Krebs, T. M. Kydd, C. S. Machtans, and G. J. Robertson. 2013. A synthesis of human-related avian mortality in Canada. *Avian Conservation and Ecology* **8**(2): 11.

CAN/CSA-C88-M90 (R2014) - Power Transformers and Reactors.

Canada's Historic Places. No date (n.d.). The Canadian Register. Available at: http://www.historicplaces.ca/en/pages/register-repertoire.aspx. Accessed: October 25, 2017.

Canadian Energy Pipeline Association and Stantec. 2013. Migratory Birds Convention Act: A Best Management Practice for Pipelines. Draft September 2013. Available at: http://www.cepa.com/wp-content/uploads/2014/01/Migratory-Birds-Sept-26-2013-for-Publication.pdf.

CWS (Canadian Wildlife Service). 2016. Canadian Nightjar Survey Protocol. Draft – April 2016.

Catto, N.R. 2006. Impacts of Climate Change and Variation on the Natural Areas of Newfoundland and Labrador. Newfoundland Ministry of Environment and Conservation, St. John's NF, 160 pp.

CCCSN (Canadian Climate Change Scenarios Network). 2009. Ensemble Scenarios for Canada, 2009. Adaptation and Impacts Research Section, Environment Canada. Available online at: http://www.cccsn.ec.gc.ca/?page=ensemblescenarios-2050s. Accessed on June 29, 2017.

Cornell Lab of Ornithology. 2015. All About Birds. Available at: http://www.allaboutbirds.org/Page.aspx?pid=1189. Date updated: 2015. Accessed: August 24, 2016.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007a. COSEWIC assessment and status report on the Common Nighthawk Chordeiles minor in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007b. COSEWIC assessment and status report on the Olive-sided Flycatcher *Contopus cooperi* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2013. COSEWIC assessment and status report on the Little Brown Myotis *lucifugus*, Northern Myotis *septentrionalis* and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxiv + 93 pp.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2017. Wildlife species assessments (detailed version): evening grosbeak. Available online at: http://www.cosewic.gc.ca/default.asp?lang=en&n=46386B2D-1

Daigle, R., D. Forbes, G. Parkes, H. Ritchie, T., Webster, D. Bérubé, A. Hanson, L. DeBaie, S. Nicholos, and L. Vasseur (ed). 2006. Impacts of Sea Level Rise and Climate Change on the Coastal Zone of South Eastern New Brunswick. Environment Canada, 613 pp.

DUC (Ducks Unlimited Canada) 2012. Annual Report 2012. Available online at http://www.canards.ca/assets/2012/06/duc-annualreport2012-full.pdf

ECCC (Environment and Climate Change Canada). 2017a. Avoidance Guidelines. Available online: https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=AB36A082-1. Last accessed: September 20, 2017.

ECCC (Environment and Climate Change Canada). 2017b. Breeding Bird Survey Results. Available online: https://wildlife-species.canada.ca/breeding-bird-survey-results. Last accessed August 15, 2017.

ECCC (Environment and Climate Change Canada). 2017c. General Nesting Periods of Migratory Birds in Canada. Available at: https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1#_04. Accessed: March 3, 2016.

Environment Canada and CITW (Canadian Institute of Treated Wood). 1999. Recommendations for the Design and Operation of Wood Preservation Facilities. Available at: http://www.ec.gc.ca/inrpnpri/default.asp?lang=En&n=29B3E589-1&offset=2&toc=show. Accessed: August 8, 2017.

Environment Canada. 2004. Industrial Treated Wood Users Guidance Document. Prepared by the Wood Preservation Strategic Options Process' Guideline Development Working Group. Version 1 – September 2004. Available at: http://www.electricity.ca/media/pdfs/environmental/wood_preservation/UGD_eng.pdf. Accessed: August 8, 2017.

Environment Canada, 2014. General Nesting Periods of Migratory Birds in Canada. Available at: https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1#_04. Accessed: August 3, 2017.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. US Army Engineer Waterways Experiment Station. Vicksburg, Mississippi.

French, Darek A. Town of Borden-Carleton Official Plan

Government of Canada. 1991. The Federal Policy on Wetland Conservation. Minister of Supply and Services Canada, Canadian Wildlife Service, Ottawa, Ontario. Available at:

http://nawcc.wetlandnetwork.ca/Federal%20Policy%20on%20Wetland%20Conservation.pdf. Accessed: September 2, 2017.

Government of Canada. 2016. Glossary. Available online at: http://climate.weather.gc.ca/glossary_e.html. Last accessed on June 29, 2017.

Government of Canada. 2017a. Canadian Climate Normals 1981-2010 Station data – Summerside. http://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnName&txtStationName=summerside&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=6547&dispBack=1. Last accessed on July 4, 2017.

Government of Canada. 2017b. Canadian Climate Normals 1981-2010 Station Data - Charlottetown. http://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnProv&lstProvince=PE&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=6526&dispBack=0. Last accessed on July 4, 2017.

Government of New Brunswick 2017. How is Climate Change Affecting New Brunswick? Available online at: http://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/climate_change/content/climate_change_affectingnb.html. Last accessed on June 29, 2017.

Government of Prince Edward Island. 2007. Fire Departments. Available online at: http://www.gov.pe.ca/infopei/index.php3?number=2472. Last accessed on June 29, 2017.

Government of Prince Edward Island. 2010. Frequently Asked Questions about PEI Nature. Available online at: http://www.gov.pe.ca/infopei/index.php3?number=19654&lang=E. Last accessed on July 4, 2017.

Health Canada. 2009. Response Statement to Public Concerns Regarding Electric and Magnetic Fields (EMFs) from Electric Power Transmission and Distribution Lines. Health Canada, Federal-Provincial-Territorial Radiation Protection Committee. Issued November 8, 2008 and updated August 5, 2009. Available at: http://www.hc-sc.gc.ca/ewh-semt/radiation/fpt-radprotect/emf-cem-eng.php. Accessed: September 12, 2017.

Health Canada. 2011. Heavy Duty Wood Preservatives: Creosote, Pentachlorophenol, Chromated Copper Arsenate (CCA) and Ammoniacal Copper Zinc Arsenate (ACZA). Re-evaluation Decision RVD2011-06

Henderson, L. E., Farrow, L. J. 2009. Summer Distribution and Status of the Bats of Prince Edward Island, Canada. Northeastern Naturalist, 16(1): 131-140.

Hinds, H.R. 2000. Flora of New Brunswick. Second Edition.

Huber, D.G. and J. Gulledge. 2011. Extreme Weather & Climate Change: Understanding the Link and Managing the Risk. Center for Climate and Energy Solutions, December 2011 Available online at: http://www.c2es.orgwww.c2es.org/docUploads/white-paper-extreme-weather-climate-change-understanding-link-managing-risk.pdf. Accessed on January 26, 2017.Independent Electricity System Operator (IESO). 2015. Glossary of Standard Operating Terms, Part 7.6 in Market Manual 7: System Operations. Document ID IMP_GOT_0002.

IPCC (Intergovernmental Panel on Climate Change). 2007. Appendix I: Glossary; in Climate Change 2007: Impacts, Adaptation and Vulnerability (Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change); (ed.) M.I. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson; Cambridge University Press, Cambridge United Kingdom, p. 869-883, Last accessed on June 29, 2017 from https://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-app.pdf.

IPCC (Intergovernmental Panel on Climate Change). 2012. Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, UK, and New York, NY, USA, 582 pp.

Jacques Whitford Environment Limited. 1995. Northumberland Strait Crossing Project: Terrestrial Environmental Effects Monitoring. Prepared for Northumberland Strait Crossing Project, Terrestrial Environmental Effects Monitoring Advisory Committee. January 1995.

Jacques Whitford Environment Limited. 1996. Northumberland Strait Crossing Project: Terrestrial Environmental Effects Monitoring. Prepared for Northumberland Strait Crossing Project. February 29, 1996.

Legal Information Institute, 2015. Legal Encyclopedia. Available at: https://www.law.cornell.edu/wex/. Accessed: August 11, 2017.

Lepage, D. 2014. Second Atlas of Breeding Birds of the Maritime Provinces. Available at: http://www.mba-aom.ca/english/. Accessed: July 29, 2016.

Lines, G.S., M. Pancura, and C. Lander. 2005. Building Climate Change Scenarios of Temperature and Precipitation in Atlantic Canada using the Statistical Downscaling Model (SDSM). Environment Canada, Meteorological Service of Canada, Atlantic Region. Science Report Series No. 2005-9, October 2005.

Lines, G.S., M. Pancura, C. Lander, and L. Titus. 2008. Climate Change Scenarios for Atlantic Canada Utilizing a Statistical Downscaling Model Based on Two Global Climate Models. Environment Canada, Meteorological Service of Canada, Atlantic Region. Science Report Series 2009-1, July 2008.

Longcore, T. and C. Rich. 2004. Ecological light pollution. Frontiers in Ecology and the Environment 2: 191–198.

Migratory Bird Convention Act. 1994. Amended December 2010. Available at: http://laws-lois.justice.gc.ca/eng/acts/M-7.01/page-1.html.

National Research Council Canada. 2011. User's Guide – National Building Code of Canada.

NAV CANADA. 2000. The Weather of Atlantic Canada and Eastern Quebec. Graphic Area Forecast 34. Available online at: http://www.navcanada.ca/EN/media/Publications/Local%20Area%20Weather%20Manuals/LAWM-Atlantic-1-EN.pdf. NRCan. 2010. Potential Impacts: Coastal Sensitivity to Sea-Level Rise. Available online at: http://geogratis.gc.ca/api/en/nrcan-rncan/ess-sst/dc9817c0-8893-11e0-82bc-6cf049291510.html. Last accessed on July 4, 2017.

NOAA (National Oceanic and Atmospheric Administration). No date (nd). Fujita Tornado Damage scale. Available online at: http://www.spc.noaa.gov/faq/tornado/f-scale.html. Last accessed July 4, 2017.

North American Breeding Bird Survey. 2016. Environment and Climate Change Canada. Available at: http://www.birdscanada.org/birdmon/default/main.jsp. Date updated: May 19, 2016. Accessed: August 22, 2016

NRCan (Natural Resources Canada). 2001. The Tides of Change: Climate Change in the Atlantic Provinces. Shaw, J. Geological Survey of Canada, Miscellaneous Report no. 75, 2001; 1 sheet, doi:10.4095/212738.

NRCan (Natural Resources Canada). 2013. Seismic Design Tools for Engineers: Ground Motion Parameters for Use with the National Building Code of Canada. Natural Resources Canada, Ottawa, Ontario. 2013. Available online at: http://www.earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/index-eng.php. Last accessed on July 4, 2017.

NRCan (Natural Resources Canada). 2014. Adapting to sea level rise in Charlottetown, P.E.I. Available online at: https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/mun/pdf/13-0647-Charlottetown_e.pdf. Last accessed on July 4, 2017.

NRCan (Natural Resources Canada). 2017. Canadian Wildland Fire Information System. Available online at: http://cwfis.cfs.nrcan.gc.ca/ha/fwnormals?type=fwi&month=7. Last accessed July 4, 2017.

NWGG (National Wetlands Working Group). 1997. The Canadian Wetland Classification System. University of Waterloo, Waterloo, Ontario. Available at: http://www.gret-perg.ulaval.ca/fileadmin/fichiers/fichiersGRET/pdf/Doc_generale/Wetlands.pdf. Accessed: September 2, 2017.

Ogden, L.J.E. 1996. Collision Course: The Hazards of Lighted Structures and Windows to Migrating Birds. Fatal Light Awareness Program (FLAP) and World Wildlife Fund Canada. Toronto, ON.

Parkes, G.S., Forbes, D.L., and Ketch, L.A. 2006. Sea-level rise and regional subsidence in southeastern New Brunswick; *in* Impacts of Sea Level Rise and Climate Change on the Coastal Zone of Southeastern New Brunswick, (ed.) R. Daigle, R, Forbes. D., Parkes, G., Ritchie, H., Webster, T., Bérubé, D., Hanson, A., DeBaie, L., Nichols, S. and Vasseur, L. Environment Canada, 24-610.

PEI CLE (PEI Department of Communities, Land, and Environment). 2015. Forests, Fire and Wildlife – Wild Fire Information. Available online at: http://www.gov.pe.ca/forestry/wildfires. PEIDELJ. 2011. Coastal Erosion and Climate Change. Available online at: http://www.csrpa.ca/sites/default/files/fichiers/coastal_erosion_and_climate_change_0.pdf. Last accessed on July 4, 2017.

PEIDFAE (Prince Edward Island Department of Fisheries, Agriculture, and Environment). 2003. A Wetland Conservation Policy for Prince Edward Island. Available at: http://www.gov.pe.ca/photos/original/2007wetlands-po.pdf. Accessed: August 30, 2017.

Phillips, D. 1990. The Climate of New Brunswick. In *Climates of Canada*. Minister of Supply and Services Canada.

PIEVC. 2011. The PIEVC Engineering Protocol for Infrastructure Vulnerability Assessment and Adaptation to a Changing Climate. Public Infrastructure Engineering Vulnerability Committee, Engineers Canada. Available online at: http://www.pievc.ca/e/doc_list.cfm?dsid=43.

Prest, V.K. 1973. Surficial Deposits of Prince Edward Island. Geological Survey of Canada. Available at: http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/downloade.web&search1=R=108971. Accessed: July 30, 2016.

Prince Edward Island Department of Environment, Labour, and Justice. 2012. Prince Edward Island Watercourse, Wetland, and Buffer Zone Activity Guidelines. Available at: http://www.gov.pe.ca/photos/original/elj_webpkg.pdf. Accessed: July 20, 2017.

PEIDFAE (Prince Edward Island Department of Fisheries, Agriculture, and Environment). 2003. A Wetland Conservation Policy for Prince Edward Island. Available at: http://www.gov.pe.ca/photos/original/2007wetlands-po.pdf. Accessed: August 30, 2016.

Quinn, M., N. Heck, S. Alexander, and G. Chernoff. 2011. Identification of bird collision hotspots along transmission power lines in Alberta: an expert-based geographic information system (GIS) approach. Journal of Environmental Informatics 18 (I): 12-21

Rioux, S., J.-P.L. Savard, and A. A. Gerick. 2013. Avian mortalities due to transmission line collisions: a review of current estimates and field methods with an emphasis on applications to the Canadian electric network. *Avian Conservation and Ecology 8(2): 7.*

Roland, A.E. and M. Zinck. 1998. Roland's Flora of Nova Scotia. Nimbus Publishing and the Nova Scotia Museum, 1297 pp.

The Ramsar Convention Secretariat. 2014. Country Profiles: Canada. Available at: http://www.ramsar.org/wetland/canada. Accessed: August 30, 2017

Stantec Consulting Ltd. 2013. November 14, 2013. Environmental Protection Plan: High Powered Transmission Construction, Prince Edward Island. Prepared for: Maritime Electric Company, Limited.

Stantec Consulting Ltd. 2015. PEI-NB Cable Interconnection Upgrade Project. Prepared for: Maritime Electric, Company, Limited.

The Ramsar Convention Secretariat. 2014. Country Profiles: Canada. Available at: http://www.ramsar.org/wetland/canada. Accessed: August 30, 2016.

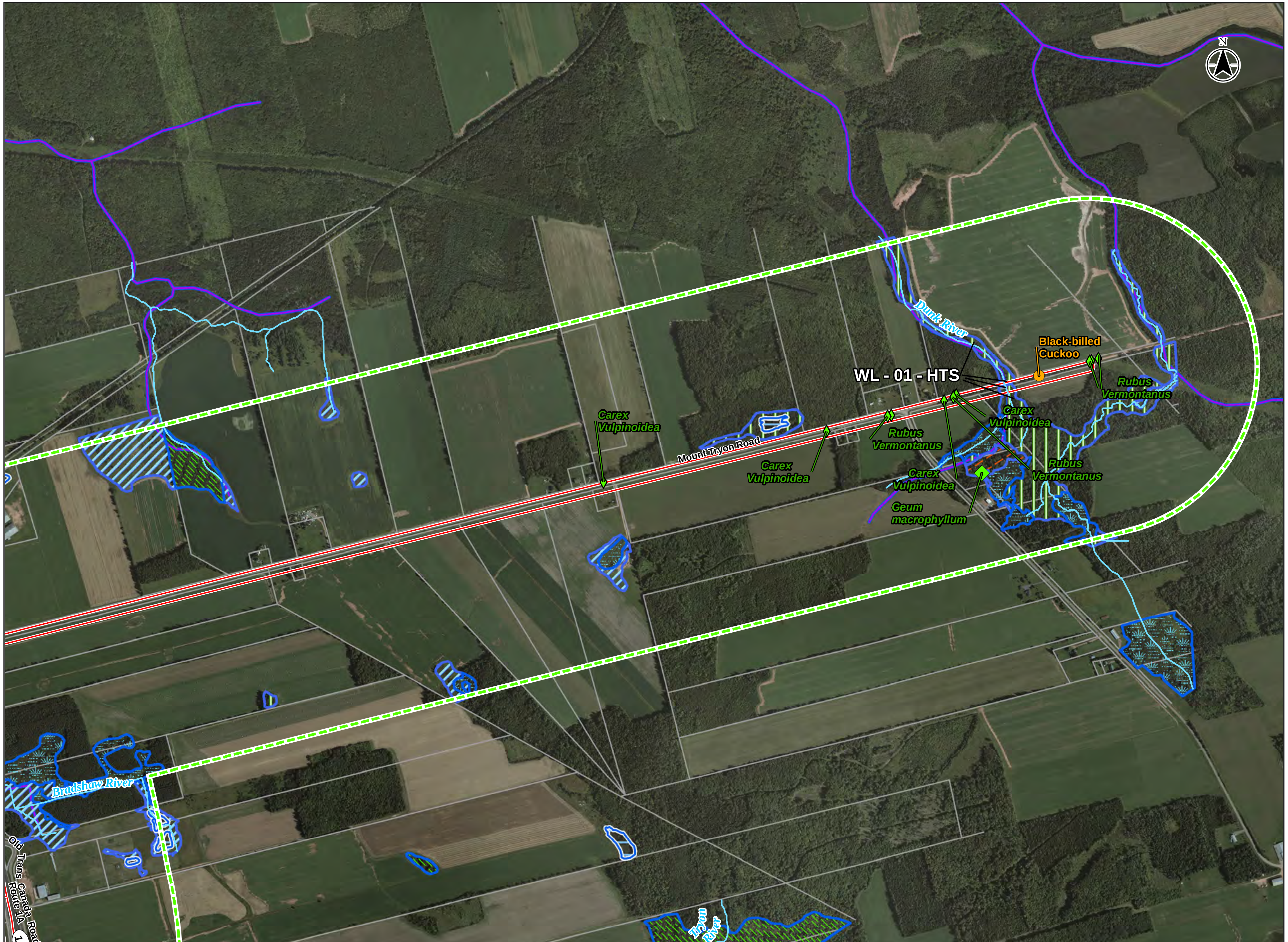
University of Prince Edward Island. 2015. It's Official! 2014-15 Snowiest Winter on Record – UPEI Climate Lab. Available online at: http://projects.upei.ca/climate/2015/04/29/its-official-2014-15-snowiest-winter-on-record/. Last accessed on July 4, 2017.

Vasseur, L. and N. Catto. 2008. Atlantic Canada; From Impacts to Adaptation: Canada in a Changing Climate 2007, edited by D.S. Lemmen, F.J. Warren, J. Lacroix and E. Bush; Government of Canada, Ottawa, ON, p. 119-170.

Wiese, F.K., W.A. Montevecchi, G.K. Davoren, F. Huettmann, A.W.Diamond, and J. Linke. 2001. Seabirds at risk around offshore oil platforms in the North-west Atlantic. Marine Pollution Bulletin 42(12): 1285-1290.

Appendix A TERRESTRIAL MAP BOOK

U:\121812508\gis\figures\general\Route_1_mapbook_v1_update.mxd mmorinsauerteig



Proposed Borden Transmission Line - Preferred Route

Local Assessment Area

Proposed Y-109 Preferred Route

Project Development Area

Proposed Y-109 Common Route

AC CDC Species at Risk (SAR) and Species of Conservation Concern (SOCC)

Bird (SOCC)

Plant (SOCC)

Stantec Field Identified Plant (SOCC)

AC CDC Atlantic Salmon

Property Boundary

Watercourse

Habitat Type

Freshwater Marsh (FM)

Hardwood Treed Swamp (HTS)

Mixedwood Treed Swamp (MTS)

Shallow Water Wetland (SWW)

Shrub Swamp (SS)

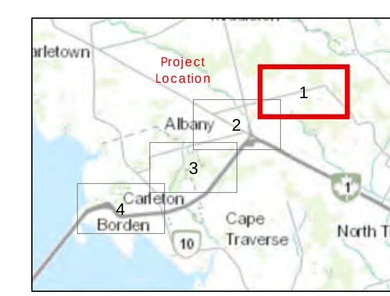
Softwood Treed Swamp (STW)

Sources: Base Data provided by the Government of Prince Edward Island - Natural Earth; Thematic Data - ERBC

0 290 580

Metres

121812508 Prince Edward Island Stereographic



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

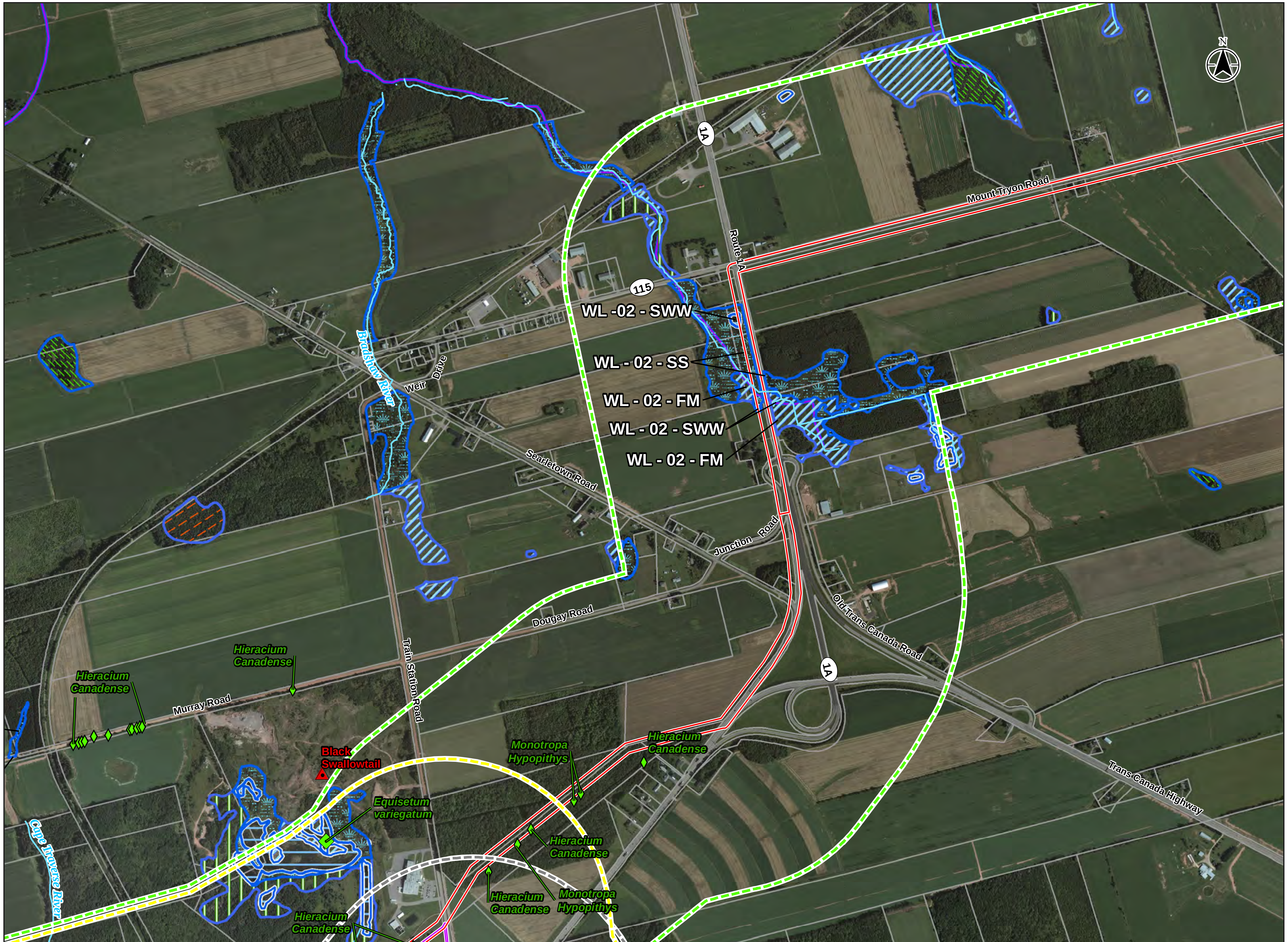
BORDEN TRANSMISSION LINE

Stantec

Fig. A.1

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO.

U:\121812508\gis\figures\general\Route_1_mapbook_v1_update.mxd mmorinsauerteig



Proposed Borden Transmission Line - Preferred Route

Local Assessment Area
- Proposed T-3 Line to be Retired
- Proposed Relocation of T-3
- Proposed Y-109 Preferred Route

Project Development Area
- Proposed Relocation of T-3
- Proposed Y-109 Common Route

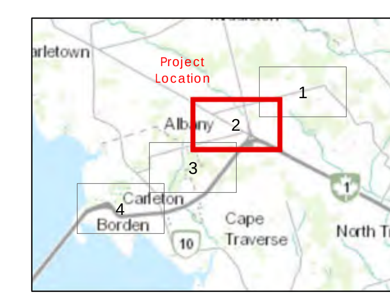
AC CDC Species at Risk (SAR) and Species of Conservation Concern (SOCC)
- Invertebrate (SOCC)
- Plant (SOCC)
- Stantec Field Identified Plant (SOCC)
- AC CDC Atlantic Salmon
- Property Boundary
- Watercourse

Habitat Type
- Freshwater Marsh (FM)
- Hardwood Treed Swamp (HTS)
- Mixedwood Treed Swamp (MTS)
- Shallow Water Wetland (SWW)
- Shrub Swamp (SS)
- Softwood Treed Swamp (STW)

Sources: Base Data provided by the Government of Prince Edward Island - Natural Earth; Thematic Data - ERBC

0 290 580
Metres

121812508 Prince Edward Island Stereographic



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

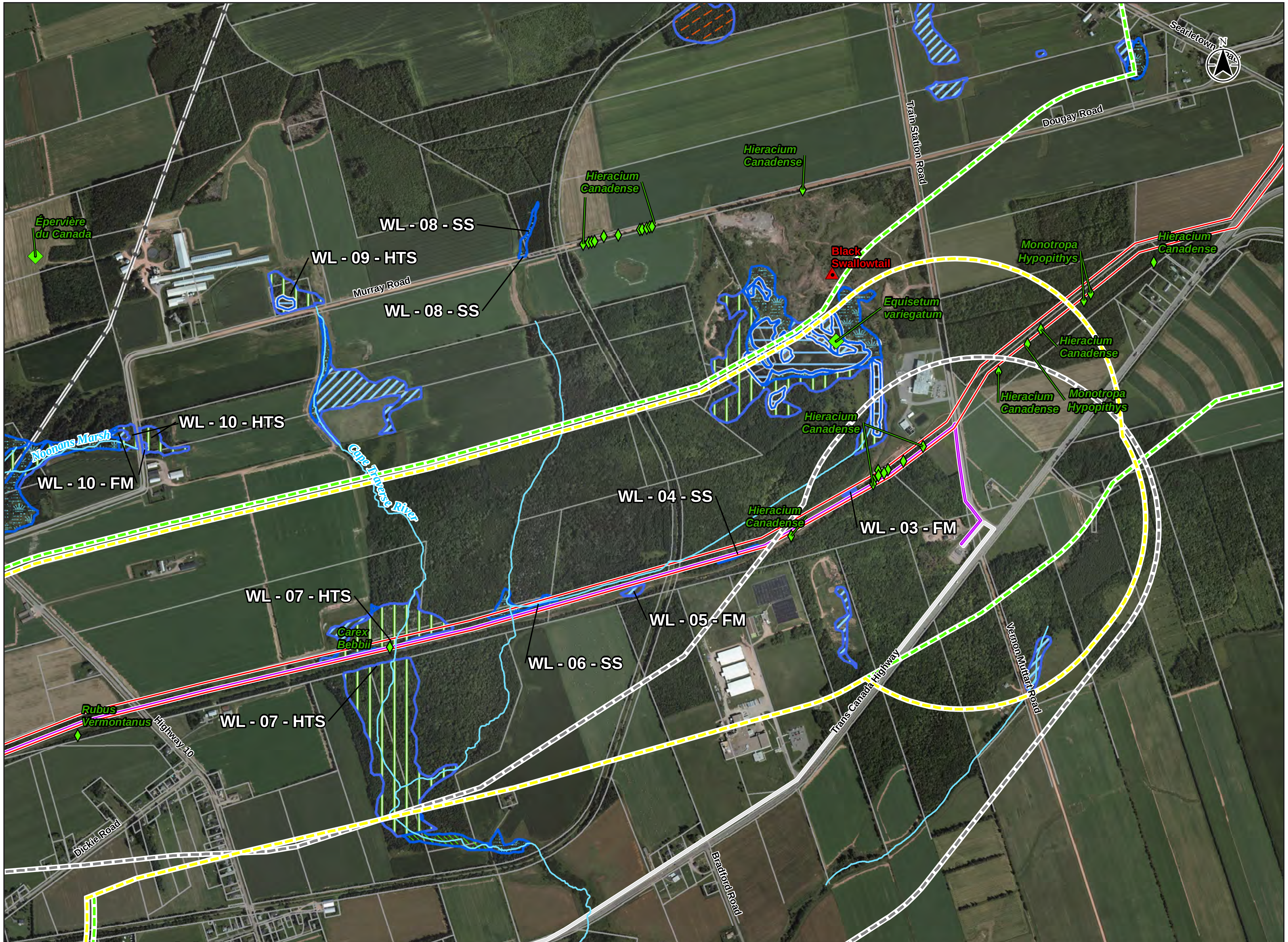
BORDEN TRANSMISSION LINE

Stantec

Fig. A.2

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO.

U:\121812508\gis\figures\general\Route_1_mapbook_v1_update.mxd mmorinsauerteig



Proposed Borden Transmission Line - Preferred Route

Local Assessment Area

- Proposed T-3 Line to be Retired
- Proposed Relocation of T-3
- Proposed Y-109 Preferred Route

Project Development Area

- Proposed T-3 Line to be Retired
- Proposed Relocation of T-3
- Proposed Y-109 Common Route

AC CDC Species at Risk (SAR) and Species of Conservation Concern (SOCC)

- Invertebrate (SOCC)
- Plant (SOCC)
- Stantec Field Identified Plant (SOCC)
- Existing Transmission Line
- Property Boundary
- Watercourse

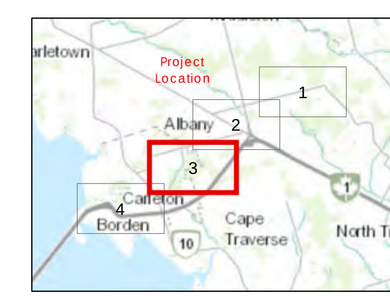
Habitat Type

- Freshwater Marsh (FM)
- Hardwood Treed Swamp (HTS)
- Mixedwood Treed Swamp (MTS)
- Shallow Water Wetland (SWW)
- Shrub Swamp (SS)
- Softwood Treed Swamp (STW)

Sources: Base Data provided by the Government of Prince Edward Island - Natural Earth; Thematic Data - ERBC

0 290 580
Metres

121812508 Prince Edward Island Stereographic



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

BORDEN TRANSMISSION LINE

Stantec

Fig. A.3

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO.

U:\121812508\gis\figures\general\Route_1_mapbook_v1_update.mxd mmorinsauerteig

Proposed Borden Transmission Line - Preferred Route

Local Assessment Area
- Proposed T-3 Line to be Retired
- Proposed Relocation of T-3
- Proposed Y-109 Preferred Route

Project Development Area
- Proposed T-3 Line to be Retired
- Proposed Relocation of T-3
- Proposed Y-109 Common Route
- Paired Wetland Plot

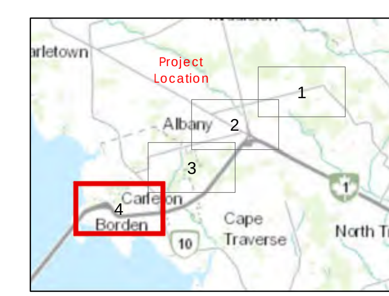
AC CDC Species at Risk (SAR) and Species of Conservation Concern (SOCC)
- Bird (SAR)
- Bird (SOCC)
- Invertebrate (SOCC)
- Plant (SOCC)
- Stantec Field Identified Plant (SOCC)
- Stantec Field Identified Bird (SAR)
- Existing Transmission Line
- Property Boundary
- Watercourse
- Important Bird Area
- Ducks Unlimited Managed Area

Habitat Type
- Brackish Marsh (BM)
- Coastal Marsh (CM)
- Freshwater Marsh (FM)
- Hardwood Treed Swamp (HTS)
- Mixedwood Treed Swamp (MTS)
- Shallow Water Wetland (SWW)
- Shrub Swamp (SS)
- Softwood Treed Swamp (STW)

Sources: Base Data provided by the Government of Prince Edward Island - Natural Earth; Thematic Data - ERBC

0 290 580
Metres

121812508 Prince Edward Island Stereographic



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

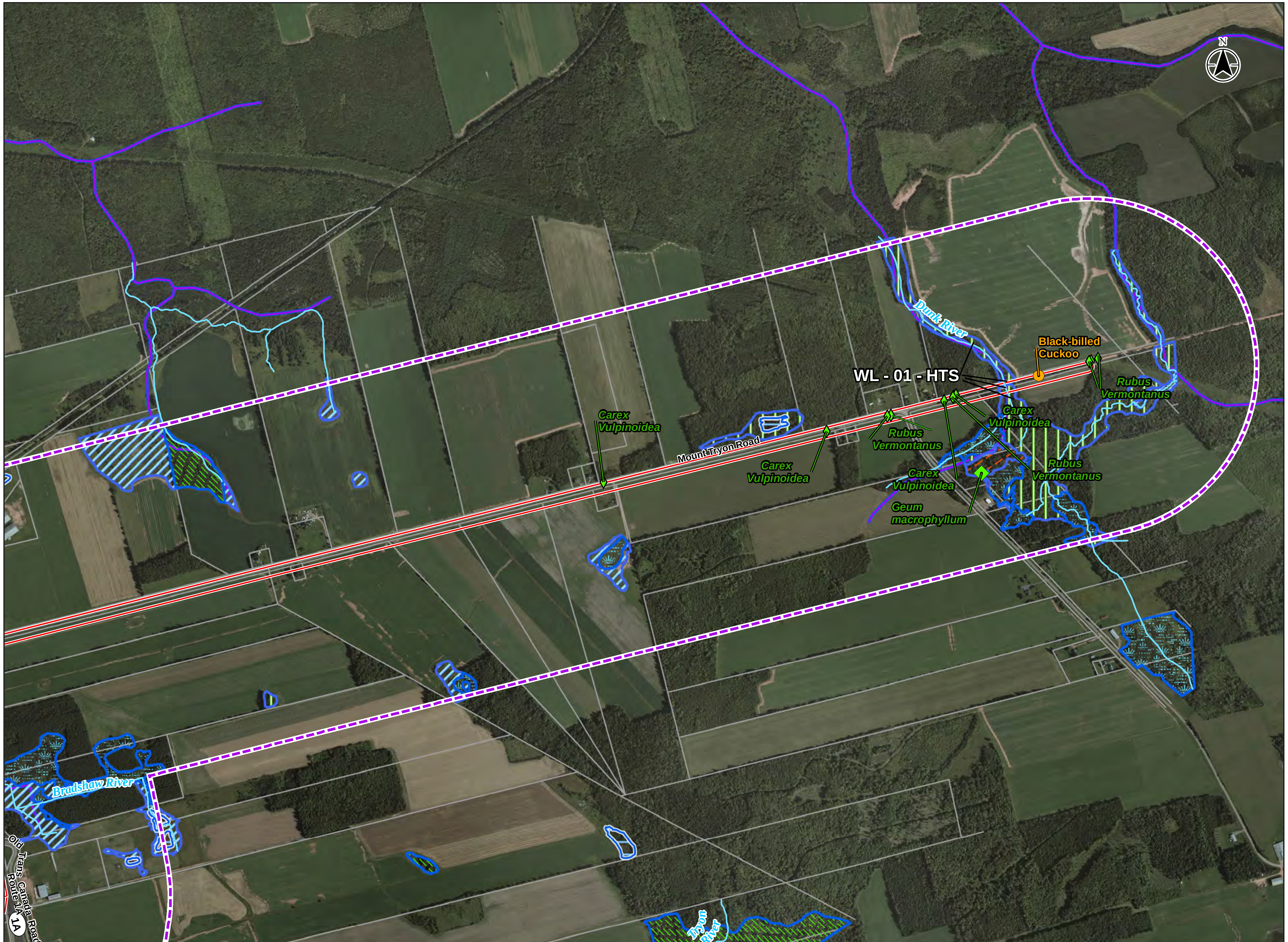
BORDEN TRANSMISSION LINE

Stantec

Fig. A.4

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO,

U:\121812508\gis\figures\general\Route_2_Alternate_mapbook_v1.mxd mmorinsauerteig



Proposed Borden Transmission Line - Alternate Route

Local Assessment Area

Alternate Route

Project Development Area

Proposed Alternate Route

AC CDC Species at Risk (SAR) and Species of Conservation Concern (SOCC)

Bird (SOCC)

Plant (SOCC)

Stantec Field Identified Plant (SOCC)

AC CDC Atlantic Salmon

Property Boundary

Watercourse

Habitat Type

Freshwater Marsh (FM)

Hardwood Treed Swamp (HTS)

Mixedwood Treed Swamp (MTS)

Shallow Water Wetland (SWW)

Shrub Swamp (SS)

Softwood Treed Swamp (STW)

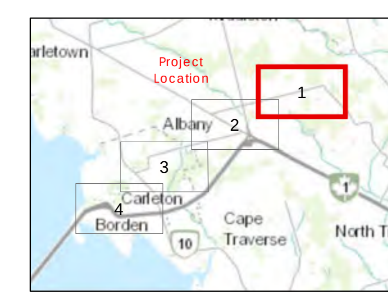
Sources: Base Data provided by the Government of Prince Edward Island - Natural Earth; Thematic Data - ERBC

0 290 580

Metres

121812508

Prince Edward Island Stereographic



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

BORDEN TRANSMISSION LINE

Stantec

Fig. A.5

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO.

U:\121812508\gis\figures\general\Route_2_Alternate_mapbook_v1.mxd mmorinsauerteig

Proposed Borden Transmission Line - Alternate Route

Local Assessment Area

Alternate Route

Project Development Area

Proposed Alternate Route

AC CDC Species at Risk (SAR) and Species of Conservation Concern (SOCC)

Invertebrate (SOCC)

Plant (SOCC)

Stantec Field Identified Plant (SOCC)

AC CDC Atlantic Salmon

Property Boundary

Watercourse

Habitat Type

Freshwater Marsh (FM)

Hardwood Treed Swamp (HTS)

Mixedwood Treed Swamp (MTS)

Shallow Water Wetland (SWW)

Shrub Swamp (SS)

Softwood Treed Swamp (STW)

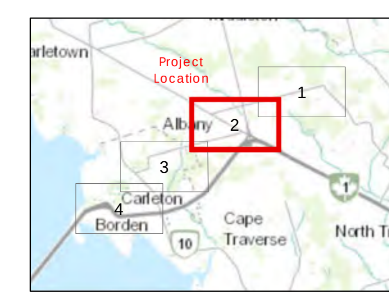
Sources: Base Data provided by the Government of Prince Edward Island - Natural Earth; Thematic Data - ERBC

0 290 580

Metres

121812508

Prince Edward Island Stereographic



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

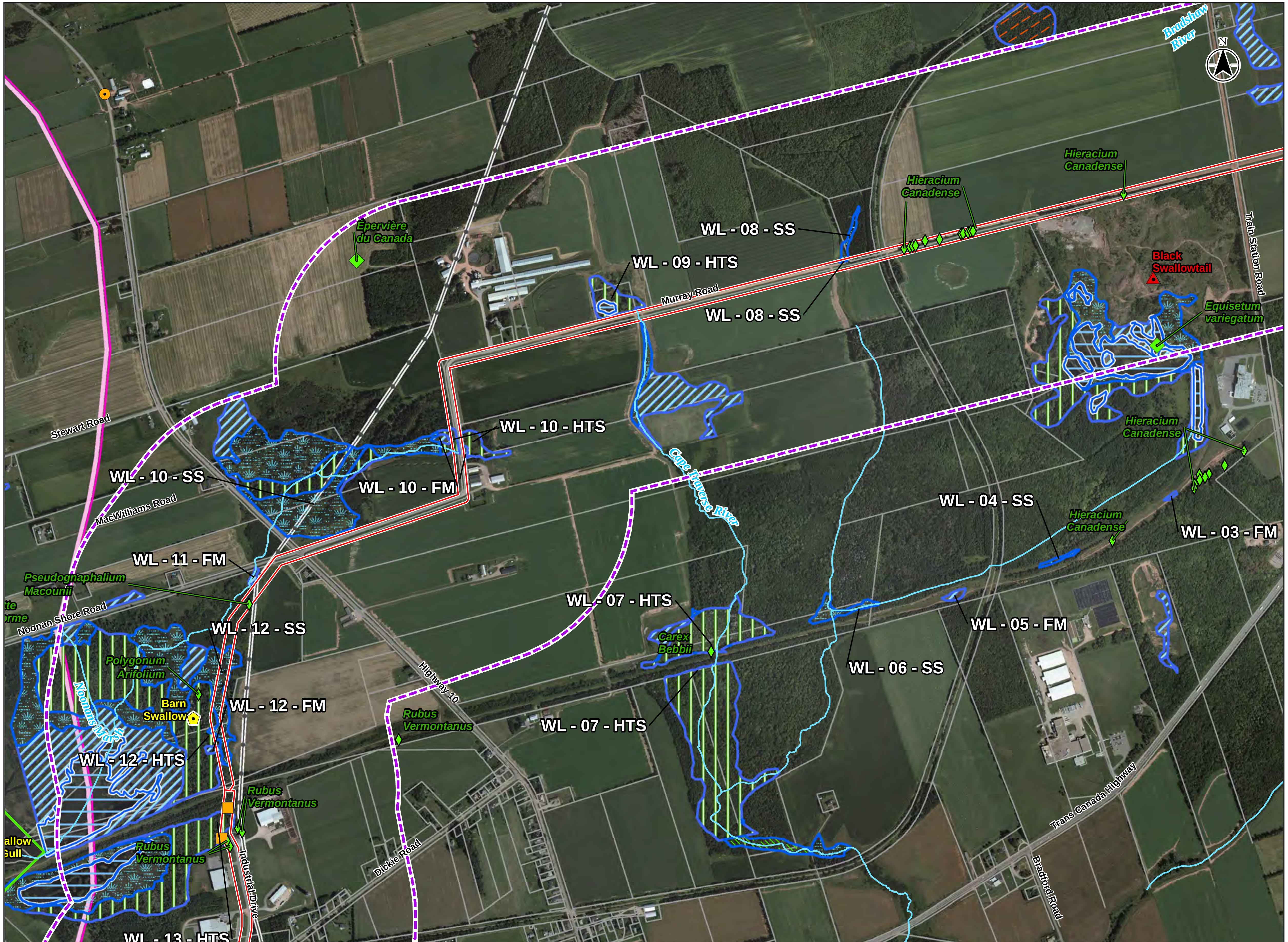
BORDEN TRANSMISSION LINE

Stantec

Fig. A.6

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO.

U:\121812508\gis\figures\general\Route_2_Alternate_mapbook_v1.mxd mmorinsauerteig



Proposed Borden Transmission Line - Alternate Route

Local Assessment Area

- Alternate Route

Project Development Area

- Proposed Alternate Route
- Paired Wetland Plot

AC CDC Species at Risk (SAR) and Species of Conservation Concern (SOCC)

- Bird (SOCC)
- Invertebrate (SOCC)
- Plant (SOCC)
- Stantec Field Identified Plant (SOCC)
- Stantec Field Identified Bird (SAR)
- Existing Transmission Line
- Property Boundary
- Watercourse
- Important Bird Area
- Ducks Unlimited Managed Area

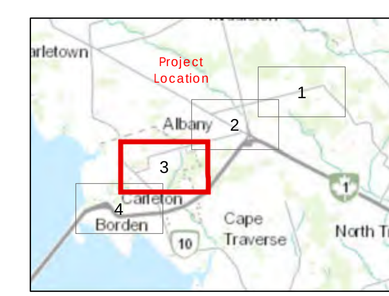
Habitat Type

- Freshwater Marsh (FM)
- Hardwood Treed Swamp (HTS)
- Mixedwood Treed Swamp (MTS)
- Shallow Water Wetland (SWW)
- Shrub Swamp (SS)
- Softwood Treed Swamp (STW)

Sources: Base Data provided by the Government of Prince Edward Island - Natural Earth; Thematic Data - ERBC

0 290 580
Metres

121812508 Prince Edward Island Stereographic



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

BORDEN TRANSMISSION LINE

Stantec

Fig. A.7

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO.

U:\121812508\gis\figures\general\Route_2_Alternate_mapbook_v1.mxd mmorrisaueteig

Proposed Borden Transmission Line - Alternate Route

Local Assessment Area

- Alternate Route

Project Development Area

- Proposed Alternate Route
- Paired Wetland Plot

AC CDC Species at Risk (SAR) and Species of Conservation Concern (SOCC)

- Bird (SAR)
- Bird (SOCC)
- Invertebrate (SOCC)
- Plant (SOCC)
- Stantec Field Identified Plant (SOCC)
- Stantec Field Identified Bird (SAR)
- Existing Transmission Line
- Property Boundary
- Watercourse
- Important Bird Area
- Ducks Unlimited Managed Area

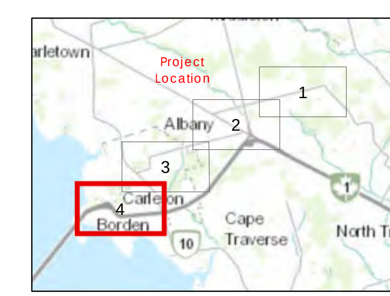
Habitat Type

- Brackish Marsh (BM)
- Coastal Marsh (CM)
- Freshwater Marsh (FM)
- Hardwood Treed Swamp (HTS)
- Mixedwood Treed Swamp (MTS)
- Shallow Water Wetland (SWW)
- Shrub Swamp (SS)
- Softwood Treed Swamp (STW)

Sources: Base Data provided by the Government of Prince Edward Island - Natural Earth; Thematic Data - ERBC

0 290 580
Metres

121812508 Prince Edward Island Stereographic



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

BORDEN TRANSMISSION LINE

Stantec

Fig. A.8

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO.

Appendix B TERRESTRIAL ENVIRONMENT FIELD SURVEY RESULTS

B.1 VASCULAR PLANT SPECIES OBSERVED DURING FIELD SURVEYS

Table B.1 Vascular Plant Species Observed During Field Surveys

Scientific Name	Common Name	AC CDC S-Rank
Abies balsamea	balsam fir	S5
Acer negundo	Manitoba maple	SNA
Acer pensylvanicum	striped maple	S5
Acer rubrum	red maple	S5
Acer saccharum	sugar maple	S4
Acer spicatum	mountain maple	S5
Achillea millefolium	common yarrow	S5
Actaea rubra	red baneberry	S4
Agrimonia striata	woodland agrimony	S4
Agrostis capillaris	colonial bent grass	SNA
Agrostis gigantea	redtop	SNA
Agrostis scabra	rough bent grass	S5
Agrostis stolonifera	creeping bent grass	S5
Alisma triviale	northern water plantain	S4S5
Allium schoenoprasum	wild chives	SU
Alnus incana	speckled alder	S5
Alnus viridis	green alder	S5
Alopecurus pratensis	meadow foxtail	SNA
Amaranthus retroflexus	green amaranth	SNA
Ambrosia artemisiifolia	common ragweed	S5
Amelanchier sp.	a serviceberry	-
Amelanchier X neglecta	running serviceberry	SNA
Anaphalis margaritacea	pearly everlasting	S5
Antennaria howellii	Howell's pussytoes	S4
Apocynum androsaemifolium	spreading dogbane	S5
Aralia nudicaulis	wild sarsaparilla	S5
Arctium minus	common burdock	SNA
Argentina anserina	common silverweed	S5
Arisaema triphyllum	Jack-in-the-pulpit	S4
Artemisia vulgaris	common wormwood	SNA
Athyrium filix-femina	common lady fern	S5
Beckmannia syzigachne	American slough grass	SNA
Betula alleghaniensis	yellow birch	S5
Betula papyrifera	paper birch	S5

Table B.1 Vascular Plant Species Observed During Field Surveys

Scientific Name	Common Name	AC CDC S-Rank
Betula populifolia	gray birch	S5
Bidens frondosa	devil's beggarticks	S5
Bromus inermis	smooth brome	SNA
Calamagrostis canadensis	bluejoint reed grass	S5
Callitriche palustris	marsh water-starwort	S4
Caltha palustris	yellow marsh marigold	S5
Calystegia sepium	hedge false bindweed	S5
Cannabis sativa	marijuana	-
Capsella bursa-pastoris	shepherd's purse	SNA
Cardamine pensylvanica	Pennsylvania bittercress	S5
Cardamine pratensis	cuckoo flower	SNA
Carex arctata	drooping woodland sedge	S5
Carex bebbii	Bebb's sedge	S3
Carex brunnescens	brownish sedge	S5
Carex canescens	silvery sedge	S5
Carex communis	fibrous-root sedge	S4S5
Carex echinata	star sedge	S5
Carex gynandra	nodding sedge	S5
Carex leptalea	bristly-stalked sedge	S5
Carex novae-angliae	New England sedge	S5
Carex projecta	necklace sedge	S5
Carex pseudocyperus	cyperuslike sedge	S5
Carex scoparia	broom sedge	S5
Carex stipata	awl-fruited sedge	S5
Carex vulpinoidea	fox sedge	S2S3
Centaurium pulchellum	branched centaury	SNA
Cerastium arvense	mouse-ear chickweed	SNA
Cerastium fontanum	common chickweed	SNA
Chamerion angustifolium	fireweed	S5
Chelone glabra	white turtlehead	S5
Chenopodium album	common lamb's quarters	SNA
Cicuta bulbifera	bulbous water-hemlock	S5
Cicuta maculata	spotted water-hemlock	S4
Circaea alpina	small enchanter's nightshade	S5
Cirsium arvense	Canada thistle	SNA
Cirsium vulgare	bull thistle	SNA

Table B.1 Vascular Plant Species Observed During Field Surveys

Scientific Name	Common Name	AC CDC S-Rank
Clintonia borealis	yellow bluebead lily	S5
Comarum palustre	marsh cinquefoil	S4
Cornus alternifolia	alternate-leaved dogwood	S5
Cornus canadensis	bunchberry	S5
Cornus sericea	red osier dogwood	S5
Corylus cornuta	beaked hazel	S5
Crataegus succulenta	fleshy hawthorn	S3S4
Crepis tectorum	narrow-leaved hawksbeard	SNA
Dactylis glomerata	orchard grass	SNA
Danthonia spicata	poverty oat grass	S5
Dennstaedtia punctilobula	eastern hay-scented fern	S5
Doellingeria umbellata	hairy flat-top white aster	S5
Dryopteris carthusiana	spinulose wood fern	S4S5
Dryopteris cristata	crested wood fern	S5
Dryopteris intermedia	evergreen wood fern	S5
Echinocystis lobata	wild cucumber	SNA
Eleocharis obtusa	blunt spikerush	S3S4
Eleocharis palustris	common spikerush	S5
Elymus repens	quack grass	SNA
Epilobium ciliatum	northern willowherb	S5
Epilobium leptophyllum	bog willowherb	S5
Epipactis helleborine	helleborine	SNA
Equisetum arvense	field horsetail	S5
Equisetum fluviatile	water horsetail	S4
Equisetum sylvaticum	woodland horsetail	S5
Erigeron strigosus	rough fleabane	S5
Erucastrum gallicum	common dog mustard	SNA
Erysimum cheiranthoides	worm-seeded wallflower	SNA
Eupatorium maculatum	spotted joe-pye-weed	S5
Euphrasia nemorosa	common eyebright	S4S5
Euthamia graminifolia	grass-leaved goldenrod	S5
Fagopyrum esculentum	common buckwheat	SNA
Fagus grandifolia	American beech	S4
Festuca rubra	red fescue	S5
Fragaria virginiana	wild strawberry	S5
Galeopsis tetrahit	common hemp-nettle	SNA

Table B.1 Vascular Plant Species Observed During Field Surveys

Scientific Name	Common Name	AC CDC S-Rank
Galium mollugo	smooth bedstraw	SNA
Galium palustre	common marsh bedstraw	S5
Galium tinctorium	Dyer's bedstraw	S4
Galium verum	yellow bedstraw	SNA
Gaultheria procumbens	eastern teaberry	S5
Geranium pratense	meadow crane's-bill	SNA
Geum aleppicum	yellow avens	S4
Geum laciniatum	rough avens	S4
Geum rivale	water avens	S4
Glechoma hederacea	ground ivy	SNA
Glyceria grandis	common tall manna grass	S5
Glyceria striata	fowl manna grass	S5
Glycine max	soybean	-
Gnaphalium uliginosum	marsh cudweed	SNA
Gymnocarpium dryopteris	common oak fern	S5
Hemerocallis fulva	orange day lily	SNA
Hesperis matronalis	dame's rocket	SNA
Hieracium aurantiacum	orange hawkweed	SNA
Hieracium caespitosum	field hawkweed	SNA
Hieracium canadense	Canada hawkweed	S3
Hieracium lachenalii	common hawkweed	SNA
Hieracium murorum	wall hawkweed	SNA
Hieracium pilosella	mouse-ear hawkweed	SNA
Hordeum vulgare	common barley	SNA
Hylotelephium telephium	garden stonecrop	SNA
Hypericum perforatum	common St. John's-wort	SNA
Ilex verticillata	common winterberry	S5
Impatiens capensis	spotted jewelweed	S5
Iris versicolor	harlequin blue flag	S5
Juncus articulatus	jointed rush	S5
Juncus balticus	Baltic rush	S5
Juncus brevicaudatus	narrow-panicled rush	S5
Juncus bufonius	toad rush	S5
Juncus effusus	soft rush	S5
Juncus gerardii	black-grass rush	S4
Juncus tenuis	slender rush	S5

Table B.1 Vascular Plant Species Observed During Field Surveys

Scientific Name	Common Name	AC CDC S-Rank
Kalmia angustifolia	sheep laurel	S5
Lactuca biennis	tall blue lettuce	S5
Larix laricina	tamarack	S5
Lathyrus palustris	marsh vetchling	S5
Ledum groenlandicum	common labrador tea	S5
Leersia oryzoides	rice cut grass	S4
Lemna turionifera	turion duckweed	S5
Leontodon autumnalis	fall dandelion	SNA
Lepidum sp.	field pepperwort	
Leucanthemum vulgare	oxeye daisy	SNA
Lolium pratense	meadow fescue	SNA
Lonicera tatarica	Tartarian honeysuckle	SNA
Lotus corniculatus	garden bird's-foot trefoil	SNA
Lupinus polyphyllus	large-leaved lupine	SNA
Luzula acuminata	hairy woodrush	S4
Luzula multiflora	common woodrush	S5
Lycopus americanus	American water horehound	S5
Lycopus uniflorus	northern water horehound	S5
Lysimachia terrestris	swamp yellow loosestrife	S5
Lythrum salicaria	purple loosestrife	SNA
Maianthemum canadense	wild lily-of-the-valley	S5
Maianthemum racemosum	large false Solomon's seal	S4
Malus pumila	common apple	SNA
Malva moschata	musk mallow	SNA
Malva rotundifolia	round-leaved mallow	SNA
Matricaria discoidea	pineapple weed	SNA
Matteuccia struthiopteris	ostrich fern	S4
Melilotus albus	white sweet-clover	SNA
Monotropa hypopithys	pinesap	S3
Monotropa uniflora	Indian pipe	S5
Morella pensylvanica	northern bayberry	S5
Myrica gale	sweet gale	S5
Nemopanthus mucronatus	mountain holly	S5
Oclemena acuminata	whorled wood aster	S5
Oenothera biennis	common evening primrose	S5
Oenothera pilosella	meadow evening primrose	SNA

Table B.1 Vascular Plant Species Observed During Field Surveys

Scientific Name	Common Name	AC CDC S-Rank
Onoclea sensibilis	sensitive fern	S5
Osmunda cinnamomea	cinnamon fern	S5
Osmunda claytoniana	interrupted fern	S5
Oxalis stricta	European wood sorrel	S5
Parthenocissus vitacea	thicket creeper	SNA
Pastinaca sativa	wild parsnip	SNA
Phalaris arundinacea	reed canary grass	SNA
Phegopteris connectilis	northern beech fern	S5
Phleum pratense	common timothy	SNA
Physocarpus opulifolius	eastern ninebark	SNA
Picea glauca	white spruce	S5
Pinus sylvestris	Scotch pine	SNA
Plantago lanceolata	English plantain	SNA
Plantago major	common plantain	SNA
Platanthera lacera	ragged fringed orchid	S4
Poa annua	annual blue grass	SNA
Poa compressa	Canada blue grass	SNA
Poa nemoralis	wood blue grass	
Poa pratensis	kentucky blue grass	S5
Polygonum arenastrum	oval-leaf knotweed	SNA
Polygonum arifolium	halberd-leaved tearthumb	S2
Polygonum aviculare	prostrate knotweed	SNA
Polygonum cuspidatum	Japanese knotweed	SNA
Polygonum lapathifolium	pale smartweed	S5
Polygonum persicaria	spotted lady's-thumb	SNA
Polygonum sagittatum	arrow-leaved smartweed	S5
Populus grandidentata	large-toothed aspen	S5
Populus tremuloides	trembling aspen	S5
Potentilla argentea	silvery cinquefoil	SNA
Potentilla recta	sulphur cinquefoil	SNA
Prenanthes trifoliolata	three-leaved rattlesnakeroot	S5
Prunella vulgaris	common self-heal	S5
Prunus pensylvanica	pin cherry	S5
Pseudognaphalium macounii	Macoun's cudweed	S2
Pteridium aquilinum	bracken fern	S5
Puccinellia distans	spreading alkali grass	SNA

Table B.1 Vascular Plant Species Observed During Field Surveys

Scientific Name	Common Name	AC CDC S-Rank
Pyrola elliptica	shinleaf	S5
Quercus rubra	northern red oak	S4
Ranunculus acris	common buttercup	SNA
Ranunculus repens	creeping buttercup	SNA
Raphanus raphanistrum	wild radish	SNA
Rhinanthus minor	little yellow rattle	SNA
Rhododendron canadense	rhodora	S5
Rhus typhina	staghorn sumac	S1S2
Ribes lacustre	bristly black currant	S5
Ribes rubrum	European red currant	SNA
Rorippa microphylla	one-rowed yellowcress	SNA
Rosa cinnamomea	cinnamon rose	SNA
Rosa multiflora	multiflora rose	SNA
Rosa virginiana	Virginia rose	S5
Rubus allegheniensis	Alleghaney blackberry	S5
Rubus canadensis	smooth blackberry	S5
Rubus hispidus	bristly dewberry	S4
Rubus idaeus	red raspberry	S5
Rubus pubescens	dwarf red raspberry	S5
Rubus vermontanus	Vermont blackberry	S1S2
Rudbeckia hirta	black-eyed Susan	SNA
Rumex acetosa	garden sorrel	SNA
Rumex acetosella	sheep sorrel	SNA
Rumex crispus	curled dock	SNA
Rumex obtusifolius	bitter dock	SNA
Rumex orbiculatus	greater water dock	S5
Salix bebbiana	Bebb's willow	S5
Salix discolor	pussy willow	S5
Salix eriocephala	cottony willow	S4
Salix humilis	upland willow	S5
Salix lucida	shining willow	S4S5
Sambucus nigra ssp. canadensis	black elderberry	S5
Sambucus racemosa	red elderberry	S5
Saponaria officinalis	bouncing-bet	SNA
Schoenoplectus tabernaemontani	softstem bulrush	S4
Scirpus atrocinctus	black-girdled bulrush	S4S5

Table B.1 Vascular Plant Species Observed During Field Surveys

Scientific Name	Common Name	AC CDC S-Rank
Scirpus cyperinus	common woolly bulrush	S5
Scirpus hattorianus	mosquito bulrush	S4
Scirpus microcarpus	small-fruited bulrush	S5
Scleranthus annuus	annual knawel	SNA
Senecio vulgaris	common ragwort	SNA
Sisyrinchium montanum	mountain blue-eyed-grass	S5
Solanum dulcamara	bittersweet nightshade	SNA
Solidago canadensis	Canada goldenrod	S5
Solidago rugosa	rough-stemmed goldenrod	S5
Sonchus arvensis	field sow thistle	SNA
Sonchus asper	prickly sow thistle	SNA
Sorbaria sorbifolia	false spiraea	SNA
Sorbus aucuparia	European mountain ash	SNA
Spergula arvensis	common corn spurrey	SNA
Spiraea alba	white meadowsweet	S5
Stellaria graminea	little starwort	SNA
Streptopus lanceolatus	rose twisted-stalk	S4
Symphyotrichum lanceolatum	lance-leaved aster	S4
Symphyotrichum lateriflorum	calico aster	S5
Symphyotrichum novi-belgii	New York aster	S5
Symphyotrichum puniceum	purple-stemmed aster	S5
Syringa vulgaris	common lilac	SNA
Tanacetum vulgare	common tansy	SNA
Taraxacum officinale	common dandelion	SNA
Taxus canadensis	Canada yew	S4
Thalictrum pubescens	tall meadow-rue	S5
Thelypteris noveboracensis	New York fern	S5
Thelypteris palustris	eastern marsh fern	S5
Thymus praecox	creeping thyme	SNA
Tilia x vulgaris	large-leaf linden	SNA
Tragopogon pratensis	meadow goatsbeard	SNA
Trientalis borealis	northern starflower	S5
Trifolium arvense	rabbit's-foot clover	SNA
Trifolium aureum	yellow clover	SNA
Trifolium campestre	low hop clover	SNA
Trifolium hybridum	alsike clover	SNA

Table B.1 Vascular Plant Species Observed During Field Surveys

Scientific Name	Common Name	AC CDC S-Rank
Trifolium pratense	red clover	SNA
Trifolium repens	white clover	SNA
Tussilago farfara	coltsfoot	SNA
Typha angustifolia	narrow-leaved cattail	S4
Typha latifolia	broad-leaved cattail	S5
Vaccinium angustifolium	late lowbush blueberry	S5
Vaccinium macrocarpon	large cranberry	S5
Valeriana officinalis	common valerian	SNA
Verbascum thapsus	common mullein	SNA
Veronica officinalis	common speedwell	SNA
Veronica serpyllifolia	thyme-leaved speedwell	SNA
Viburnum nudum	northern wild raisin	S5
Viburnum opulus	highbush cranberry	S4
Vicia cracca	tufted vetch	SNA
Viola cucullata	marsh blue violet	S5

B.2 BIRD SPECIES RECORDED IN THE LAA AND SURROUNDING AREA DURING FIELD SURVEYS AND FROM OTHER SOURCES

Table B.2 All Bird Species Observed During Field Surveys, or Recorded in the Area by AC CDC, MBBA or BBS

Common Name	Scientific Name	COSEWIC	AC CDC S-Rank	General Status Rank	Source
common loon	*Gavia immer*	Not At Risk	S1B, S4M	Secure	BBS, AC CDC
pied-billed grebe	*Podilymbus podiceps*		S4B	Secure	MBBA
double-crested cormorant	*Phalacrocorax auritus*	Not At Risk	S5B	Secure	BBS
American bittern	*Botaurus lentiginosus*		S4B	Secure	MBBA, BBS
great blue heron	*Ardea herodias*		S4B	Secure	MBBA, BBS
Canada goose	*Branta canadensis*		SNAB, S5M	Secure	BBS
wood duck	*Aix sponsa*		S4B	Secure	MBBA
green-winged teal	*Anas crecca*		S5B	Secure	MBBA, BBS
American black duck	*Anas rubripes*		S5B, S4N	Secure	MBBA, BBS
mallard	*Anas platyrhynchos*		S5B	Secure	Field, MBBA, BBS
northern pintail	*Anas acuta*		S1S2B	Secure	AC CDC
blue-winged teal	*Anas discors*		S3B	Secure	MBBA, BBS, AC CDC
northern shoveler	*Anas clypeata*		S2B	Secure	MBBA, AC CDC
gadwall	*Anas strepera*		S4B, S2N	Secure	MBBA
American wigeon	*Anas americana*		S5B	Secure	MBBA, BBS
redhead	*Aythya americana*		SNA	Accidental	MBBA
ring-necked duck	*Aythya collaris*		S5B	Secure	MBBA, BBS
red-breasted merganser	*Mergus serrator*		S1S2B, S5N	Secure	BBS
osprey	*Pandion haliaetus*		S5B	Secure	Field, MBBA, BBS
bald eagle	*Haliaeetus leucocephalus*	Not At Risk	S5	Secure	Field, MBBA, BBS
northern harrier	*Circus cyaneus*	Not At Risk	S4B	Secure	MBBA, BBS
northern goshawk	*Accipiter gentilis*	Not At Risk	S4	Secure	MBBA, BBS

Table B.2 All Bird Species Observed During Field Surveys, or Recorded in the Area by AC CDC, MBBA or BBS

Common Name	Scientific Name	COSEWIC	AC CDC S-Rank	General Status Rank	Source
red-tailed hawk	*Buteo jamaicensis*	Not At Risk	S4B	Secure	Field, MBBA, BBS
American kestrel	*Falco sparverius*		S4S5B	Secure	MBBA, BBS
merlin	*Falco columbarius*	Not At Risk	S4S5B	Secure	BBS
gray partridge	*Perdix perdix*		SNA	Exotic	MBBA, BBS
ring-necked pheasant	*Phasianus colchicus*		SNA	Exotic	BBS
ruffed grouse	*Bonasa umbellus*		S5	Secure	Field, MBBA, BBS
wild turkey	*Meleagris gallopavo*		no status	-	BBS
sora	*Porzana carolina*		S5B	Secure	Field, MBBA, BBS
black-bellied plover	*Pluvialis squatarola*		S3M	Secure	AC CDC
American golden-plover	*Pluvialis dominica*		S2S3M	Secure	AC CDC
semipalmated plover	*Charadrius semipalmatus*		SHB, S3M	Secure	AC CDC
killdeer	*Charadrius vociferus*		S2S3B	Sensitive	MBBA, BBS, AC CDC
greater yellowlegs	*Tringa melanoleuca*		S3S4M	Secure	AC CDC
lesser yellowlegs	*Tringa flavipes*		S3M	Secure	AC CDC
willet	*Tringa semipalmata*		S4B	Secure	Field, MBBA, BBS
spotted sandpiper	*Actitis macularius*		S2S3B	Sensitive	MBBA, BBS, AC CDC
ruddy turnstone	*Arenaria interpres*		S3M	Secure	AC CDC
semipalmated sandpiper	*Calidris pusilla*		S3M	Secure	AC CDC
least sandpiper	*Calidris minutilla*		S3M	Secure	AC CDC
short-billed dowitcher	*Limnodromus griseus*		S3M	Secure	AC CDC
Wilson's snipe	*Gallinago delicata*		S3B	Sensitive	MBBA, BBS, AC CDC
American woodcock	*Scolopax minor*		S5B	Secure	MBBA, BBS
ring-billed gull	*Larus delawarensis*		S1B, S5M	Secure	MBBA, BBS, AC CDC
herring gull	*Larus argentatus*		S2B, S5N	Secure	Field, BBS, AC CDC

Table B.2 All Bird Species Observed During Field Surveys, or Recorded in the Area by AC CDC, MBBA or BBS

Common Name	Scientific Name	COSEWIC	AC CDC S-Rank	General Status Rank	Source
great black-backed gull	*Larus marinus*		S2S3B, S5N	Secure	BBS, AC CDC
common tern	*Sterna hirundo*	Not At Risk	S1B	May Be At Risk	MBBA, BBS, AC CDC
black guillemot	*Cepphus grylle*		S2B	Secure	MBBA, AC CDC
rock pigeon	*Columba livia*		SNA	Exotic	Field, MBBA, BBS
mourning dove	*Zenaida macroura*		S5	Secure	Field, MBBA, BBS
black-billed cuckoo	*Coccyzus erythropthalmus*		S3B	Secure	MBBA, BBS, AC CDC
great horned owl	*Bubo virginianus*		S4	Secure	MBBA, BBS
barred owl	*Strix varia*		S5	Secure	MBBA
northern saw-whet owl	*Aegolius acadicus*		S4B	Secure	MBBA
common nighthawk	*Chordeiles minor*	Threatened	S1B	At Risk	Field, BBS
ruby-throated hummingbird	*Archilochus colubris*		S5B	Secure	MBBA, BBS
belted kingfisher	*Megaceryle alcyon*		S5B	Secure	MBBA, BBS
yellow-bellied sapsucker	*Sphyrapicus varius*		S5B	Secure	Field, MBBA, BBS
downy woodpecker	*Picoides pubescens*		S5	Secure	Field, MBBA, BBS
hairy woodpecker	*Picoides villosus*		S5	Secure	MBBA, BBS
northern flicker	*Colaptes auratus*		S5B	Secure	Field, MBBA, BBS
olive-sided flycatcher	*Contopus cooperi*	Threatened	S2B	At Risk	BBS, AC CDC
eastern wood-pewee	*Contopus virens*	Special Concern	S3B	Secure	MBBA, BBS, AC CDC
yellow-bellied flycatcher	*Empidonax flaviventris*		S3B	Secure	MBBA, BBS, AC CDC
alder flycatcher	*Empidonax alnorum*		S5B	Secure	Field, MBBA, BBS
willow flycatcher	*Empidonax traillii*		SNA	Accidental	BBS
least flycatcher	*Empidonax minimus*		S4B	Secure	Field, MBBS, BBS
eastern phoebe	*Sayornis phoebe*		SNA	Accidental	BBS
great crested flycatcher	*Myiarchus crinitus*		SUB	Undetermined	MBBA

Table B.2 All Bird Species Observed During Field Surveys, or Recorded in the Area by AC CDC, MBBA or BBS

Common Name	Scientific Name	COSEWIC	AC CDC S-Rank	General Status Rank	Source
eastern kingbird	*Tyrannus tyrannus*		S2B	Sensitive	MBBA, BBS, AC CDC
horned lark	*Eremophila alpestris*		S1?B, S4N	Secure	BBS
tree swallow	*Tachycineta bicolor*		S3S4B	Secure	MBBA, BBS, AC CDC
bank swallow	*Riparia riparia*	Threatened	S2S3B	Secure	MBBA, BBS, AC CDC
barn swallow	*Hirundo rustica*	Threatened	S2B	Sensitive	Field, MBBA, BBS, AC CDC
blue jay	*Cyanocitta cristata*		S5	Secure	Field, MBBA, BBS
American crow	*Corvus brachyrhynchos*		S5	Secure	Field, MBBA, BBS
common raven	*Corvus corax*		S5	Secure	Field, MBBA, BBS
black-capped chickadee	*Poecile atricapilla*		S5	Secure	Field, MBBA, BBS
boreal chickadee	*Poecile hudsonica*		S3	Secure	MBBA, BBS, AC CDC
red-breasted nuthatch	*Sitta canadensis*		S5	Secure	Field, MBBA, BBS
white-breasted nuthatch	*Sitta carolinensis*		S1	May Be At Risk	AC CDC
brown creeper	*Certhia americana*		S5	Secure	Field, MBBA
winter wren	*Troglodytes troglodytes*		S5B	Secure	BBS
golden-crowned kinglet	*Regulus satrapa*		S5	Secure	Field, MBBA, BBS
ruby-crowned kinglet	*Regulus calendula*		S3B	Secure	MBBA, BBS, AC CDC
veery	*Catharus fuscescens*		S3B	Secure	MBBA, AC CDC
Swainson's thrush	*Catharus ustulatus*		S4B	Secure	MBBA, BBS
hermit thrush	*Catharus guttatus*		S5B	Secure	MBBA, BBS
American robin	*Turdus migratorius*		S5B	Secure	Field, MBBA, BBS
gray catbird	*Dumetella carolinensis*		S3B	Secure	MBBA, BBS, AC CDC
northern mockingbird	*Mimus polyglottos*		S1B	Secure	MBBA, AC CDC
cedar waxwing	*Bombycilla cedrorum*		S5B	Secure	Field, MBBA, BBS
European starling	*Sturnus vulgaris*		SNA	Exotic	Field, MBBA, BBS

Table B.2 All Bird Species Observed During Field Surveys, or Recorded in the Area by AC CDC, MBBA or BBS

Common Name	Scientific Name	COSEWIC	AC CDC S-Rank	General Status Rank	Source
blue-headed vireo	*Vireo solitarius*		S5B	Secure	Field, MBBA, BBS
red-eyed vireo	*Vireo olivaceus*		S5B	Secure	Field, MBBA, BBS
Tennessee warbler	*Vermivora peregrina*		S2B	Sensitive	MBBA, BBS, AC CDC
Nashville warbler	*Vermivora ruficapilla*		S5B	Secure	MBBA, BBS
northern parula	*Parula americana*		S5B	Secure	Field, MBBA, BBS
yellow warbler	*Dendroica petechia*		S5B	Secure	Field, MBBA, BBS
chestnut-sided warbler	*Dendroica pensylvanica*		S5B	Secure	MBBA, BBS
magnolia warbler	*Dendroica magnolia*		S5B	Secure	Field, MBBA, BBS
Cape May warbler	*Dendroica tigrina*		S3B	Secure	BBS
black-throated blue warbler	*Dendroica caerulescens*		S4B	Secure	BBS
yellow-rumped warbler	*Dendroica coronata*		S5B	Secure	Field, MBBA, BBS
black-throated green warbler	*Dendroica virens*		S5B	Secure	Field, MBBA, BBS
Blackburnian warbler	*Dendroica fusca*		S5B	Secure	MBBA, BBS
palm warbler	*Dendroica palmarum*		S5B	Secure	Field, MBBA
bay-breasted warbler	*Dendroica castanea*		S2B	Sensitive	BBS, AC CDC
black-and-white warbler	*Mniotilta varia*		S5B	Secure	Field, MBBA, BBS
American redstart	*Setophaga ruticilla*		S4S5B	Secure	Field, MBBS, BBS
ovenbird	*Seiurus aurocapilla*		S5B	Secure	Field, MBBA, BBS
northern waterthrush	*Seiurus noveboracensis*		S3B	Secure	BBS
mourning warbler	*Oporornis philadelphia*		S4B	Secure	Field, MBBA, BBS
common yellowthroat	*Geothlypis trichas*		S5B	Secure	Field, MBBA, BBS
Canada warbler	*Wilsonia canadensis*	Threatened	S2B	At Risk	MBBA, BBS, AC CDC
rose-breasted grosbeak	*Pheucticus ludovicianus*		S2S3B	Sensitive	MBBA, BBS, AC CDC
chipping sparrow	*Spizella passerina*		S4B	Secure	MBBA, BBS

Table B.2 All Bird Species Observed During Field Surveys, or Recorded in the Area by AC CDC, MBBA or BBS

Common Name	Scientific Name	COSEWIC	AC CDC S-Rank	General Status Rank	Source
vesper sparrow	*Pooecetes gramineus*		S1S2B	May Be At Risk	BBS
savannah sparrow	*Passerculus sandwichensis*		S5B	Secure	Field, MBBA, BBS
nelson's sparrow	*Ammodramus nelsoni*	Not At Risk	S4B	Secure	MBBA, BBS
song sparrow	*Melospiza melodia*		S5B	Secure	Field, MBBA, BBS
swamp sparrow	*Melospiza georgiana*		S5B	Secure	Field, MBBA, BBS
white-throated sparrow	*Zonotrichia albicollis*		S5B	Secure	Field, MBBA, BBS
dark-eyed junco	*Junco hyemalis*		S5	Secure	Field, MBBA, BBS
bobolink	*Dolichonyx oryzivorus*	Threatened	S2B	Sensitive	MBBA, BBS, AC CDC
red-winged blackbird	*Agelaius phoeniceus*		S4B	Secure	Field, MBBA, BBS
common grackle	*Quiscalus quiscula*		S5B	Secure	Field, MBBA, BBS
brown-headed cowbird	Molothrus ater		S1S2B	Sensitive	MBBA, BBS, AC CDC
purple finch	Carpodacus purpureus		S4S5B	Secure	Field, MBBA, BBS
white-winged crossbill	Loxia leucoptera		S3	Secure	MBBA, BBS, AC CDC
pine siskin	Carduelis pinus		S2S3B, S4N	Secure	BBS, AC CDC
American goldfinch	Carduelis tristis		S5	Secure	Field, MBBS, BBS
evening grosbeak	Coccothraustes vespertinus		S1S2B, S2S3N	Sensitive	MBBA, BBS, AC CDC
house sparrow	Passer domesticus		SNA	Exotic	MBBA, BBS

COSEWIC:

Not at Risk - Found to be not at risk of extinction given the current circumstances.

Threatened – Likely to become an endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

Special Concern – May become threatened or endangered because of a combination of biological characteristics and identified threats.

AC CDC S-Rank:

S1 - Critically Imperiled: extreme rarity (often 5 or fewer occurrences)
S2 – Imperiled: Limited range, very few populations (often 20 or fewer),
S3 – Vulnerable: restricted range, few populations (often 80 or fewer),
S4 – Apparently Secure: Uncommon but not rare
S5 – Secure: Common, widespread, and abundant
B – Breeding N – Non-breeding

B.3 BREEDING BIRD DATA

Table B.3 Highest Breeding Evidence of All Species Observed During 2017 Breeding Bird Surveys

Common Name	Scientific Name	Highest Evidence of Breeding	Route
mallard	*Anas platyrhynchos*	Observed	Both
osprey	*Pandion haliaetus*	Confirmed	Both
ruffed grouse	*Bonasa umbellus*	Observed	Preferred
willet	*Tringa semipalmata*	Possible	Both
herring gull	*Larus argentatus*	Observed	Both
rock pigeon	*Columba livia*	Observed	Both
mourning dove	*Zenaida macroura*	Observed	Preferred
yellow-bellied sapsucker	*Sphyrapicus varius*	Observed	Both
downy woodpecker	*Picoides pubescens*	Observed	Both
alder flycatcher	*Empidonax alnorum*	Observed	Both
least flycatcher	*Empidonax minimus*	Possible	Both
barn swallow	*Hirundo rustica*	Observed	Alternate
blue jay	*Cyanocitta cristata*	Observed	Both
American crow	*Corvus brachyrhynchos*	Observed	Both
common raven	*Corvus corax*	Observed	Both
black-capped chickadee	*Poecile atricapilla*	Observed	Both
red-breasted nuthatch	*Sitta canadensis*	Possible	Preferred
brown creeper	*Certhia americana*	Possible	Both
golden-crowned kinglet	*Regulus satrapa*	Possible	Both
American robin	*Turdus migratorius*	Observed	Both
cedar waxwing	*Bombycilla cedrorum*	Observed	Both
European starling	*Sturnus vulgaris*	Observed	Both
blue-headed vireo	*Vireo solitarius*	Possible	Both
red-eyed vireo	*Vireo olivaceus*	Possible	Both
northern parula	*Parula americana*	Possible	Both
yellow warbler	*Dendroica petechia*	Observed	Both
magnolia warbler	*Dendroica magnolia*	Possible	Both
yellow-rumped warbler	*Dendroica coronata*	Observed	Both
black-throated green warbler	*Dendroica virens*	Possible	Both
palm warbler	*Dendroica palmarum*	Possible	Both
black-and-white warbler	*Mniotilta varia*	Possible	Both
American redstart	*Setophaga ruticilla*	Observed	Both

B.3 BREEDING BIRD DATA

Table B.3 Highest Breeding Evidence of All Species Observed During 2017 Breeding Bird Surveys

Common Name	Scientific Name	Highest Evidence of Breeding	Route
ovenbird	*Seiurus aurocapilla*	Possible	Both
mourning warbler	*Oporornis philadelphia*	Possible	Both
common yellowthroat	*Geothlypis trichas*	Observed	Both
savannah sparrow	*Passerculus sandwichensis*	Possible	Both
song sparrow	*Melospiza melodia*	Observed	Both
swamp sparrow	*Melospiza georgiana*	Possible	Both
white-throated sparrow	*Zonotrichia albicollis*	Possible	Both
dark-eyed junco	*Junco hyemalis*	Observed	Both
red-winged blackbird	*Agelaius phoeniceus*	Observed	Both
common grackle	*Quiscalus quiscula*	Observed	Both
purple finch	*Carpodacus purpureus*	Possible	Both
American goldfinch	*Carduelis tristis*	Observed	Both