



Stantec

DRAFT Environmental Assessment (EA):
Trans-Canada Highway Realignment Through
New Haven-Bonshaw, Queens County, PEI

Prepared for:

Prince Edward Island Department of Transportation
and Infrastructure Renewal
11 Kent Street, PO Box 2000
Charlottetown PE C1A 7N8

Prepared by:

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

Project No. 121810317

August 2, 2012

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Executive Summary

The Prince Edward Island Department of Transportation and Infrastructure Renewal (PEITIR) proposes to construct a two lane highway realignment of the Trans-Canada Highway (TCH) connecting New Haven and Bonshaw, Queens County, PEI. This Project is a transportation infrastructure improvement initiative by the province under the Atlantic Gateway Funding Program.

The TCH Realignment Project consists of 6.2 km of new and upgraded highway from the St. Catherines Road in Bonshaw to just east of the West River Road in New Haven. The Project will overlap approximately 500 m of existing highway and include the installation of four new watercourse crossings and the widening of the Bonshaw Bridge from two to three lanes. Turning lanes will be added to the highway in nine locations. Project construction is expected to commence in the Fall of 2012 and last for approximately one year, work will be carried out in 8 phases.

Funding is scheduled under the Gateways and Border Crossing Fund from Transport Canada; therefore a screening report (this document) is required under the *Canadian Environmental Assessment Act (CEAA)*. Requirements under *CEAA* will also be triggered due to federal authorizations on the *CEAA Law List Regulations*.

The scope of the Project and factors addressed in the screening are based on a Scoping Document prepared by Transport Canada (April 2012) which incorporated project description and proposed scoping information submitted by PEITIR and federal agency comments received based on that information.

Biophysical and socio-economic Valued Environmental Components (VECs) selected for the screening were based primarily on the scoping document, regulatory concerns, and professional judgment of the authors of this environmental assessment. The assessment of potential Project effects on the environment considers effects on the following VECs:

- Atmospheric Environment
- Freshwater Environment
- Terrestrial Environment
- Marine Environment
- Groundwater Resources
- Land Use
- Archaeological and Heritage Resources
- Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons
- Transportation
- Public Health and Safety
- Effects of Environment on the Project

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Project-related environmental effects were assessed considering the following Project activity categories:

Construction

- Site preparation
- Roadbed preparation
- Installation of structures
- Surfacing and finishing
- Temporary ancillary elements
- Materials and equipment

Operation and Maintenance

- Project presence
- Infrastructure maintenance
- Winter maintenance
- Vegetation management

Several biophysical and socio-economic studies were undertaken in the course of this screening to gather background information detailing the existing environment. This information was used for detailed environmental effects assessment for each VEC.

Environmental effects were evaluated for each VEC, with the consideration of mitigation and monitoring programs to reduce or eliminate potentially adverse effects for each VEC. The significance of residual environmental effects (*i.e.*, after mitigation has been applied) was also predicted for each VEC.

Potential residual effects from other projects and activities were examined to determine whether they could potentially overlap in time and space with predicted residual effects from the Project. There are cumulative effects predicted for many of the biophysical and socio-economic components assessed; however, none of the residual cumulative effects are predicted to be significant.

In general, potential adverse effects, including cumulative effects, on the Project VECs can be effectively mitigated through technically and economically feasible methods. No significant adverse residual effects are therefore considered likely for all VECs during Project construction and operation. Decommissioning of the Project is not planned at this time and therefore was not assessed.

In summary, there are not likely to be any significant adverse environmental effects as a result of Project construction and operation activities and the Project is predicted to result in considerable improvements in travel efficiency and safety along the Trans-Canada Highway.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table of Contents

1	INTRODUCTION	1
1.1	Project Title, Project Proponent, and Author of the EA	1
1.2	Project Overview	2
1.2.1	Project Summary	2
1.2.2	Project Location	3
1.2.3	Project Purpose	3
1.3	Regulatory Context	4
1.3.1	Federal Environmental Assessment	4
1.3.2	Provincial Environmental Assessment	6
1.4	Terms of Reference	7
1.5	Organization of this EA	7
2	PROJECT DESCRIPTION	8
2.1	Overview of Project	8
2.2	Project Objective	8
2.3	Alternative Means of Carrying out the Project	8
2.3.1	Alternative Alignments	9
2.4	Phased Construction Approach	10
2.5	Project Schedule	11
2.6	Project Elements	12
2.6.1	Construction of a Two-lane Partially Controlled Access Highway Alignment	12
2.6.2	Installation of Four Watercourse crossings on Tributaries of West River	12
2.6.3	Widening of the Existing Bonshaw Bridge	12
2.6.4	Modification of Local Access Roads	12
2.7	Project Activities	13
2.7.1	Construction Activities	13
2.7.2	Operation and Maintenance Activities	23
2.8	Accidents, Malfunctions, and Unplanned Events	24
2.8.1	Hazardous Material Spill	25
2.8.2	Erosion and Sediment Control Failure	25
2.8.3	Fire	26
2.8.4	Vehicle Collision	26
2.8.5	Wildlife Encounter	26
2.8.6	Disturbance of Heritage Resources	26
2.9	Environmental Management	27
2.9.1	Design and Construction	27
2.9.2	Operation and Maintenance	28
3	ENVIRONMENTAL ASSESSMENT METHODS, SCOPE OF ASSESSMENT, AND CONSULTATION AND ENGAGEMENT	29
3.1	Environmental Assessment Methods	29
3.1.1	Overview of Approach	29
3.2	Scope of Assessment	32
3.2.1	Scope of Project	32
3.2.2	Factors to be Considered	33
3.2.3	Scope of Factors to be Considered	33

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

3.3	Consultation and Engagement.....	35
3.3.1	Regulatory Consultation.....	35
3.3.2	Public and Stakeholder Engagement.....	35
3.3.3	First Nations Consultation.....	37
3.3.4	Other Project or Activities That Have Been or Will Be Carried Out.....	37
4.0	SUMMARY OF THE EXISTING ENVIRONMENT	40
4.1	Physical Environment	40
4.1.1	Geological Conditions	40
4.1.2	Soil	40
4.1.3	Bedrock.....	41
4.2	Groundwater Resources.....	42
4.2.1	Atmospheric Environment.....	43
4.3	Biological Environment	50
4.3.1	Terrestrial Environment.....	50
4.3.2	Freshwater Environment.....	74
4.3.3	Human Environment	80
5.0	ENVIRONMENTAL EFFECTS ASSESSMENT	83
5.1	Project Interactions with the Environment.....	83
5.1.1	Project-Environment Interaction Matrix.....	84
5.1.2	VECs with No Interaction with the Project (Ranking of 0).....	85
5.1.3	VECs with No Significant Interaction with the Project (Ranking of 1).....	86
5.1.4	Determination of Significance	90
5.1.5	VECs Which May Result in an Interaction with the Project that Requires Further Assessment (Ranking of 2).....	90
5.2	Atmospheric Environment.....	90
5.2.1	Scope of Assessment	91
5.2.2	Assessment of Project-Related Environmental Effects.....	103
5.2.3	Assessment of Cumulative Environmental Effects.....	110
5.2.4	Determination of Significance	115
5.2.5	Follow-up and Monitoring.....	117
5.3	Freshwater Environment.....	117
5.3.1	Scope of Assessment	117
5.3.2	Existing Conditions.....	122
5.3.3	Potential Project-VEC Interactions.....	122
5.3.4	Assessment of Project-Related Environmental Effects.....	124
5.3.5	Assessment of Cumulative Environmental Effects.....	132
5.3.6	Determination of Significance	134
5.3.7	Follow-up and Monitoring.....	135
5.4	Terrestrial.....	135
5.4.1	Scope of Assessment	136
5.4.2	Existing Conditions.....	141
5.4.3	Potential Project-VEC Interactions.....	141
5.4.4	Assessment of Project-Related Environmental Effects.....	144
5.4.5	Assessment of Cumulative Environmental Effects.....	157
5.4.6	Determination of Significance	159
5.4.7	Follow-up and Monitoring.....	159

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

5.5	Land Use.....	160
5.5.1	Scope of Assessment	160
5.5.2	Existing Conditions.....	162
5.5.3	Potential Project-VEC Interactions.....	162
5.5.4	Assessment of Project-Related Environmental Effects	163
5.5.5	Assessment of Cumulative Environmental Effects.....	169
5.5.6	Determination of Significance	171
5.5.7	Follow-up and Monitoring.....	172
5.6	Effects of the Environment on the Project.....	172
5.6.1	Scope of Assessment	172
5.6.2	Effects Analysis.....	174
5.6.3	Potential Effects of Climate Change on the Project	174
5.6.4	Determination of Significance	177
5.6.5	Follow-up and Monitoring.....	178
5.7	Accidents, Malfunctions, and Unplanned Events.....	178
5.7.1	Methodology.....	178
5.7.2	Identification of Accidents, Malfunctions, and Unplanned Events	178
5.7.3	Environmental Effects Assessment.....	179
5.7.4	Determination of Significance	185
6.0	CONCLUSION.....	187
6.1	Scope of the Environmental Assessment	187
6.2	Environmental Effects Assessment	187
6.3	Follow-Up and Monitoring.....	198
6.4	Overall Conclusion.....	198
7.0	CLOSING.....	199
8.0	REFERENCES	200

List of Figures

Figure 3.1	Summary of Stantec’s Environmental Assessment Methodology.....	31
Figure 4.1	Monitored Results – Location 1: Bolger Park Road	46
Figure 4.2	Monitored Results – Location 2: West Transect	47
Figure 4.3	Monitored Results – Location 3: Cameron Road	48
Figure 4.4	Monitored Results – Location 4: East Transect	49
Figure 5.1	Daytime Noise Model Predictions after Realignment (Project Operation)	114

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

List of Tables

Table 2.5	Key Project Timelines.....	11
Table 3.1	Valued Ecosystem Components to be Assessed in this Environmental Assessment.....	34
Table 3.2	Other Projects and Activities for Consideration of Cumulative Environmental Effects	38
Table 4.1	Well Construction	42
Table 4.2	Locations of Sound Pressure Level Monitoring Events	45
Table 4.3	Maritime Breeding Bird Atlas Region 27 (Prince Edward Island) Bird Species List Squares 20MS71, 20MS72	51
Table 4.4	Birds Recorded in 19 MBBA Point Counts within 5 km of PDA.....	55
Table 4.5	Bird Species of Conservation Concern Recorded within 5 km of PDA Centre (AC CDC 2012, CESSC 2011, Species at Risk Public Registry 2011)	56
Table 4.6	Bird Species Encountered within 100 m of April/May Point Count Surveys	60
Table 4.7	Bird Species Encountered within 100 m of June Point Count Surveys	61
Table 4.8	Wildlife SOCC with Potential to Exist in the Vicinity of the PDA.....	64
Table 4.9	Vascular Plant SOCC Recorded within 5 km of PDA Centre (AC CDC 2012) ..	66
Table 4.10	Vascular Plant SOCC Previously Observed within 1 km of PDA	67
Table 4.11	Vascular Plant SOCC Observed within the PDA in 2012	67
Table 4.12	Characteristic Wetlands within and adjacent to PDA	73
Table 4.13	Quantitative Stations and Fish Species Collected During Electrofishing Surveys June 12 and 22, 2012.....	79
Table 4.14	Length Ranges of Brook Trout Captures During Electrofishing Surveys.....	80
Table 5.1	Scope of Project – Summary Table.....	83
Table 5.2	Potential Interactions of the Project with the Environment	85
Table 5.3	Environmental Effects on Atmospheric Environment	92
Table 5.4	Canadian and Prince Edward Island Ambient Air Quality Objectives.....	96
Table 5.5	Potential Project Environmental Effects to the Atmospheric Environment	101
Table 5.6	Summary of Residual Project-Related Environmental Effects on the Atmospheric Environment	104
Table 5.7	Typical Construction Equipment Sound Pressure Levels.....	108
Table 5.8	Noise Model Validation.....	112
Table 5.9	Summary of Measured and Modelled Sound Pressure Levels at Sensitive Receptors	113
Table 5.10	Measurable Parameters for Freshwater Environment.....	120
Table 5.11	Potential Project Environmental Effects to the Freshwater Environment	123
Table 5.12	Summary of Residual Project-Related Environmental Effects to the Freshwater Environment	126

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.13	Potential Cumulative Environmental Effects to the Freshwater Environment .	133
Table 5.14	Measureable Parameters for Terrestrial Environment.....	137
Table 5.15	Potential Project Environmental Effects on the Terrestrial Environment	142
Table 5.16	Summary of Residential Project-Related Environmental Effects on the Terrestrial Environment	145
Table 5.17	Habitat and Land Use Types and Areas Within the LAA and PDA	152
Table 5.18	Potential Cumulative Environmental Effects on Terrestrial Populations.....	158
Table 5.19	Measureable Parameters for Land Use	161
Table 5.20	Potential Project Environmental Effects to Land Use	163
Table 5.21	Summary of Residential Project-Related Environmental Effects on Land Use	165
Table 5.22	Potential Cumulative Environmental Effects to Land Use	170
Table 5.23	Seasonal Precipitation % Change Projections for SDSM and HadC Models for Charlottetown, PEI.....	176
Table 5.24	Projected Extreme 24-hour Precipitation Amounts for Charlottetown, PEI	176
Table 5.25	Projected Annual Temperature Change for Charlottetown, PEI.....	177
Table 5.26	Potential Interactions Between Selected Accidents, Malfunctions and Unplanned Events	180
Table 6.1	Potential Environmental Effects Analysis Summary	188

List of Appendices

Appendix A	Figures
Appendix B	Letter to Aboriginal Groups
Appendix C	Plant List
Appendix D	Memo from PEI Dept. of Agriculture and Forestry
Appendix E	Wetland Forms

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

1 INTRODUCTION

This report is an Environmental Assessment (EA) for the Trans-Canada Highway Realignment through New Haven-Bonshaw, Queens County, Prince Edward Island (PEI) (“the Project”), proposed by the Prince Edward Island Department of Transportation and Infrastructure Renewal (“PEITIR”; the “Proponent”).

This document is intended to fulfill the requirements for the Project under the *Canadian Environmental Assessment Act (CEAA)* and the *PEI Environmental Protection Act (PEI EPA)*, thereby initiating the environmental impact assessment review and approval process. The information provided herein will assist the provincial and federal Regulatory Authorities (RAs) in reviewing the environmental effects of the Project, in determining required mitigation, and ultimately deciding whether an approval will be issued for the Project to proceed.

1.1 Project Title, Project Proponent, and Author of the EA

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

Project Title: Trans-Canada Highway Realignment, New Haven-Bonshaw, Queens County, PEI

Project Proponent: Prince Edward Island Department of Transportation and Infrastructure Renewal
11 Kent Street, P.O. Box 2000
Charlottetown PEI C1A 7N8

Environmental Consultant, Author of the EA, and Principal Contact Person for this environmental assessment: Mr. Dale Conroy, M.Sc.
Associate, Environmental Management
Stantec Consulting Ltd.
165 Maple Hills Road
Charlottetown, PE C1C 1N9

Tel: (902) 566-2866 Fax: (902) 566-2004
Email: dale.conroy@stantec.com

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Proponent's Principal Contact Person for the purposes of this environmental assessment:

Mr. Brian Thompson, P. Eng.
Director, Land and Environment
Transportation and Infrastructure Renewal

Tel: (902) 368-5185 Fax: (902) 368-5395
Email: bfthompson@gov.pe.ca

Ms. Shelley Cole-Arbing
Environmental Coordinator
Environmental Management Section
Transportation and Infrastructure Renewal

Tel: (902) 368-5095 Fax: (902) 368-5395
Email: slcole@gov.pe.ca

1.2 Project Overview

A brief overview of the Project, including a summarized description of the Project, as well as its location, purpose, and schedule, is provided below.

1.2.1 Project Summary

The Project consists of the construction of 6.2 kilometers (km) of new and upgraded highway to realign the existing Trans-Canada Highway (TCH) from St. Catherines Road in Bonshaw just west of the West River crossing (*i.e.*, Bonshaw Bridge) heading east to just east of West River Road (Route 9) in New Haven, Queens County, PEI (Figure 1, Appendix A). The realignment will overlap a 500-metre (m) section of the existing TCH near Riverdale Road in Churchill. The Project includes the installation of four watercourse crossings on three tributaries of West River, as well as a widening of the Bonshaw Bridge crossing of West River. Turning lanes will be added to nine locations along the new and upgraded highway sections, including:

- left and right turning lanes onto Green Road
- a left turning lane onto St. Catherines Road
- a left turning lane onto Crosby Road
- a left turning lane onto Riverdale Road
- a left turning lane into the Strathgartney Provincial Park
- a left turning lane onto Peters Road
- a left turning lane onto Colville Road

New T-intersections will be constructed near both ends of the realignment; one to connect the western end of the existing TCH to the newly relocated Crosby Road and another as an extension of Colville Road to the new alignment. Additionally, the end of Peters Road that currently exits onto the existing highway will be decommissioned and rerouted east of the existing location. The entrance to Green Road will be realigned and the entrance to

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Strathgartney Provincial Park will be moved to align directly with Riverdale Road; this will include the construction of a new parking area for park users just off of the upgraded highway. Cul-de-sacs will be constructed at five locations on the existing TCH. The existing section of highway through Churchill (perpendicular to Riverdale Road) will have a cul-de-sac at either end, while two cul-de-sacs will be constructed near the eastern end of the new alignment where the new highway intersects the existing highway near Cameron Road. There will also be a cul-de-sac at the western end of the existing highway, west of the new Crosby Road location. The connection to the existing TCH at the eastern end of the alignment will be maintained as an off ramp.

1.2.2 Project Location

The Project will be located between St. Catherines Road in Bonshaw west of Bonshaw Bridge heading east to just east of West River Road (Route 9) in New Haven, Queens County, PEI. The general location of the Project is shown in Figures 1 and 2 (**Appendix A**).

1.2.3 Project Purpose

This section of the TCH is a major trade corridor, accounting for 95% of all goods and services entering and leaving PEI. According to Delphi Systems Inc. (2000), the section of the TCH that would be replaced by this Project has vehicle accident rates higher than those for similar sections of highway in other locations. The current highway was designed and built in the 1950s and has had very few geometric alignment changes since that time. It also has grades that range from six to eight percent; higher than four percent which is the recommendation for a highway designed to Rural Arterial Undivided highway design standards with a posted speed of 90 kilometres per hour (km/hr) (RAU100). Numerous short horizontal and vertical curves result in speed changes and inefficiency. The majority of accidents in this area have involved motorists going off the road (to either side of the highway) and also right angle accidents. This suggests that both the curves, and the frequency and orientation of entrances and intersections are contributing factors to accidents on this section of the TCH. While there are climbing lanes along this section of the highway, there are no well-designed passing lanes, leading to few opportunities for passing. This has been shown to result in driver frustration, which in turn leads to poor driving behaviour. The Project will improve safety by reducing grades, providing longer and larger curves in the road, and will improve vertical curves giving drivers a higher level of service. Access and sight distances will be improved, which will allow drivers to see hazards sooner and will provide more time and space for avoidance. Improvements to the highway will benefit all users, including major economic sectors such as tourism.

The following summarizes the benefits and features of the new alignment:

- eliminates thirty-five driveway accesses
- eliminates five sharp curves (one in New Haven and four in Churchill) and reduces the vertical grade of the highway

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

- improves access to Strathgartney Provincial Park and Riverdale Road by realigning the entranceway to the park to form a four-way intersection with improved sight distance
- improves safety at “the lookout” by restricting access from the highway
- expands Bonshaw Bridge to accommodate new turning lanes for Green Road
- improves safety at Cameron Road, Crosby Road, and Colville Road by reducing traffic count
- allows for new accesses onto the former Trans-Canada Highway which were previously not permitted

1.3 Regulatory Context

1.3.1 Federal Environmental Assessment

This activity is considered a Project under *CEAA*, as it is the proposed construction of a physical work. An EA under *CEAA* is required if a federal authority exercises one of the powers or performs one of the duties listed in Section 5(1) of *CEAA*, in respect of a project. This Project is potentially subject to two sections:

- Section 5(1)(b) of *CEAA*, which states that a federal EA is required for projects that use funds provided by a federal authority
- Section 5(1)(d) of *CEAA*, which states that projects that require permits, licenses, or approvals under the *Law List Regulations* require an EA

1.3.1.1 The *CEAA* Trigger

Pursuant to <i>CEAA</i> Section 5.(1), Transport Canada	
<input type="checkbox"/> 5.(1)(a) - Is the proponent of the project	
<input checked="" type="checkbox"/> 5.(1)(b) - Proposes to fund all or part of a project	
<input type="checkbox"/> 5.(1)(c) - Proposes to sell, lease or otherwise dispose of land for the project	
<input checked="" type="checkbox"/> 5.(1)(d) - Proposes to issue a permit, approval or authorization on the <i>Law List Regulations</i> :	
<input checked="" type="checkbox"/> <i>NWPA</i> subsection 5.(2)	<input type="checkbox"/> <i>National Energy Board Act</i> subsection 108(4)
<input type="checkbox"/> <i>NWPA</i> subsection 5.(3)	<input type="checkbox"/> <i>National Energy Board Act</i> subsection 108(6)
<input type="checkbox"/> <i>NWPA</i> subsection 6.(4)	<input type="checkbox"/> <i>Railway Safety Act</i> subsection 10(1)
<input type="checkbox"/> <i>NWPA</i> section 16	<input type="checkbox"/> <i>Aeronautics Act</i> subsection 5.9(2)
<input type="checkbox"/> <i>NWPA</i> section 20	<input type="checkbox"/> <i>Federal Real Property Regulations</i> paragraph 4(2)(a)

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

1.3.1.2 Notification of Federal Departments and Agencies

The following federal departments/agencies were notified in accordance with the *Federal Coordination Regulations (FCR)*.

Departments/ Agencies	Notified on (dd-mm-yyyy)	FCR response (dd-mm-yyyy)	Trigger or Federal Interest	Role (RA/FA or N/A)
Transport Canada- Surface programs	07-02-2012	07-02-2012	Potential Funding	RA
Fisheries and Oceans Canada	07-02-2012	14-02-2012	<i>Fisheries Act</i> s35(2) and s32	RA
Transport Canada- NWPP	07-02-2012	13-03-2012	<i>NWPA</i> s5(2)	RA
Environment Canada	07-02-2012	07-03-2012	Specialist Knowledge	FA
Health Canada	07-02-2012	09-02-2012	Specialist Knowledge	FA
Natural Resources Canada	07-02-2012	06-03-2012	Specialist Knowledge	N/A
Canadian Transportation Agency	07-02-2012	21-02-2012	N/A	N/A
Parks Canada	07-02-2012	14-02-2012	N/A	N/A

Funds for the Project will be cost shared (50/50) by the Federal and Provincial governments. Federal funds will be provided through the Atlantic Gateway Fund (administered by Transport Canada). Therefore, Transport Canada will be a Responsible Authority (RA) for the EA, as per Section 5(1)(b) of *CEAA*.

There are two potential triggers of the *Law List Regulations* that could apply to this Project. The Project may require an Authorization from the federal Minister of Fisheries and Oceans Canada (DFO) if, in the opinion of the Minister, the work would constitute a Harmful Alteration, Disruption or Destruction (HADD) of fish habitat under Section 35(2) of the *Fisheries Act*. In consideration of the nature and duration of the work and planned mitigation to minimize adverse environmental effects, the Minister may determine that an Authorization is not required, if it is concluded that a HADD to fish habitat is not likely. Although a determination regarding the need for authorization under Section 35(2) has not been made at this time, recent experience on similar corridor projects in PEI and elsewhere strongly suggests that this will be required. Therefore, DFO is a likely RA for the EA, per Section 5(1)(b) of *CEAA*.

The project may require approval under Section 5(1) of the *Navigable Waters Protection Act* for any works carried out in navigable waters. The additional four watercourse crossing structures have been evaluated as per the *Minor Works and Waters Order* (2009), made pursuant to

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Section 13(1) of the *Navigable Waters Protection Act (NWPA)*, and these structures are exempt from requiring approvals under Section 5(1) of the *NWPA* for these structures. West River is considered navigable and modifications to the existing Bonshaw Bridge are planned. Therefore, Transport Canada is a likely RA for the EA, per Section 5(1)(d) of *CEAA*.

The Project does not appear within the *Exclusion List Regulations*, or the *Comprehensive Study List Regulations* and it has not been referred by the Minister of Environment to a review panel. All EAs under *CEAA* are screenings unless they are listed on the *Comprehensive Study List Regulations* or have been referred by the Minister of Environment to a review panel. As neither of these conditions appears to apply to the Project, the assessment of the Project shall be a screening.

The Project is subject to both the requirements of the PEI provincial EA legislation and the federal *CEAA* process. Therefore, the federal and provincial EA processes will be coordinated to the extent possible (*i.e.*, joint correspondence to the proponent during the EA process, as well as a joint federal/provincial review committee). Transport Canada has been designated as the Federal Environmental Assessment Coordinator (FEAC) for the duration of the EA process.

1.3.2 Provincial Environmental Assessment

The Project is considered to be an “undertaking” under Section 9(1) of the PEI *EPA*:

“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.”

Further, Section 9(3) of the Act states:

“An environmental assessment and environmental impact statement shall have such content as the Minister may direct.”

An environmental impact assessment must be completed and the corresponding environmental impact statement prepared and submitted so as to enable a review of the Project by the Technical Review Committee (TRC). The TRC is comprised of provincial regulatory agencies. The outcome of the environmental impact assessment review process will determine if the Project should be approved, including any approval conditions.

Further, a Watercourse, Wetland, and Buffer Zone Activity permit, administered by the Prince Edward Island Department of Environment, Labour, and Justice (PEIDELJ), will be required for the Project as is to be conducted within 15 m of a water body.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

1.4 Terms of Reference

On April 16, 2012, the CEAA Environmental Assessment - Final Scoping Document Trans-Canada Highway Realignment through New Haven – Bonshaw, Queen’s County, Prince Edward Island was provided to the Proponent by Transport Canada (TC). The scoping document was prepared by TC Surface Infrastructure Programs with assistance from DFO, Environment Canada (EC), Health Canada (HC), and PEIDELJ.

The scoping document provides Guidance on the scope of the Project and the scope of the assessment is provided in the scoping document (Transport Canada 2012).

1.5 Organization of this EA

This EA is organized to reflect the process by which the assessment has been conducted. It is organized into eight sections, as follows:

- **Section 1** - background information on the Project including the purpose for the Project and the regulatory context
- **Section 2** - a description of the Project. Construction and Operation activities are described, as is the location and schedule for the Project
- **Section 3** - a description of the methodology employed to carry out this EA, the scope of the assessment (scope of Project, factors to be considered, and scope of factors to be considered), and a summary of consultation and engagement activities and initiatives undertaken for the Project
- **Section 4** - an overview of the existing environment in which the Project is located
- **Section 5** - the environmental effects assessment for the Project, including Project-related environmental effects during Construction, Operation, Decommissioning and Abandonment of the Project, including Accidents, Malfunctions, and Unplanned Events; a discussion of the effects of the environment on the Project is also provided
- **Section 6** - the conclusions of the environmental assessment
- **Section 7** - closing remarks
- **Section 8** - the literature references, websites, and personal communication cited in the report

2 PROJECT DESCRIPTION

A preliminary description of the activities and equipment that comprise the Project is provided in this section.

It is important to recognize that the Project description, equipment, and layout described below may change slightly with detailed engineering design. The description outlines the most up to date details of the Project. The key aspects of the Project, as currently conceived, include:

- a description of the Project components and proposed mitigation for potential environmental effects
- a discussion of the activities that will be carried out during Construction, and Operation and Maintenance of the Project
- a discussion of the Project-related releases to the environment and the generation and handling of wastes

2.1 Overview of Project

The Project consists of the construction of 6.2 km of new and upgraded highway to realign the existing TCH from St. Catherines Road in Bonshaw west of the Bonshaw Bridge heading east to just east of West River Road (Route 9) in New Haven, Queens County, PEI. The Project is part of an effort to improve the safety and efficiency of the TCH system on PEI. The project will be a two-lane highway, built to the Transportation Association of Canada's (TAC's) Geometric Design Guide standards for a highway built to RAU100 standards. The posted speed limit will be 90 km/hr and sections of the realignment will be access controlled. The TCH in this area is part of the National Highway System and therefore, is expected to be built to meet national minimum standards. Refer to Figure 2 (Appendix A) for the site location plan.

2.2 Project Objective

The Project objective is to provide safe access to highway infrastructure on the TCH (Route 1), between New Haven and Bonshaw, PEI. The Project will address highway safety and upgrade this section of highway to meet national standards.

2.3 Alternative Means of Carrying out the Project

Alternatives to the Project are defined by the Canadian Environmental Assessment Agency as functionally different ways of achieving the same end. Alternatives to the Project include: the "do nothing" scenario (null alternative) or other modes of transportation (*i.e.*, boat).

One alternative to the new alignment would be to maintain and upgrade the existing highway from New Haven to Bonshaw. The full reconstruction and rehabilitation of the road, bridge widening at Bonshaw Bridge, and upgrades to the highway immediately to the west of the

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

bridge would cost the province of PEI approximately 9 million dollars. This alternative would not address the current safety issues associated with the curves and grade of this section of the TCH.

The objective of the Project is to enhance safe and efficient transport of goods in and out of the region and is part of the Atlantic Gateway Project. No alternatives to the Project (alternative forms of transportation) exist. Therefore, no further consideration is given to alternative means of carry out the Project.

Alternative alignments are discussed below. The current alignment has been developed to avoid constraints as identified through consultations.

2.3.1 Alternative Alignments

Three alternative alignments have been proposed to re-route the TCH through Churchill, PEI. The first alignment was to be located south of the existing highway and consist of 2.2 km of new highway. The second alignment was 6.2 km in length and was located both north and south of the existing highway. The second alignment included upgrades to sections of the existing highway. The current alignment is a modification of the second proposed alignment. The alternative alignments and the currently proposed alignment are illustrated in Figure 3 (Appendix A).

Originally, PEITIR planned to realign 2.2 km of the TCH between Peters Road and Crosby Road, in Churchill, PEI. The proposed alignment was located south of the existing TCH, and would have gone through Strathgartney Provincial Park. The proposed alignment also included the installation of a culvert on one tributary of West River, as well as an underpass to maintain public access to Strathgartney Provincial Park. A cul-de-sac was going to be constructed on the existing highway northeast of the Strathgartney Homestead where the realignment was to join the existing highway in order to maintain property access. The proposed alignment crossed a National Historic Monument Site, a Provincial Park, and three properties designated as Natural Areas. The proposed Project Development Area (PDA) also crossed six private properties and four provincial properties, as well as one institutional (*i.e.*, a church) and four commercial properties (*i.e.*, Aliant, CBC, Strathgartney Golf Course, and Bonshaw 500), in proximity to the PDA. Four open houses/public meetings were held in late October and early November 2011 which allowed the public to have an opportunity to view proposed realignment plans for the TCH in Churchill (as well as two other proposed realignment projects), to ask questions, and to submit feedback. The province received over three hundred submissions from Islanders, as well as a petition to preserve Strathgartney Provincial Park which contained over 2,700 signatures. The result was the development of a new realignment.

The second proposed alignment was the construction of 6.2 km of new and upgraded highway to realign the existing TCH from the St. Catherines Road in Bonshaw west of the Bonshaw Bridge heading east to just east of West River Road (Route 9) in New Haven, PEI. This proposed alignment was located north of the existing TCH between Bonshaw and New Haven,

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

and south of the existing TCH in New Haven. This alignment moved the originally proposed route away from the provincial park, designated Natural Areas, and National Historic Monument Site. The proposed alignment overlapped a 500 m section of the existing TCH near Riverdale Road in Churchill. It included the installation of culverts on three tributaries of the West River, as well as a widening of the south side of Bonshaw Bridge to allow for a right turning lane onto Green Road. New T-intersections were proposed near either end of the realignment; one to connect the western end of the old TCH by extending Crosby Road to the realignment and another as an extension of Colville Road to the realignment. A grade separation involving an underpass to cross the existing TCH was proposed just east of Cameron Road. Other intersecting roads were to either be maintained as on or off ramps, or cut off from the TCH and cul-de-sacs constructed. Connections to the existing TCH near both ends of the project would be maintained as off ramps. One open house meeting was held in April 2012 to allow the public to view the newly proposed alignment.

The current alignment is a modification of the second proposed alignment. Updates include relocation of Crosby Road, relocation of a portion of Peters Road, increased number of cul-de-sacs (one shifting of the alignment to the south), removal of the grade separation, widening of Bonshaw Bridge being conducted on the north side, shifting of the alignment to the north at the Bonshaw and the New Haven ends, addition of a watercourse crossing, and additions of French drains. By moving the alignment south in one location (near Station 1+500), the majority of a stand of hemlock will be avoided. In total, the stand is approximately 2.5 ha, of which approximately 422 m² or 0.04 ha is within the PDA. Prior to relocation of the alignment, the area of the stand within the PDA was 1,950 m² or 0.19 ha. Relocating a portion of Peters Road will reduce the length of the water crossing required in the area as well as completely avoid a wetland. By shifting the alignment north near Stations 5+800 through 6+100 and 2+000 through 2+500, impacts to properties on the south side of the existing highway are reduced; the amount of forest clearing required in that area is also reduced.

2.4 Phased Construction Approach

The Project will be completed in eight phases between September 17, 2012 and August 2, 2013. The new alignment is broken down into 100 m sections, each with a Station ID. The Stations associated with each phase of the Project are as follows:

- TCH New Haven Phase 1 - Station 0+340 to Station 1+900
- TCH New Haven Phase 2 - Station 2+100 to Station 3+160
- TCH New Haven Phase 3 - Station 3+160 to Station 3+360
- TCH New Haven Phase 4 - Station 1+900 to Station 2+100
- TCH Bonshaw Phase 1 - Station 6+200 to Station 7+960
- TCH Bonshaw Phase 2 - Station 5+590 to Station 5+620
- TCH Bonshaw Phase 3 - Station 7+960 to Station 0+340
- TCH Bonshaw Phase 4 - Station 4+960 to Station 6+200

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

The Station locations are illustrated in Figure 2 (Appendix A).

2.5 Project Schedule

Construction of the Project is expected to begin in the fall of 2012, following receipt of all necessary permits, approvals, and authorizations. A one-year construction period is anticipated. Construction activities will be conducted in a phased approach, with sections of the new alignment being broken down into separate phases. Key timelines (subject to change) are outlined below:

Table 2.5 Key Project Timelines

Location	Phase	Station Nos.	Timeframe
TCH-New Haven	1	0+340 - 1+900	2012 Oct.1- Nov 9 6 weeks
TCH-New Haven	2	2+100 - 3+160	2012 Oct. 15-Dec.14 9 weeks
TCH-New Haven	3	3+160 - 3+360	2013 June 3- June 28 4 weeks
TCH-New Haven	4	1+900 - 2+100	2013 July 15- August 2 3 weeks
TCH-Bonshaw	1	6+200 - 7+960	2012 Sept. 17- Oct. 13 4 weeks
TCH-Bonshaw	2	5+590 - 5+620	2013 May 6- June 14 6 weeks
TCH-Bonshaw	3	7+960 - 0+340	2013 May 6 - June 14 6 weeks
TCH-Bonshaw	4	4+960 - 6+200	2013 June 3- July 14 6 weeks

Operation of the Project will begin immediately following Construction and will continue for several decades or longer. The useful service life of the Project, with applicable maintenance is 50 years or more into perpetuity. As a result, Decommissioning and Abandonment of the Project is not expected to occur and is therefore not considered further in the assessment.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Future activities associated with decommissioning and/or abandonment of the Project will be assessed pursuant to environmental legislation applicable at that time.

2.6 Project Elements

The Project elements include:

- construction of a two-lane partially controlled access highway alignment
- installation of four watercourse crossings on tributaries of West River
- widening of the existing Bonshaw Bridge
- modification of secondary roads

The following subsections provide more detailed information for each of these Project elements.

2.6.1 Construction of a Two-lane Partially Controlled Access Highway Alignment

The new highway alignment will consist of the construction of 6.2 km of new and upgraded highway to realign the existing TCH from the St. Catherines Road in Bonshaw west of the Bonshaw Bridge heading east to just east of West River Road (Route 9) in New Haven, Queens County, PEI.

2.6.2 Installation of Four Watercourse crossings on Tributaries of West River

Four watercourse crossings will be installed in tributaries of West River. It is anticipated that two concrete arches, a concrete pipe, and a concrete box will be used. The concrete arches will have streambeds reconstructed with rip-rap material.

2.6.3 Widening of the Existing Bonshaw Bridge

A lane will be added to the north side of Bonshaw Bridge in order to widen the structure. This will allow for turning lanes to be put in place for Green Road.

2.6.4 Modification of Local Access Roads

Local access roads are roads that place a greater importance on land access than on traffic movement. They are two lane roads with posted speed limits ranging from 50-90 km/hr. The predominant vehicle traffic on secondary roads consists of passenger vehicles, light to medium weight trucks, farm equipment, and occasionally heavy trucks.

At the western end of the alignment the existing Crosby Road will be rerouted to the west side of the Bonshaw 500 Amusement Park property (Station 6+600). The new Crosby Road will extend from the existing highway to the new alignment. Peters Road will also be rerouted as

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

part of the Project. It will be moved east of the existing location and will extend between the existing highway and the new highway alignment (between Stations 1+300 and 1+400). Rerouting Peters Road will reduce the length of the watercourse crossing structure required in this area and will also avoid direct impact to the wetland located near the end of the existing Peters Road location. At the eastern end of the alignment Colville Road will be extended to meet up with the new section of highway (between Stations 2+900 and 3+000).

2.7 Project Activities

Project activities include the activities that are likely to occur during Construction, and Operation and Maintenance. These activities are outlined below.

2.7.1 Construction Activities

The following is a description of Construction activities typical for the construction of a rural arterial undivided highway built to RAU 100 specifications. The description of Construction activities has been divided into five categories.

- Site Preparation includes activities associated with preparing the site for road and structure development (including access roads), such as surveying and geotechnical investigations, vegetation clearing, grubbing, installation of sediment control structures, and removal or modification of buildings.
- Roadbed Preparation includes the activities associated with preparing the roadbed to base elevation (including access roads), such as excavation, placement of fill material, and ditching and drainage management.
- Installation of Structures includes permitting and installation of watercourse crossings, as well as widening of the Bonshaw Bridge.
- Surfacing and Finishing includes activities such as paving, highway marking, and installation of signs, guardrails, and lighting.
- Temporary Ancillary Elements includes development, use, and removal of temporary ancillary structures and facilities.

The Decommissioning and Abandonment of the Project is not included as the highway is intended to be in Operation in perpetuity.

2.7.1.1 Site Preparation

Site preparation includes activities associated with the preparation of the site in anticipation of roadbed construction, such as:

- surveying and geotechnical investigations
- clearing and grubbing
- installing sediment and erosion control measures

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

- removing or modifying of buildings

2.7.1.1.1 Surveying and Geotechnical Investigations

Surveying and geotechnical investigations will be completed with minimal clearing, given that direct access is available for much of the alignment from existing access points.

The Surveying activity includes clearing of a centerline and cross-section offsets wide enough to provide unobstructed sight lines as well as to allow access along the PDA for vehicles and/or geotechnical equipment. The PEITIR will be conducting surveying activities during the breeding season for migratory birds (May 1 to August 31) which may require some clearing. If clearing is required during the migratory bird season, surveys for nesting birds will be conducted prior to the removal of any trees. Surveys will combine observation of the area for cues that nests may be present and also acoustic surveys to determine if birds in the area are potentially breeding. In the event a nest is discovered, a perimeter will be set up around the nest site and limited activity will take place in that area until chicks have fledged and left the area. The survey crew will carry out their garbage, ensure access roads remain unobstructed, maintain prescribed tree cutting, felling, and removal practices, and take all the necessary precautions to prevent pollution or obstruction of watercourses.

Geotechnical investigations involve the drilling of boreholes or excavation of test pits along the centre line and offsets to determine the subsurface conditions. This may require additional clearing. Equipment used may include a backhoe or drill rig with tracks.

2.7.1.1.2 Vegetation Clearing and Grubbing

Vegetation clearing and grubbing activities will take place throughout the phases of the Project. The limits of clearing will be flagged prior to/in advance of clearing activity (e.g., during surveying) to limit the amount of clearing to that which is required for construction. The clearing width for the main lanes will vary depending on the toe of slope of the embankments. Merchantable timber may be harvested and sold depending on the timing of clearing. Non-salvageable material will be chipped, or buried on or offsite. The PEITIR plans to conduct the majority of clearing activities during the fall, which is outside of the breeding season for migratory birds. All Project related activities will comply with the *Migratory Birds Convention Act*, 1994. Areas that have been cleared in the fall will be surveyed for ground nesting bird species prior to construction in the spring. In the event a ground nesting migratory bird species is found nesting, work will be delayed until such time that the young have fledged.

Grubbing for roadway construction involves the removal of all organic material and unsuitable soil above the underlying soil. It also consists of the removal and disposal of all stumps, roots, felled timber, embedded logs, humus, root mat and topsoil from areas of excavations, and embankments or other areas as directed by the Resident Engineer.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Graders and bulldozers are typically used to scrape the organic material off the underlying soil and to pile the material. Where grubbing involves the removal of extensive organic deposits (e.g., peat), the material is typically removed by a track mounted excavator and loaded directly to dump-trucks. Grubbed material will be disposed of in a provincially approved manner.

2.7.1.1.3 Installation of Sediment and Erosion Control Measures

The primary environmental concern during clearing is minimizing ground disturbance that may result in the erosion and sedimentation of the watercourses running through the PDA. Prior to construction activities, the proper environmental controls will be in place (e.g., installation of silt fences, check dams). Sediment and erosion control measures will be put in place during all phases of the Project. Refer to the site specific Environmental Protection Plan (EPP) for further information regarding sediment and erosion control measures.

To minimize environmental risks associated with erosion and sedimentation, where possible, a 30 m buffer will be maintained between the construction area and watercourses.

2.7.1.1.4 Removal or Modification of Buildings

There are nine residential properties and one commercial property within the PDA with buildings that need to be removed/demolished during site preparation for the Project. PEITIR will follow their standard practice for public tendering of buildings located on provincial land to remove the buildings associated with acquired properties. Depending on the offers received from the tendering process, the buildings will be removed or demolished. Prior to any demolition activities, PEITIR will offer Habitat for Humanity the opportunity to remove any useable material from the buildings. Any disposal of materials from these buildings will be conducted in accordance with provincial waste disposal regulations. PEITIR plans to conduct removal and modifications of the buildings during the fall, which is outside of the breeding season for migratory birds.

2.7.1.2 Roadbed Preparation

Roadbed Preparation includes activities associated with construction of the road base prior to surfacing and finishing, such as:

- excavation
- placement of fill, cutting, and grading
- ditching and drainage management
- work progression (includes stabilization of exposed soils)

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****2.7.1.2.1 Excavation**

The excavation of material for the preparation of the subgrade may involve the removal of overburden, including till, small boulders, and topsoil. The volume of material to be removed during each phase of the Project to bring the realignment to grade is approximately:

- 178,000 cubic metres (m³) for TCH New Haven Phase 1
- 177,000 m³ for TCH New Haven Phase 2
- 92,900 m³ for TCH New Haven Phase 3
- 83,400 m³ for TCH New Haven Phase 4
- 497,000 m³ for TCH Bonshaw Phase 1
- 18,500 m³ for TCH Bonshaw Phase 3
- 7,500 m³ for TCH Bonshaw Phase 4

Excavated soils will be re-used as fill material for the Project. Excess material is not anticipated. In the event that excess material remains after the placement of fill, it will remain property of PEITIR.

2.7.1.2.2 Placement of Fill and Grading

Placement of fill will consist of placing soil intermittent sandstone for preparation and construction of roadbeds, embankments, and slopes. Material from onsite excavation will be used as fill material; select borrow will also be used as fill. It will be the responsibility of the contractor to secure a provincially-approved, local source of select borrow. The volume of fill material and select borrow to be used during each phase of the Project is approximately:

- 296,000 m³ of fill and 24,700 m³ of select borrow for TCH New Haven Phase 1
- 175,250 m³ of fill and 15,150 m³ of select borrow for TCH New Haven Phase 2
- 1,450 m³ of fill and 8,450 m³ of select borrow for TCH New Haven Phase 3
- 1,800 m³ of select borrow for TCH New Haven Phase 4
- 344,000 m³ of fill and 33,000 m³ of select borrow for TCH Bonshaw Phase 1
- 7,700 m³ of fill and 12,400 m³ of select borrow for TCH Bonshaw Phase 3
- 3,050 m³ of fill and 2,100 m³ of select borrow for TCH Bonshaw Phase 4

Grading will consist of shaping the unpaved road or site surface and is used to stabilize the surface, improve surface drainage, and to provide for runoff in a controlled manner. Dust created onsite by Project activities will be controlled by the application of water, as required.

2.7.1.2.3 Ditching and Drainage Management

Ditching, side slopes, and drainage channels will be designed and constructed, as required, during all phases of construction to avoid erosion problems, and ponding over and along roadways from surface water runoff. Ditches, culverts, and drainage channels will be

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

constructed where natural drainage and surface runoff flows are disrupted by the new roadway. Drainage channels will be directed away from the watercourse and into surrounding vegetation, where possible. Drainage is necessary to prevent flooding of the road and ponding on the road surface, to ensure the bearing capacity of the pavement and subgrade material are protected, and to avoid erosion of the side slopes. Two French drains will be installed during TCH New Haven Phase 1 of the Project. There are two springs located approximately at Station 1+600; water from these springs enters into Crawford's Stream. The drains will be installed in each of these springs to redirect the water into Crawford's Stream (Figure 2, Appendix A). French drains involve laying down open jointed pipes in a trench which is then filled with porous stone material.

Erosion control structures, mulching, hydroseeding (using native species where possible, when not possible, non-invasive species will be used) and/or the use of rip-rap are measures that may be applied to ditches, side slopes, and channels in an effort to minimize or prevent erosion and siltation of watercourses and wetlands.

2.7.1.2.4 Work Progression

The progression of Construction will be carried out in a manner, such that activities in any work area proceed continuously and diligently to promote an orderly progression of work and effective protection of the environment. In any given work area, the time between grubbing/cut/fill activities to stabilization will be no greater than 30 days. Stabilization refers to hydroseeding (using native species where possible, when not possible, non-invasive species will be used) and/or mulching, and includes completion of ditches and shaping of slopes as well as installation/maintenance of sediment and erosion control structures.

2.7.1.3 Installation of Structures**2.7.1.3.1 Permitting**

The installation of watercourse crossings in tributaries of the West River, and widening of the Bonshaw Bridge may require approval under the *Navigable Waters Protection Act (NWPA)*. A Subsection 35(2) authorization under the *Fisheries Act* may be required for the harmful alteration, disruption, or destruction of fish habitat at the crossings. All prescribed requirements in the permits will be strictly adhered to.

Watercourse, Wetland, and Buffer Zone Activity permits, issued by PEIDELJ, will be required as the Project will be conducted adjacent to several watercourses. The permits are required for work that will create a temporary or permanent change within 15 m of a watercourse or wetland. All conditions of the permit will be adhered to.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****2.7.1.3.2 Installation of Watercourse crossings**

Watercourse crossings will be installed on tributaries of West River during construction of TCH New Haven Phases 1 and 2. TCH New Haven Phase 1 of the Project will include the installation of watercourse crossings at Crawford's Brook and Crawford's Stream. TCH New Haven Phase 2 of the Project will include the installation of the watercourse crossing at Encounter Creek. See Figure 2 (Appendix A) for all watercourse crossing locations.

At Crawford's Brook (between Stations 0+900 and 1+000) a concrete box structure will be installed with an opening of 5.76 square metres (m²). The box structure will be approximately 160 m in length, constructed of pre-cast concrete, and will be surrounded by granular 'A' backfill. To bring the area up to grade 19.9 m of fill material will be added. The structure will be placed below the existing grade of the stream bed and 0.60 m of granular stream bedding will be placed inside the structure to simulate a natural bottom. During Construction a coffer dam will be used and the streambed will be dewatered prior to installation of the box structure. See Figure 4 for the cross section of the proposed structure.

At both Structure A (south of Station 1+300) and Structure B (Station 1+500) on Crawford's Stream, concrete arches will be installed with 14 m² openings. The arches will be approximately 75 m and 85 m in length, respectively, and constructed of pre-cast concrete panels with cast-in-place concrete footings. The streambeds will be reconstructed with R-5 rip-rap and the sides will be lined with R-50 rip-rap. The arch structures will be covered with granular 'A' backfill. To bring both areas up to grade, 12.7 m of fill material will be added at MacDonald's Stream, while at Crawford's Stream 13.2 m of fill material will be added. During Construction the streams will be diverted in order to conduct the work "in the dry". Diversion of the streams will involve lining excavated trenches with HDPE material and diverting the existing watercourse through the temporary channels. See Figure 5 for a cross section of a typical concrete arch and location of the stream diversion.

At Encounter Creek (between Stations 2+400 and 2+500) a 175 m long pipe with a 1.2 m diameter will be installed. The pipe will be surrounded with granular 'A' backfill and topped with 17.6 m of fill material to bring the area up to grade. The stream will not be diverted at this location, rather the upstream spring will be dammed and the streambed will be allowed to dry out prior to construction. The location of the dam is shown on Figure 2 (Appendix A).

All the water crossing structures are designed to accommodate the precipitation from a one in 100 year storm for the area as defined by data from the Meteorological Service of Canada. Consultation with DFO will be carried out prior to any instream work being conducted.

2.7.1.3.3 Widening of Bonshaw Bridge

Construction activities for widening of Bonshaw Bridge will be conducted during TCH Bonshaw Phase 2 of the Project (Station 5+600), scheduled for May 2013. Construction activities will

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

involve the addition of a lane on the north side of the Bonshaw Bridge. A set of steel H-piles will be installed on the north side of the existing bridge to support the new lane. Other additions include a new pre-cast pre-stressed concrete girder, a concrete pile cap, a concrete sidewalk and aluminum traffic barrier, and new concrete collision blocks. The existing clearance of the bridge above the mean high water mark is 2.688 m; the proposed clearance after the addition of the new lane is 2.638 m.

The upgrades to the bridge are designed to accommodate the precipitation from a one in 100 year storm for the area as defined by data from the Meteorological Service of Canada. All work associated with the widening of the Bonshaw Bridge will be conducted above high water. No environmental issues are expected with respect to the widening of Bonshaw Bridge.

As bridge widening activities are schedule to take place during the migratory bird nesting season (May 1 to August 31), a survey of the bridge for nesting birds will be conducted prior to construction. In the event that nesting migratory birds are discovered, Project activities will be put on hold until the young have fledged.

2.7.1.4 Surfacing and Finishing

Surfacing and finishing includes activities associated with the completion of the highway prior to commissioning, such as:

- paving
- highway marking
- signage, lighting, guardrail installation

2.7.1.4.1 Paving

Conventional asphalt-concrete will be used in the Construction of this Project. This material is made by mixing petroleum based liquid asphalt with sand and crushed stone in an asphalt plant. The hot mix is easily transported, spread, and rolled to provide a smooth surface that can be used almost immediately.

Erosion control measures will be employed during paving operations to minimize runoff from the construction site, where warranted. Paving will be conducted in accordance with the applicable permits and approvals. Paving activities will be conducted during TCH Bonshaw and TCH New Haven Phases 3 and 4 of the Project, scheduled for May to August 2013.

2.7.1.4.2 Signage, Lighting, and Guardrail Installation

Signage and guardrails will be installed during TCH Bonshaw Phase 4 and New Haven Phase 4, once the majority of Construction activities have been completed. Signage installation involves localized disturbances within the PDA, and will require small amounts of excavation and placement of concrete footings for the installation of the signposts and signs. Guardrail

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

installation involves posthole drilling, post installation, and attachment of metal guardrail to the posts. Lighting and reflective devices will also be installed where necessary (e.g., intersections, exits, and horizontal curves).

2.7.1.4.3 Highway Marking

The painting of pavement markings will also be performed after the majority of Construction activities have been completed (*i.e.*, TCH Bonshaw and New Haven Phase 4). Marking, or striping, a highway consists of physically painting yellow and white longitudinal and transverse lines and other symbols and words as required on road surfaces to ensure the traveling public receives direction and guidance. The products that will be used for highway marking will be approved products, commonly available in the market place at the time of marking.

2.7.1.5 Temporary Ancillary Elements

The construction and decommissioning of temporary ancillary elements includes activities associated with the development and removal of temporary ancillary Project elements, such as:

- temporary access roads
- borrow areas
- petroleum storage areas
- materials and equipment (transportation, storage, and handling)

2.7.1.5.1 Temporary Access Roads

Construction activities will require provision of access to the PDA. Existing access roads will be used to the extent possible; however, temporary access roads will be necessary at several locations. In total there will be nine access roads during various phases of the Project. The access roads will be approximately located at the following Station locations:

- Station A 1+000
- Between Stations A 0+400 and A 0+600
- Between Stations A 1+600 and A 1+800
- Station A 2+400
- Station A 2+500
- Station A 0+000
- Station A 3+000
- Station 6+600
- Station 7+800

A temporary bypass road will also be constructed from the existing TCH onto the new TCH alignment and will be in place during excavation and road preparation activities near Station A 2+000. Temporary access roads will be constructed in accordance with landowner agreements

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

and locations will be approved by PEITIR. The access roads will not require watercourse crossings and have been located accordingly.

2.7.1.5.2 Borrow Areas

Selection of borrow areas will be the responsibility of the Contractor. The location and suitability of any new borrow sites for the Project must be approved by the Resident Engineer and must be developed and operated in accordance with all applicable provincial guidelines, policies, acts, and regulations.

2.7.1.5.3 Petroleum Storage Areas

There will be a petroleum storage area set up for each phase of the Project. They will be located near the temporary access site greater than 30 m from any watercourse or wetland. Specific mitigation measures in regard to storage of hazardous materials during Construction are identified in the project specific EPP. Mitigation includes the following guidelines:

- temporary storage areas for containers or drums will be clearly marked
- storage areas will have appropriate secondary containment
- containers will be located on an impermeable floor that slopes to a safe collection area
- storage of all hazardous materials will comply with the Workplace Hazardous Materials Information System (WHMIS) requirements
- appropriate material safety data sheets (MSDS) will be located at the storage site
- machinery will be checked regularly for leaks
- hazardous materials should not be stored within 30 m of wetlands, watercourses, known groundwater sources, or private wells
- refuelling and equipment maintenance required in the field will not occur within 30 m of wetlands, watercourses, known groundwater sources, and private wells where feasible

These guidelines apply directly to watercourses, but are also considered to be relevant to the protection of groundwater, including private wells. The appropriate permits will be obtained for any onsite temporary fuel storage tanks. On-site petroleum storage will be the responsibility of the contractor.

2.7.1.6 Materials and Equipment

Materials and Equipment refer to construction related transportation, and the storage and handling of construction related materials.

2.7.1.6.1 Transportation

Vehicles used in construction typically include excavators, bulldozers, front end loaders, rollers, trucks, asphalt-concrete pavers, and graders. Most of these vehicles operate on diesel fuel and

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

require some form of daily maintenance. Truck traffic generated by the Project during Construction is largely dependent upon the amount of imported fill material required and also on the amount of asphalt required. Offsite truck traffic will also consist of hauling various unclassified excavated and other materials to approved disposal sites, and/or the movement of construction equipment to and from the project site. Trucking operations during the subgrade Construction phase will mainly involve onsite transportation activities of materials for cut and fill operations.

Offsite truck traffic will be generated during the construction of the project subbase and base layers. The volume of truck traffic will depend upon the quantities of crushed stone aggregates and other borrow materials that need to be imported to the site versus that which can be produced onsite from cut sections within the PDA. In addition, specific borrow sites will not be known until they are identified by the construction contractor. All borrow will be sourced at local, provincially approved sites.

Heavy equipment used in base and pavement construction include steel drum rollers, graders, trucks, and asphalt concrete pavers.

Use of local and collector highways for access to the Project will be subject to applicable Provincial gross vehicle weight maximums and spring weight restrictions.

2.7.1.6.2 Storage and Handling

Where applicable, excavated material and aggregates will be stored for later use in provincially-approved locations. If there is potential for runoff to leave the site, measures will be put in place to collect and test runoff prior to discharge. Material will be stockpiled in such a way as to prevent their erosion and to prevent sedimentation to any adjacent watercourses. Prior to the usage of the stockpiled material, during the breeding bird season (May 1 to August 31), the pile will be inspected for use by migratory birds. In the event that migratory birds do nest on one of the piles alternate arrangements will need to be made for erosion control and use of the material. According to Canadian Wildlife Services, for a species such as Bank Swallow, the period when the nests would be considered active would include incubation, care of nestlings, and a period of time after chicks have learned to fly, since swallows return to their colony to roost.

2.7.1.6.3 Disposal Areas

Disposal of Project-related waste materials from Construction will be at a provincially approved waste disposal facility, where applicable. Measures to divert waste from the landfills will be taken, such as on-site use of materials (*i.e.*, uncontaminated rock, soil, and brush) where possible, and the disposal of construction and demolition debris at an approved construction and demolition debris site. Waste disposal will be the responsibility of the contractor.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Non-salvageable material from the clearing operations, such as limbs and timber, may be chipped within the PDA and left in place with the exception of buffer zones for watercourses and wetlands.

2.7.2 Operation and Maintenance Activities

The following is a description of Operation and Maintenance activities typical for highways of this nature. The description of Operation and Maintenance activities has been divided into three categories:

- infrastructure maintenance
- winter maintenance
- vegetation management

2.7.2.1 Infrastructure Maintenance

General highway maintenance activities retain roadways at a reasonable level of service, comfort, and safety and typically take place during the summer months. The rate of degradation of the pavement surface will be determined by the volume of traffic, proportion of heavy trucks, certain vehicle characteristics (e.g., radial tires), and the structure and quality of pavement. The repair of the asphalt surface may involve excavation or removal of the existing pavement and subgrade, patching and leveling, grading and gravelling, surface treatment, and asphalt concrete overlays. Disruption to the public from these repairs would be temporary and infrequent in nature.

Periodic maintenance of roadway drainage systems may be required. This may involve the replacement or repair of culverts and re-establishment of the drainage ditches.

Other highway maintenance activities include shoulder grading, localized pavement repair, and line repainting. Disruption to the public from these repairs will be temporary and infrequent in nature.

2.7.2.2 Winter Maintenance

Winter highway operation activities generally involve snow removal and ice control to reduce traffic disruptions and safety hazards. Snow removal involves plowing services provided by, or contracted out and supervised by PEITIR. When snow banks build up along the highway, the banks may be winged back or the snow is removed and dumped at a suitable site (*i.e.*, not in wetlands or environmentally sensitive areas). Road ice is managed through the application of salt and sand. Salt can melt ice, or stop the formation of ice, and is applied to roads to retain clear driving lanes within a reasonable time after a storm. Sand is applied to icy or snow-packed road surfaces to provide traction.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Road salts that contain inorganic chloride salts are considered “toxic” as defined in Section 64 of the *CEPA*. Recognizing that a total ban of road salt could potentially compromise human safety, the focus is on implementation of measures that optimize winter road maintenance practices so as not to jeopardize road safety while minimizing the potential environmental effects. Therefore, Environment Canada has categorized road salt as a Track 2 substance, requiring Life-Cycle Management. In 2004, Environment Canada released the “Code of Practice for the Environmental Management of Road Salts” (Environment Canada 2004). The environmental effects of increased chloride concentrations in the natural environment were a large part of the reason for the development of the Code of Practice. The focus of road salt risk management is on implementation measures that optimize winter road maintenance practices, while minimizing the use of road salt, particularly near areas that may be sensitive to road salt. Environment Canada determined that the development and refinement of Salt Management Plans is the best mitigation against potential environmental effects from road salt use.

On PEI, pure road salt is used to de-ice the main arterial routes (*i.e.*, 1, 1a, 2, 3, and 4). A blend of 6% salt and 94% sand is used on the remaining provincial roadways. Health Canada’s Guidelines for Canadian Drinking Water Quality (2010) has set the aesthetic objective of chloride in drinking water as ≤ 250 milligrams per litre (mg/L). The PEITIR has established a policy to deal with cases where elevated levels of chloride are caused by road salt. Further information can be found in PEITIR’s Salt Management Plan, which also includes their commitment to optimizing road salt use in PEI through improved operational efficiency, newer technology, and the implementation of best management practices.

2.7.2.3 Vegetation Management

Growth of vegetation within the PDA may interfere with the lines of sight required for safe use of the highway. Clearing/mowing along the PDA is part of PEITIR’s regular maintenance to maintain sight lines and may involve both manual and mechanized cutting. The PEITIR does not use herbicide application for the control of vegetation.

2.8 Accidents, Malfunctions, and Unplanned Events

All necessary precautions will be taken to prevent the occurrence of Accidents, Malfunctions, and Unplanned Events that may occur throughout all phases of the Project and to minimize any environmental effects should they occur. Accidental events with the greatest potential for environmental effects include:

- hazardous material spills
- failure of erosion and sediment control measures
- fire
- vehicular collisions
- wildlife encounter
- disturbance of archaeological or heritage resources

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

It is difficult to predict the precise nature and severity of these events. The probability of serious accidental events or those causing significant adverse environmental effects is low, particularly when Construction and Operation and Maintenance procedures incorporate contingency and emergency response planning. Construction and Operation and Maintenance will be conducted in accordance with the project specific EPP. Nevertheless, the potential effects of these events are discussed in more detail below.

2.8.1 Hazardous Material Spill

Spills of petroleum, oils, or lubricants (POLs) may occur during Construction, fuelling of machinery or through breaks in hydraulic lines. These spills are usually highly localized and easily cleaned up by on-site crews using standard equipment. In the unlikely event of a large spill, soil, groundwater, and surface water contamination may occur, thereby potentially adversely affecting the quality of groundwater, fish and fish habitat, and wetland habitat, thus resulting in the ingestion/uptake of contaminants by wildlife. Depending on the nature of the spill, it could also potentially affect residential, commercial, agricultural, and other land uses.

The likelihood of a hazardous materials spill is minimized through the mitigation described in the project specific EPP for the storage and handling of hazardous materials. A Spill Contingency Plan is included in the EPP and this includes actions and measures that should be taken in the event of a hazardous materials spill including: what to do if first-on-scene; stopping the flow of product if it can be done safely; and notifying relevant agencies (Canadian Coast Guard, PEIDELJ). The PETIR also has a Spill Response Policy that will be followed in the event of a hazardous materials spill. In the event of a hazardous materials spill, the Environmental Emergency Response phone number (1-800-565-1633) will be called. Materials to facilitate a rapid containment and clean-up of hazardous materials spills will be available on site during Construction in or near watercourses and wetlands. Emergency vehicle access will be provided. Emergency response and contingency planning are accepted and effective means to limit the severity of environmental effects.

The likelihood of a hazardous materials spill during Operation and Maintenance will be minimized through highway design standards, enforcement of speed limits, signage, and winter safety methods.

2.8.2 Erosion and Sediment Control Failure

The potential exists for failure of erosion and sediment control structures due to precipitation events, particularly during Construction activities. Such a failure could result in the release of sediment-laden runoff to the receiving watercourse, with potential adverse environmental effects on fish and fish habitat. In the event of erosion and sediment control failure, the Environmental Emergency Response phone number (1-800-565-1633) will be called. Erosion and sediment control measures will be implemented and maintained as described in the project specific EPP. These measures will be monitored during Construction by PEITIR and the selected Contractor,

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

particularly after a heavy precipitation event or snow melt that results in the visible overland flow of water. Remedial action will be taken as necessary.

2.8.3 Fire

Fire may result in habitat loss, sensory disturbance, direct mortality to wildlife, loss or damage of property, and loss or damage to archaeological and heritage resources. In the unlikely event of a fire, local emergency response and firefighting capability will be able to reduce the severity and extent of damage. Fire prevention procedures are included in the project specific EPP to reduce the potential for fires, including, keeping the worksite free of flammable wastes. In the event of a fire, the Environmental Emergency Response phone number (1-800-565-1633) will be called.

2.8.4 Vehicle Collision

Without the use of extraordinary measures, there is a risk of vehicle collision, including vehicle to vehicle collision, wildlife strike, or pedestrian strike during all phases of the Project. With the implementation of standard mitigation, the severity and risk of a vehicular collision can be reduced. The Project in and of itself is intended to reduce the occurrence of a vehicular collision through the implementation of well-established design standards resulting in improved sightlines, wider travelling lanes, and diminished curves. Throughout the phases of the Project, standard signage and lighting will be maintained to advise motorists of changes in traffic patterns and potential hazards.

2.8.5 Wildlife Encounter

There is the potential for workers to come into contact with wildlife (e.g., foxes, raccoons, coyotes) during the Construction and Operation and Maintenance phases of the Project. This could have adverse environmental effects on both worker (e.g., disruption of work activity) and wildlife (e.g., disturbance of critical life cycles). All work areas will be kept free from food debris and garbage will be properly contained. Limiting off road travel will also reduce the potential for encountering wildlife.

2.8.6 Disturbance of Heritage Resources

There is the potential for the unplanned disturbance to or discovery of heritage resources, including archaeological, paleontological, and heritage artifacts. A significant 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 significant. In the event of an unplanned encounter the Contractor will notify PEITIR, all work will cease in the immediate area of the discovery, and the provincial Archaeologist will be contacted immediately at (902) 368-5378.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****2.9 Environmental Management**

The PEITIR has an Environmental Management Section (EMS) which provides environmental planning, environmental permitting, and environmental compliance services for all projects occurring within the provincial right-of-way. The EMS is responsible for ensuring all department activities comply with provincial and federal regulations. As part of its environmental management strategy, PEITIR has prepared an EPP, which includes emergency response planning. As the Project is being conducted in sensitive areas, PEITIR has decided to complete a Project specific EPP (including project specific emergency response plans) for the Project prior to the initiation of construction activities. The EPP will include project specific mitigations that are identified in the environmental assessment process. Environmental Management Section staff, including the Environmental Coordinator and the County Environmental Officer will actively manage the implementation of the environmental protection plan, its measures, and ensure compliance from PEITIR staff, and contractors working on behalf of the Department. This will include regular site inspections and participation in regular Project meetings.

The PEITIR Salt Management Plan, as described in Section 2.8.2.2, will also apply to this Project.

2.9.1 Design and Construction

Project design will include environmental elements identified in this EA, which will be implemented during Construction. Technically and economically feasible methods for achieving standards and meeting regulatory requirements will be implemented for each Construction activity.

The PEITIR highways are constructed under contract through a public tendering process. The contract documents contain a description of the work, the standards under which it is to be carried out, and the results expected to be attained. Construction specifications not only provide design details, but also refer to management practices and contain environmental protection measures, as outlined in the project specific EPP. The contractor will be qualified to do the work and will receive environmental awareness training.

Construction will follow the project specific EPP, which will provide mitigation on a number of design and construction-related environmental concerns normally associated with bridges and highways.

Other applicable standards and guidelines to be employed during Construction include, but are not limited to:

- Geometric Design Guide for Canadian Roads, Transportation Association of Canada (TAC 1999)
- Guidelines for the Protection of Fish and Fish Habitat – The Placement and Design of Large Culverts (DFO 1998)

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

- Prince Edward Island Watercourse and Wetland Alteration Guidelines (PEIDEEF 2006)

To ensure compliance with environmental standards and regulations, regular inspections and monitoring will be performed through consultation with the appropriate regulatory authority on the proper environmental practices.

Environmental protection control measures employed during Construction will be inspected regularly. Improperly installed or damaged environmental controls will be corrected immediately upon discovery. Inspections of the construction site to ensure compliance with the project specific EPP will be conducted before and after known major rainstorm events.

Machinery will be inspected regularly to ensure it is properly maintained and minimizes POL leaks and drips. Employees and subcontractors will be required to implement appropriate control measures to prevent leaks of petroleum, oils, or lubricants during Construction activities.

2.9.2 Operation and Maintenance

Environmental protection procedures and measures will be observed and employed throughout the life of the Project. The PEITIR will be responsible to ensure installation, maintenance, and inspection and monitoring of environmental protection control measures during Operation and Maintenance.

3 ENVIRONMENTAL ASSESSMENT METHODS, SCOPE OF ASSESSMENT, AND CONSULTATION AND ENGAGEMENT

3.1 Environmental Assessment Methods

An overview of the methods used to conduct this environmental assessment is provided in this section. The EA has been completed using the methodological framework developed by Stantec to meet the requirements of both *CEAA* and 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 EA focuses on specific environmental aspects (called Valued Environmental Components or VECs) that are of particular value or interest to regulatory agencies, the public, and other stakeholders. The VECs are broad components of the biophysical and human environments that, if altered by the Project, may be of concern to regulatory agencies, Aboriginal persons, resource managers, scientists, and/or the general public. VECs are selected on the basis of:

- regulatory issues, guidelines, and requirements
- knowledge of the project, its components, and activities
- knowledge of existing conditions where the project will be located
- issues raised by regulatory agencies, the public, and stakeholders
- the scope of factors to be considered in the EA as determined by RAs
- the professional judgment of the Study Team

It is noted that “environment” is defined to include not only biological systems but also human, social, and economic conditions that are affected by changes in the biological environment. The VECs relate to ecological, biophysical, social, or economic systems that comprise the environment.

3.1.1 Overview of Approach

The Project-related environmental effects are assessed using a standardized methodological framework for each VEC, with tables and matrices used to facilitate and support the evaluation. The residual Project-related environmental effects (*i.e.*, after mitigation has been applied) are characterized using specific criteria (*e.g.*, direction, magnitude, geographic extent, duration, frequency, and reversibility) that are defined for each VEC. The significance of the Project-related environmental effects is then determined based on pre-defined criteria or thresholds for determining the significance of the environmental effects (also called significance criteria).

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Cumulative environmental effects (*i.e.*, where there is overlap between the residual effects of other projects or activities) may occur and the potential for this needs to be assessed. The cumulative environmental effects of the Project are assessed to determine if those cumulative environmental effects could be significant, and to consider the contribution of the Project to those effects

The environmental effects assessment approach used in this EA is shown graphically in Figure 3.1. The environmental effects assessment methodology involves the following generalized steps.

- **Scope of Assessment** - This involves the scoping of the overall assessment, including the selection of VECs; description of measurable parameters; description of temporal, spatial, and administrative/technical boundaries; definition of the parameters that are used to characterize the Project-related environmental effects; and identification of the standards or thresholds that are used to determine the significance of environmental effects. This step relies upon the scoping undertaken by regulatory authorities; consideration of the input of the public, stakeholders, and First Nations (as applicable); and the professional judgment of the Study Team.
- **Existing Conditions** - Establishment of existing (baseline) environmental conditions for the VEC. In many cases existing conditions expressly and/or implicitly include those environmental effects that may be or may have been caused by other past or present projects or activities that have been or are being carried out.
- **Assessment of Project-Related Environmental Effects** - Project-related environmental effects are assessed. The assessment includes descriptions of how an environmental effect will occur, the mitigation and environmental protection measures proposed to reduce or eliminate the environmental effect, and the characterization of the residual environmental effects of the Project. The focus is on residual environmental effects, *i.e.*, the environmental effects that remain after planned mitigation has been applied. All phases of the Project are assessed (*i.e.*, Construction, Operation and Maintenance), as are Accidents, Malfunctions, and Unplanned Events. The evaluation also considers the effects of the environment on the Project. For each VEC, a determination of significance is then made, based on the identified significance criteria.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

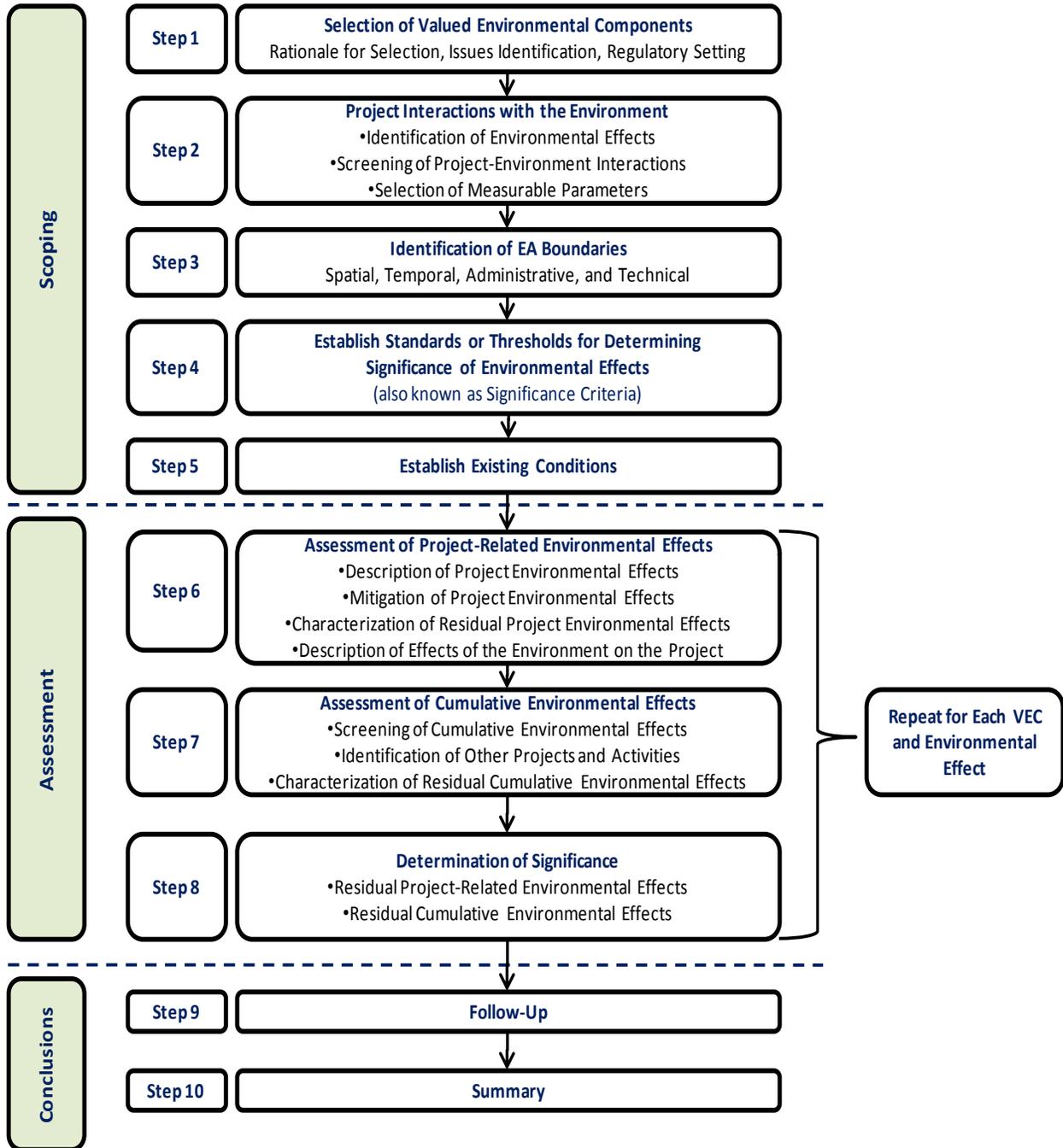


Figure 3.1 Summary of Stantec’s Environmental Assessment Methodology

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

- **Assessment of Cumulative Environmental Effects** - Cumulative environmental effects of the Project are identified in consideration of other past, present or future projects or activities, for all phases of the Project (*i.e.*, Construction, Operation and Maintenance), as well as for Accidents, Malfunctions, and Unplanned Events. An assessment of potential interactions is completed to determine if an assessment of cumulative environmental effects is required (*i.e.*, there is potential for substantive interaction) for that specific Project-related environmental effect that overlaps with those of other projects or activities that have been or will be carried out. The residual cumulative environmental effects of the Project in combination with other past, present, or future projects or activities that have been or will be carried out are then evaluated, including the contribution of the Project to those cumulative environmental effects.
- **Determination of Significance** - The significance of residual Project-related and cumulative environmental effects is then determined, in consideration of the significance criteria that have been established for each VEC.
- **Recommendations for Follow-up** - Follow-up and monitoring to verify the environmental effects predictions or to assess the effectiveness of the planned mitigation are recommended, where applicable.

Further details on the environmental assessment methodologies that were used in this EA can be provided upon request to Stantec.

3.2 Scope of Assessment

3.2.1 Scope of Project

The RAs, namely TC Surface Infrastructure Program and DFO in consultation with EC and HC, have determined that the scope of the Project to be assessed under CEAA includes the following components:

- constructing a 6.2 km, two-lane, partially controlled access new highway development
- installing watercourse crossings in tributaries of West River
- widening of the existing Bonshaw Bridge crossing West River
- modifications to secondary roads

The scoping document provided by the RAs indicates that a description of each Project component is required, as follows:

- site preparation activities (*e.g.*, clearing vegetation, utilities)
- construction and operation of the highway, intersections, culverts, and bridges
- construction of any temporary structures or construction roads

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

- construction, modification, and operation of associated infrastructure (e.g., traffic control structures, watercourse crossings)
- construction and operation of all ancillary works (e.g., borrow pits, material storage areas, etc.)
- maintenance of the proposed project components (e.g., de-icing methods, periodic pavement rehabilitation, vegetation management)
- removal or modification of commercial and residential properties within the project development area (e.g., deconstruction of barns, houses, etc.)
- decommissioning of any existing sections of the TCH, if applicable
- decommissioning of proposed project components

3.2.2 Factors to be Considered

The EAs conducted under *CEAA* require specific factors to be considered. Section 16(1) of *CEAA* establishes the mandatory factors to be considered for all EAs.

The RAs have determined that the EA will consider the mandatory factors outlined in Sections 16(1)(a) through 16(1)(e) of *CEAA*, as follows:

- “the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out
- the significance of the effects referred to in paragraph (a)
- comments from the public that are received in accordance with this Act and the regulations
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project
- Any other matter relevant to the screening...that the responsible authority...may require to be considered”

3.2.3 Scope of Factors to be Considered

The EA shall consider the factors outlined in Section 16(1)(a) to (e), of *CEAA*. Specifically, the EA will consider the potential environmental effects of planned activities and mitigation to be carried out during Construction, and Operation and Maintenance of the Project, as required under Sections 16(1)(a) and (b) of *CEAA*, including the potential cumulative environmental effects of other projects or activities that have been or will be carried out. The potential

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

environmental effects of credible Accidents, Malfunctions, and Unplanned Events that could occur during these phases and/or as part of these activities shall also be assessed.

The scope of factors to be considered identified in the scoping document to be included in the EA are listed in Table 3.1, along with the name of the VEC that each of those components will be assessed under this EA. Contaminated Sites was not carried forward in the assessment as there are no known issues with contamination within the PDA. The effects of the Project to Human Health are an important part of the project assessment. Specific effects are addressed under the VEC section to which they directly relate. For instance, risks to human health from ground water sources will be dealt with in the Groundwater Resources section while health risks related to air quality will fall under the Atmospheric Environment section. For this reason, there is no need to carry forward these issues as a separate VEC.

Table 3.1 Valued Ecosystem Components to be Assessed in this Environmental Assessment

Scope of Factors to be Considered in Scoping Document	VECs Assessed in this EA
Air Quality and Climate	Atmospheric Environment
Surface Water and Aquatic Habitat	Freshwater Environment
Groundwater	Groundwater Resources
Subsurface Geology and Soils	Terrestrial Environment
Vegetation and Vegetation Communities	Terrestrial Environment
Old Mature Forests	Terrestrial Environment
Fish and Fish Habitat	Freshwater Environment
Wildlife and Wildlife Habitat	Terrestrial Environment
Migratory Birds	Terrestrial Environment
Species at Risk and Species of Conservation Concern	Terrestrial Environment
Noise and Vibration	Atmospheric Environment
Effects of the Project on Federal Lands	Land Use
Wetlands	Terrestrial Environment
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons	Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons
Physical and Cultural Heritage, including First Nations Interest	Archaeological and Heritage Resources
Socio-economic Conditions	Transportation Land Use Public Health and Safety
Anything of Historical, Paleontological, or Architectural Significance	Archaeological and Heritage Resources

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

3.3 Consultation and Engagement

The consultation and engagement plan in support of the EA of the Project has been developed following the guidance of *CEAA* and provincial EIA guidelines (PEI 2010). A summary of the planned activities and initiatives is provided in the following sections.

3.3.1 Regulatory Consultation

Regulatory consultation has been conducted with several regulatory agencies throughout the course of the EA process. A meeting was held with DFO and the PEI Department of Fish and Wildlife on April 10, 2012, to discuss project details and the proposed watercourse crossing structures. In addition, a meeting was held with PEIDELJ on April 24, 2012, to discuss the provincial requirements and extent of the baseline studies required as part of the scope of the EA.

3.3.2 Public and Stakeholder Engagement

Consultation has been conducted between PEITIR and the following stakeholders to date through a variety of mechanisms (e.g., requests for information, professional advice, meetings), concerning the original realignment through Strathgartney Park.

- PEI Department of Transportation and Infrastructure Renewal (internal consultation of divisions)
- PEI Department of Environment, Labour, and Justice
- Mi'kmaq Confederacy of PEI
- Island Nature Trust
- Natural History Society of PEI
- South Shore Watershed Association
- West River Watershed Group
- Bonshaw Community Council
- New Haven Riverdale Community Council
- South Shore Chamber of Commerce
- affected property owners
- the general public

Consultation was conducted with the PEIDELJ regarding the original proposed realignment, involving three properties protected under the PEI *Natural Areas Protection Act* that are in the vicinity of the Project.

Six open houses/public meetings were held in late October and early November 2011 which allowed residents an opportunity to view proposed realignment plans for the TCH in Churchill (as well as two other nearby realignment projects), to ask questions and to submit feedback.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

The province received over three hundred submissions from Islanders, as well as a petition to preserve Strathgartney Provincial Park which contained over 2,700 signatures. The result was a new realignment.

In March 2012, the PEITIR conducted a Public Information Session allowing residents an opportunity to view and comment of the revised route. Approximately 150 residents and members of the general public appeared at session to evaluate and comment on the proposed revisions.

On Thursday April 26, 2012, a rally was held at Province House to present a new petition to Premier Robert Ghiz and Transportation Minister Robert Vessey opposing the proposed Highway Realignment project. The petition requested the PEI Government to reconsider the current proposed TCH realignment from New Haven to Bonshaw based on concerns about need, cost and environmental impact. The petition also stated that any upgrades for safety should be made in a cost-efficient manner to the existing road, through consultation with local residents. Premier Ghiz addressed the crowd at this time, outlining the rationale behind the Project and highlighting the benefits.

Letters to the Editor received by The Guardian between December 23, 2011 and the present have revealed the following environmental concerns from the general public:

- destruction of old mature forests (*i.e.*, hemlock and pine)
- impact of the construction and operation of the Project on biodiversity in the area
- impacts to streams and springs in the area
- loss of habitat for birds and other wildlife
- death/injury of wildlife associated with the highway
- impacts to managed woodlots
- impacts to water balance in the watershed

As part of the EA process, additional stakeholders and the general public will be invited to an additional public open house to present information collected in support of the EA, answer questions, and collect comments and feedback. The open house will be held no less than 15 days after the EA is registered with PEIDELJ. A report summarizing the open house, including all comments and questions received, will be prepared and submitted to TC and PEIDELJ.

The EA will be posted on the website of the Government of PEI (www.gov.pe.ca) along with any other Project-related information. A copy of the EA will also be available for public review at the Charlottetown office of PEIDELJ, which is located on the fourth floor of the Jones building at 11 Kent Street. A Notice of Commencement has been posted on the Canadian Environmental Assessment Registry (CEAR) website (<http://www.ceaa.gc.ca/050/details-eng.cfm?evaluation=59114>) with a project description and contact information for additional information.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

A notice will be placed in the local newspaper, the Guardian, advising the public of the Project and providing contact information of both the Proponent and PEIDELJ so that comments can be submitted or so that further information can be requested.

3.3.3 First Nations Consultation

The Project is planned within the traditional territory of the Mi'kmaq. As part of fulfilling the Crown's duty to consult, PEITIR has and will continue to conduct First Nations consultation for the Project. Consultation with the Aboriginal Affairs Secretariat indicated that there are no records of current Aboriginal land and resource use in the area. It was also indicated that there are no known sites of historic or cultural importance within the PDA.

On July 4, 2012 a letter of initial notification and details regarding the Project were forwarded to the Abegweit and Lennox Island Band chiefs, and copies were provided to the Mi'kmaq Confederacy of Prince Edward Island (MCPEI), and the Aboriginal Affairs Secretariat. Copies of the letters are included in Appendix B. Feedback on the Project was requested on or before August 3, 2012. The PEITIR has since met with the MCPEI and it has indicated that the organization had no concerns with the Project other than construction activities that may affect the West River. In the meeting, details regarding mitigation for sediment and erosion control during bridge widening activities and construction of the highway realignment near the river were discussed. The MCPEI indicated that they had no further concerns with the Project in view of the details provided in the meeting.

3.3.4 Other Project or Activities That Have Been or Will Be Carried Out

The consideration of other projects or activities that have been or will be carried out in the vicinity of the Project is a necessary component of the assessment of cumulative environmental effects to meet the requirements of CEAA. For convenience, the specific projects and activities that are planned or under construction are grouped with other similar projects, to facilitate the assessment of cumulative environmental effects in logical groupings. The other projects and activities considered in the cumulative environmental effects assessment in this EA (*i.e.*, "other projects or activities that have been or will be carried out") are listed in Table 3.2.

Table 3.2 was generated based on current knowledge of the area of the Project and professional judgment of the Study Team. The list of potential future projects or activities that will be carried out was generated by consulting PEIDELJ's list of undertakings (<http://www.gov.pe.ca/envengfor/index.php3?number=1005874&lang=E>), April 13, 2012 update) as well as the Canadian Environmental Assessment Registry (CEAR) (http://www.ceaa-acee.gc.ca/050/_index_e.cfm, accessed April 26, 2012), and selecting projects or activities within reasonable proximity to the Project.

The list of other projects or activities that will be carried out as outlined in Table 3.2 considers only those projects or activities that are proximal to the Project and where a reasonable

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

probability of their environmental effects overlapping with those of the Project would be expected.

Table 3.2 Other Projects and Activities for Consideration of Cumulative Environmental Effects

Name of Project or Activity	Brief Description of Project or Activity	Key Environmental Effects that May Overlap with the Potential Environmental Effects of the Project
Past or Present Projects or Activities that have been and will continue to be Carried Out		
Existing Infrastructure	Historical and current development and use of modern infrastructure to support modern societal needs, including the development of the existing road transportation network, power transmission infrastructure, and telecommunications infrastructure.	<ul style="list-style-type: none"> • Change in Land Use • Change in Transportation • Change in Freshwater Environment
Land Use	Historical and current use of land for agriculture, forest resource harvesting, recreational purposes, including recreational hunting, fishing, trail development, and use of land for hiking, all-terrain vehicles, or snowmobiling.	<ul style="list-style-type: none"> • Change in Land Use • Change in Terrestrial Environment
Potential Future Projects or Activities That Will Be Carried Out		
Prince Edward Island Department of Transportation and Infrastructure Renewal Realignment of Trans-Canada Highway Crapaud to Tryon, Prince County, PEI	Construction and operation of a 7.5 km segment of TCH between Crapaud, and Tryon Prince County, PE. The realignment will include replacement of the Westmoreland Bridge and construction of an overpass spanning the Tryon River.	<ul style="list-style-type: none"> • Change in Land Use • Change in Atmospheric Environment • Change in Freshwater Environment • Change in Terrestrial Environment
Highway operation and maintenance	The operation of the TCH and surrounding secondary roads in the area. On occasion maintenance activities will also be conducted (e.g., resurfacing, line painting)	<ul style="list-style-type: none"> • Change in Land Use • Change in Atmospheric Environment • Change in Freshwater Environment

Searches of PEIDELJ's Record of undertakings list and the CEAR list of active projects revealed that there are no other recent or proposed projects in the New Haven to Bonshaw area. The PEITIR are considering one future project within 20 km of the PDA that is scheduled to occur within the next five years. The project includes a realignment of approximately 7.5 km of the Trans-Canada Highway between Crapaud and Tryon, in Prince County, PEI. This

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

realignment will include the replacement of the Westmorland Bridge east of Crapaud and the construction of a new overpass spanning the Tryon River. This is the only future project currently planned by PEITIR in the vicinity of the PDA within a five year time frame.

The list of other projects or activities in Table 3.2 considers all past and present projects that have been or are currently being carried out and that will continue into the future, as well as those projects or activities that have been formally proposed by project proponents or identified by PEITIR. Other potential projects, proposals, concepts, ideas, visions, or initiatives that may be under consideration, but have not been formally registered provincially or federally, are not included in this list; their cumulative environmental effects with the Project are thus not assessed in this EA. If other projects or activities are formally proposed and assessed federally, the potential cumulative environmental effects of those projects in consideration of the current Project would need to be assessed as part of a cumulative environmental effects assessment in those EAs.

4.0 SUMMARY OF THE EXISTING ENVIRONMENT

A summary of existing environmental conditions in the vicinity of the Project is provided in this chapter. The summary is based on existing literature and sources of information that are available in the area of the Project, supplemented by field reconnaissance where needed.

4.1 Physical Environment

4.1.1 Geological Conditions

The geology along the realignment consists of an upper thin layer of recent soil, colluvium and alluvium which is derived primarily from bedrock or Quaternary tills. The tills are sand-phase or silt-phase derived primarily from local bedrock materials. The bedrock comprises relatively soft Pennsylvanian to Permian-aged sedimentary strata consisting of sandstone with lesser amounts of conglomerate, mudstone and siltstone.

4.1.2 Soil

MacDougall *et al.* (1988) indicated that the primary surficial soil type along the PDA consists of the Charlottetown (Ch) soils map unit, a moderately coarse-textured, Orthic Humo-Ferric Pedzol, soil. The Charlottetown map unit occupies the largest area (approximately 188,000 hectares) of any soil type in the Province.

Soils of the Charlottetown map (also referred to as the Ch map) unit are predominantly well drained, but a moderately well drained phase also occurs. From an agricultural perspective, Ch soils have good surface drainage and adequate to rapid upper profile permeability. Hydraulic conductivity decreases with depth as a result of increasing soil density. Below a depth of 50 to 60 cm, the soil has a relatively low porosity and low hydraulic conductivity.

The Ch soils have developed on strongly acid, fine sandy loam, till or other residual material. Clay content of the parent material varies from 8 to 18 percent (%) and silt plus clay content ranges from 25% to 50%. As a result of this relatively high fines content, Ch soils are susceptible to erosion and disturbance when exposed to water. The dominant surface texture for the subject area varies from a fine sandy loam to a very fine sandy loam. Ch soils typically occur within gently undulating to undulating terrain (< 5% slope) whereas the topography along the proposed realignment varies from gently undulating to hilly (> 30% slope).

Prest (1973) shows the parent material along the proposed realignment to consist predominantly of sedimentary bedrock (Late Pennsylvanian to Early Permian sedimentary, dominantly sandstone) with some areas where the bedrock is overlain by glacially derived materials, including:

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

- minor areas of well stratified and permeable sand and gravel Kame complex and sand-phase till may be present in the vicinity of the extreme westerly ramp areas
- westernmost 1 km commencing at Bonshaw Bridge where ablation moraine (loose stony to boulder sand till with lenses of stratified silt, sand, and gravel) is present
- an approximately 500 m long section in a low-lying area located in the vicinity of Peter's Road (Route 244) where a clay-sand phase till is present

The overburden along the remainder of the PDA is typically a moderately permeable sand-phase soil with possible exposed bedrock in the higher elevation areas. Based on 32 well drillers logs in the area, however, the overburden thickness ranges from 5.6 to 29.6 m, averaging 15.9 m (median 15.9 m). The results of a current geotechnical investigation have shown the overburden thickness to range from 1.3 to 3.4 m, with an average of 2.3 m.

4.1.3 Bedrock

PEI is underlain by sedimentary bedrock, considered to be Late Pennsylvania to Early Permian in age (250 to 300 million years old). Van de Poll (1983) describes the bedrock in this area as a fining-upwards sequence of conglomerate, sandstone and siltstone sediments of the Lower Permian aged Pictou Group Megacyclic Sequence III. The megacycles are 300 to 400 m in thickness, and are locally sub-divided into mini-cycles of fining upwards sequences of conglomerate/coarse sandstone to siltstone/mudstone, with average repetitions of about 18 m between mini-cycles. Due to the cross-bedded fluvial depositional environment, the bedding is generally discontinuous across short horizontal distances. The relatively flat-lying bedding in the vicinity of the PDA generally strikes in an east-west direction dipping to the north at an average inclination of 2 to 3 degrees.

Based on its location within the sedimentary sequence, medium to coarse grained sandstone bedrock with conglomerate and minor siltstone and mudstone interbeds are expected to be the dominant lithology underlying the PDA. Coarser sandstone with conglomerate interbeds are expected in the western end, and sandstone with an increasing proportion of siltstone interbedding is expected in the eastern end. Numerous bedrock outcrops are noted between Bonshaw and Strathgartney, suggesting that the bedrock surface approaches or is exposed over an estimated 60% of the surface area. The results of the present geotechnical investigation have shown medium grained sandstone to be the predominant bedrock type.

The sandstone bedrock is typically weak and can often be excavated with large backhoes, excavators, and bull-dozers (equipped with a ripper-tooth), but in some areas it is calcareous and hard making excavation with conventional earth moving equipment difficult, particularly where significant excavation depths are required.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

4.2 Groundwater Resources

All potable and domestic water supplies for all residential, commercial establishments and farms within the study area are derived from groundwater supplied by drilled wells completed in bedrock. Table 4.1 below summarizes well construction information provided by PEIDELJ for residences located along the PDA. These logs span a period of 1972 to present. Domestic water supply wells are typically 100 to 152 mm in diameter, and range from 15.2 m to 122 m in depth (mean 63 m) with an average of 16.8 m of steel well casing. These wells provide sufficient yield for single family dwellings, generally in excess of 45 L/min (10 lgpm). Static water levels range from 3 m to 79 m below grade, averaging 32 m below grade. The results of the present geotechnical investigation show the groundwater table along the proposed alignment to be generally located within 10 to 15 m of ground surface.

Table 4.1 Well Construction

Well Location	No. Wells	Depth Range (mean) (m)	Casing Range (mean) (m)	Water Level Range (mean) (m)	Est. Overburden Thickness Range (mean) (m)
All Wells	34	15.2-121.9 (63.0)	6.6-30.5 (16.8)	3-79.2 (31.7)	5.6-29.6 (15.9)
Bonshaw	7	15-112.8 (58.1)	11-24.4 (20)	3-79.2 (19.8)	10.1-23.5 (19.1)
Churchill	4	16.8-91.4 (54.8)	6.6-25.6 (14.4)	6.4-57.9 (34.5)	5.6-24.7 (13.5)
New Haven	19	31.7-121.9 (62.6)	7.3-23.2 (15.5)	5.5-45.4 (28.8)	6.4-22.2 (14.6)

Source: PEIDELJ Well Driller's Logs

The dominant directions of regional groundwater flow are expected to generally reflect topography from recharge areas located in the vicinity of Glen Valley (maximum elevation 142 m) about 16 km to the northwest, towards discharge areas along the Northumberland Strait to the south and southeast, with a regional horizontal gradient of less than one percent.

A review of groundwater chemistry from over 100 pumping tests conducted on PEI characterizes the bedrock groundwater quality as a clear (Color < 5 TCU), moderately hard (mean hardness 129 mg/L) and neutral to slightly alkaline (mean alkalinity 118 mg/L, mean pH 7.9, mean Langelier calcite saturation index -0.2) calcium bicarbonate water type of low dissolved solids (mean TDS 155 mg/L). The groundwater typically meets Guidelines for Canadian Drinking Water Quality (Health Canada 2011), with rare exceptions of arsenic (<1 to 30, mean 2.3 µg/L), barium (89 to 1500, mean 533 µg/L) and uranium (0.2 to 23, mean 6.2 µg/L).

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****4.2.1 Atmospheric Environment**

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

- Air Quality, which is characterized by the measure of the constituents of ambient air, and includes the presence and the quantity of air contaminants in the atmosphere.
- Climate, which is characterized by the composite or generally prevailing meteorological conditions of a region, including temperature, air pressure, humidity, precipitation, sunshine, cloudiness, and winds, throughout the seasons, averaged over a series of years (typically a 30 year period of record). The net emissions of greenhouse gases (GHG) from the Project are used in this EA as an indicator of potential environmental effects on Climate. The assessment of potential environmental effects of Climate on the Project is addressed in Effects of the Environment on the Project Chapter.
- Sound Quality, which is characterized by the type, character, frequency, intensity, and duration of noise (unwanted sound) in the outdoor environment. The audible frequencies for humans are in the range of 20 - 20,000 Hertz (Hz). Vibration, identified as oscillations in matter that may lead to unwanted sound or stress in materials, is qualitatively assessed within Change in Sound Quality.

4.2.1.1 Air Quality

The existing air quality in the vicinity of the Project is influenced by traffic and nearby farming. Local road traffic and agricultural emissions are the predominant sources of air contaminant emissions in the Project area. In the vicinity of the PDA, contributors to air pollution include combustion emissions from vehicle traffic and combustion and fugitive emissions, and the generation of airborne dust during plowing.

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

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****4.2.1.2 Climate**

Annual climate normals for the nearest Environment Canada weather station (Charlottetown) indicate that January is typically the coldest month, with a mean daily temperature of -8 degrees Celsius (°C). July and August are typically the hottest months having mean daily temperatures of 18.5°C and 18.1°C, respectively. The mean annual precipitation is 1,173.3 millimeters (mm). October is typically the rainiest month with an average rainfall amount of 105.2 mm, while January is the snowiest month with an average recorded snowfall of 71.1 centimeters (cm). The prevailing winds are generally from the west during the winter months and from the southwest during the summer months. The average annual wind speed is approximately 17.4 km/hr. The maximum wind speeds occur in December with average speeds of 19.6 km/hr and minimum wind speeds occur in August with an average speed of 14.2 km/hr (Environment Canada 2011).

4.2.1.3 Greenhouse Gas (GHG) Emissions

Similar to air contaminant emissions, there are no substantive sources of GHG emissions in the Project area. The only nearby sources include local road traffic and agricultural emissions, which account for a very small fraction of the total provincial GHG emissions.

4.2.1.4 Sound Quality

The location of the PDA is in a rural area with relatively few residential dwellings (Figure 2, Appendix A). Sound quality in the vicinity of the Project is mainly influenced by vehicle traffic due to the presence of the existing highway and operating farm machinery. There are 22 houses, two churches (Churchill Presbyterian Church and Bonshaw Baptist Church, which do not appear to be currently in use), a legion, five residences and farms, and four commercial buildings located in the vicinity of the Project. The majority of these properties are also located in the vicinity of the existing section of the TCH in the area (within approximately 300-750 m). No other noise sensitive areas were identified proximate to the PDA.

Monitoring was conducted at four locations in the PDA. Two are residential neighborhoods/subdivisions while the other two are within close proximity to the existing TCH. A description of the locations and the monitoring periods is provided in Table 4.2. The monitoring locations are shown in Figure 6, Appendix A.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 4.2 Locations of Sound Pressure Level Monitoring Events

Location Number	Coordinates (m) (PEI Double Stereographic)		Description	Date and Time		Duration (h)
	X	Y		Start	Stop	
1	372219	683499	Residential property (Bolger Park Road) – approx. 780 m west of the existing TCH	March 20 09:54	March 22 10:22	48
2	373146	683689	West transect, 10 m from existing TCH	March 20 10:07	March 22 10:39	48
3	375435	684719	Residential property (Cameron Road) – approx. 300 m north of the existing TCH	March 7 10:09	March 9 08:41	46
4	375669	684672	East transect, 17 m from highway	March 7 10:52	March 9 08:54	46

Monitoring was conducted using two Type A precision sound level meters manufactured by Larson Davis. The meters were located in open areas, away from trees, walls, or other obstructions.

The measuring equipment was calibrated prior to the monitoring event with a calibrator that satisfies the requirements of the International Electrotechnical Commission (IEC) 942-1988 Class 1 standard.

The monitoring results are compared with Nova Scotia Environment (NSE) criteria for ambient sound levels based on time of day (NSE 1989). The criteria are written in terms of hourly L_{eq} , which is used to represent the overall sound pressure levels during the hour. The criteria established by the NSE are as follows:

- an L_{eq} of 65 dB_A between 0700 to 1900 hours
- an L_{eq} of 60 dB_A between 1900 to 2300 hours
- an L_{eq} of 55 dB_A between 2300 to 0700 hours

The sound level criteria are further described below in Section 5.2.1.

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
 COUNTY, PEI

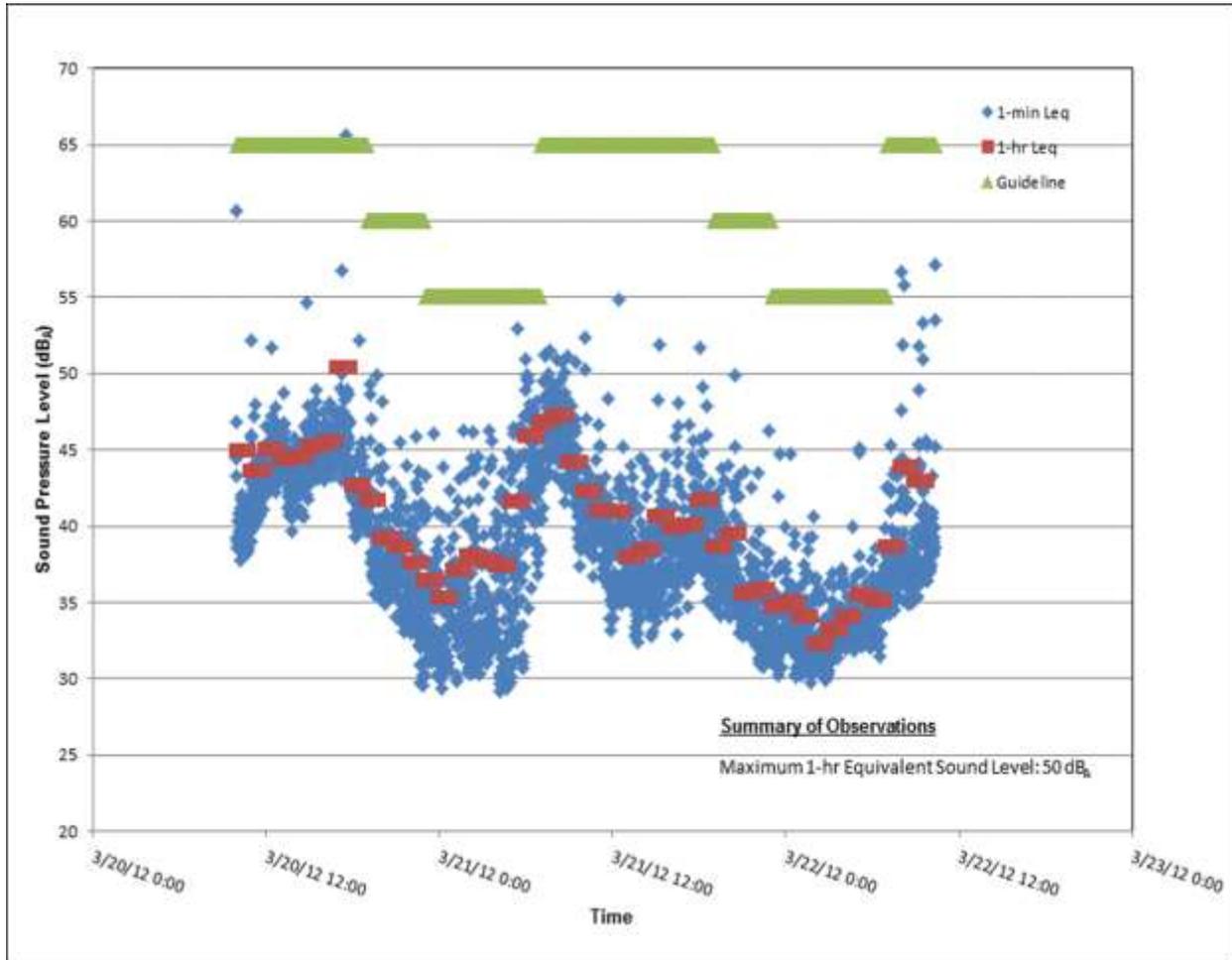


Figure 4.1 Monitored Results – Location 1: Bolger Park Road

The maximum 1-h L_{eq} was calculated to be 50 dB_A, during the daytime (17:00) at the Bolger Park Road location (Figure 4.1 above). This is well below the NSE criteria of 65 dB_A. The maximum 1-h L_{eq} calculated during the evening was 42 dB_A and the maximum during the night period was 46 dB_A. The 1-h L_{eq} were below the NSE criteria of 60 dB_A and 55 dB_A for evening and night periods, respectively. The monitoring data suggest that Location 1 is in a relatively quiet rural setting.

The 1-minute and hourly L_{eq} results based on the monitoring for the west transect location nearest to the highway are presented in Figure 4.2. Note that the monitor was 10 m from the TCH for this event, thus the data are not representative of sound pressure levels at residential receptors. The data from monitoring in close proximity to the TCH (Locations 2 and 4) will be used for acoustic model validation (comparison to the model output based on traffic counts). These locations provide good validation of the model for traffic noise as traffic noise is known to be the dominant source within close proximity to a highway. At the greater distances of 300 to

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

750 m where the residential receptors are located, there is more likelihood for other noise sources (such as non-road machinery) to also noticeably influence sound pressure levels.

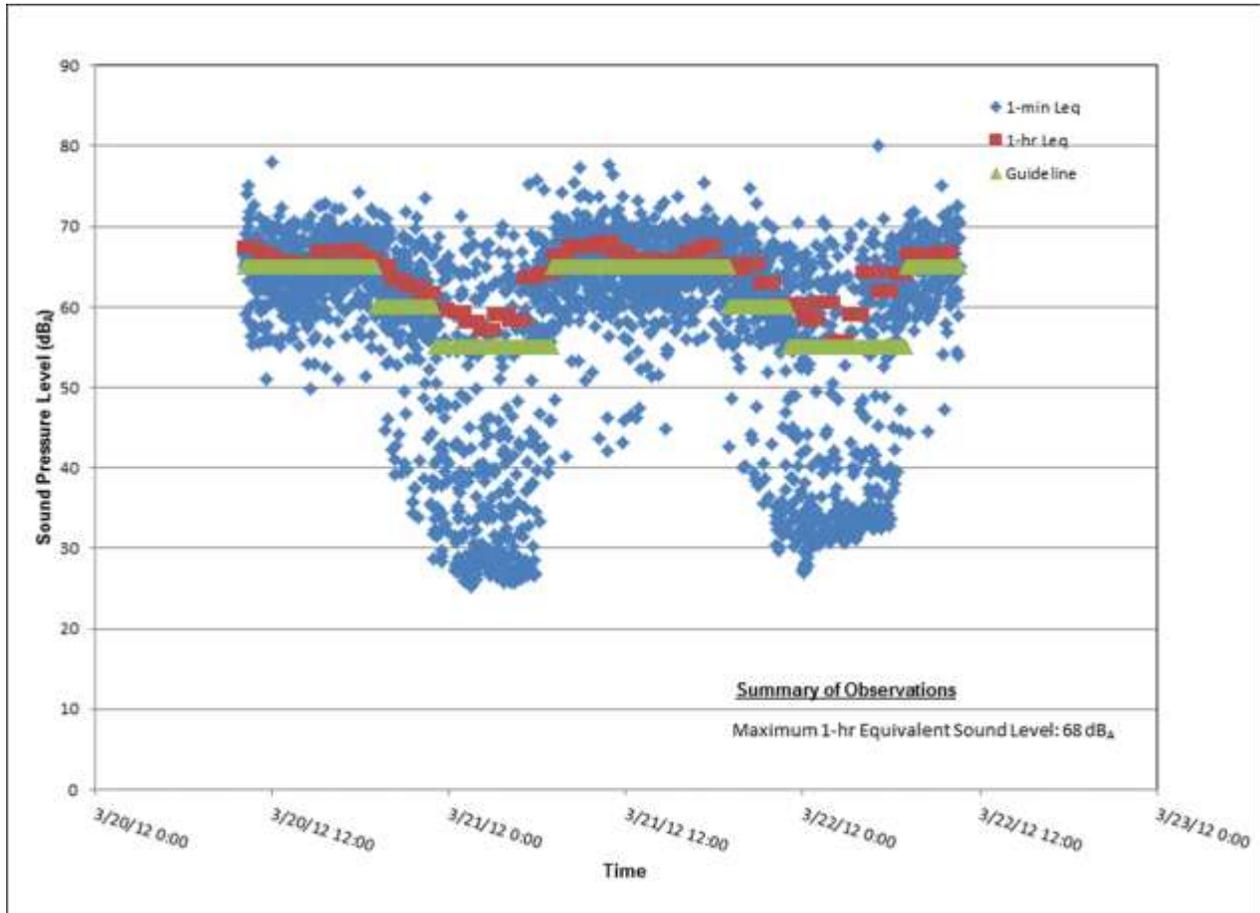


Figure 4.2 Monitored Results – Location 2: West Transect

The maximum 1-h L_{eq} was calculated to be 68 dB_A, during the daytime (10:00). This is above the NSE criteria of 65 dB_A. This is consistent with what would be expected at 10 metres from a highway with this level of traffic. The maximum 1-h L_{eq} calculated during the evening was 65 dB_A and the maximum during the night period was 64 dB_A. The 1-h L_{eq} were above the NSE criteria of 60 dB_A and 55 dB_A for evening and night periods, respectively.

The 1-minute and hourly L_{eq} results from the monitoring for the Cameron Road location are presented in Figure 4.3.

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
 COUNTY, PEI

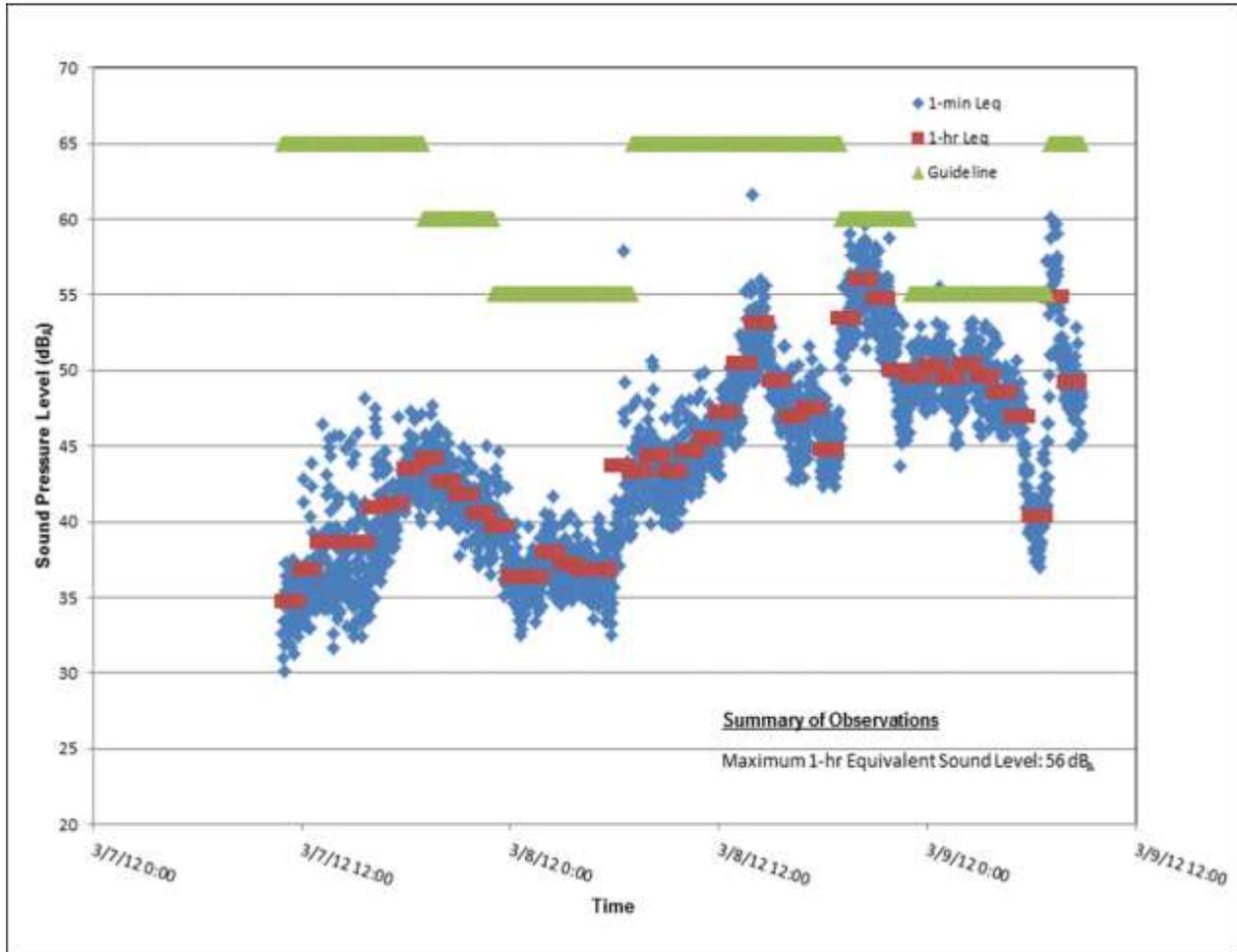


Figure 4.3 Monitored Results – Location 3: Cameron Road

The maximum 1-h L_{eq} was calculated to be 56 dB_A , during the evening (20:00). This is below the NSE criteria of 60 dB_A . The maximum 1-h L_{eq} calculated during the daytime was 55 dB_A and the maximum calculated during the night was 50 dB_A . The 1-h L_{eq} were below the NSE criteria of 65 dB_A and 55 dB_A for daytime and night periods, respectively. The monitoring data suggest that Location 3 is in a relatively quiet rural setting.

The 1-minute and hourly L_{eq} results based on the monitoring for the east transect location adjacent to the existing highway are presented in Figure 4.4.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

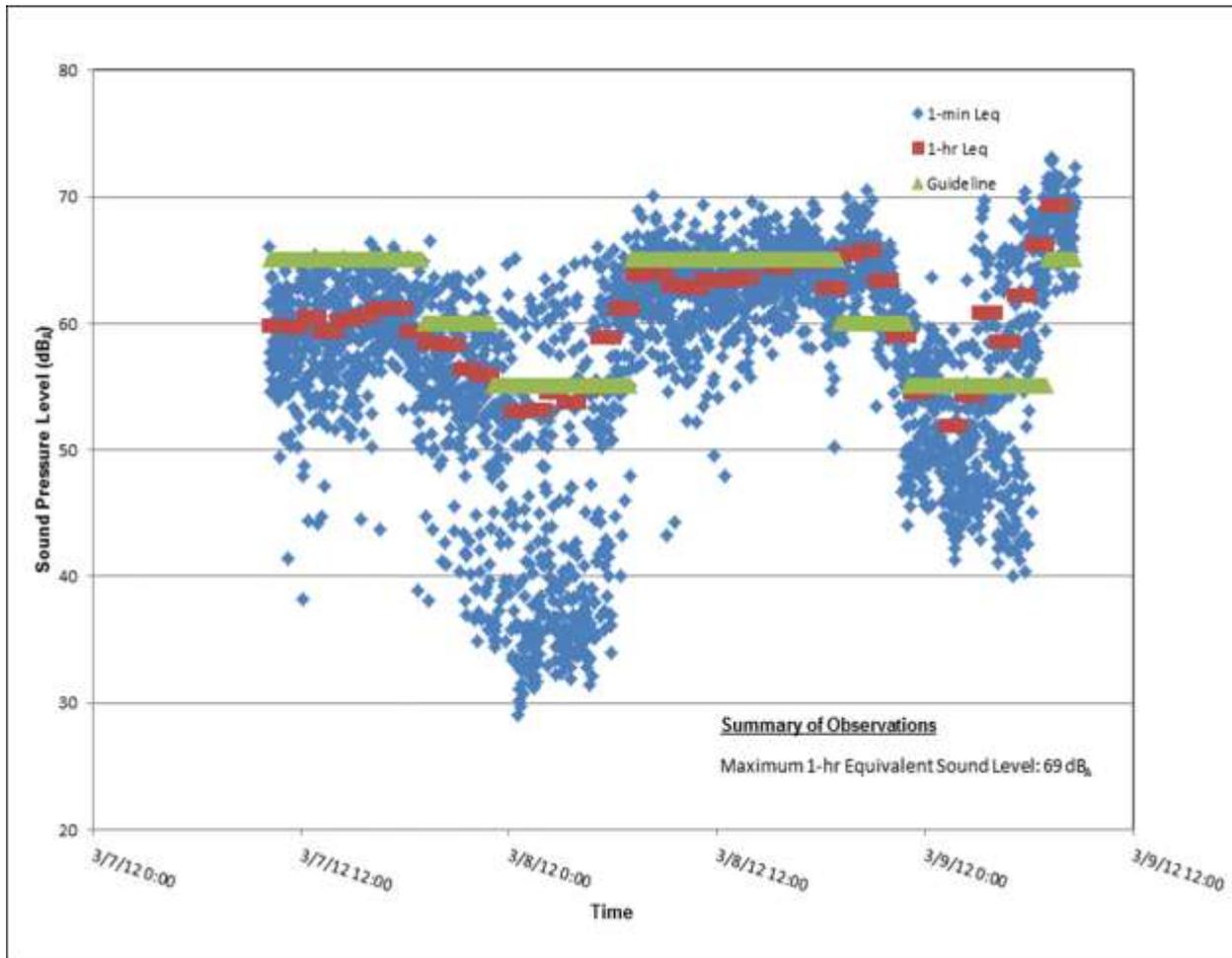


Figure 4.4 Monitored Results – Location 4: East Transect

The maximum 1-h L_{eq} was calculated to be 69 dB_A, during the day (7:00). This is above the NSE criteria of 65 dB_A. During this hour, vehicle traffic was high, and is expected to be the cause of the exceedance (along with the relatively close proximity to the highway). The maximum 1-h L_{eq} calculated during the evening was 66 dB_A and the maximum calculated during the night was 66 dB_A. The 1-h L_{eq} exceed the NSE criteria of 60 dB_A and 55 dB_A for evening and night periods, respectively.

The monitoring events close to the highway were conducted primarily to establish the measured sound pressure levels due to highway traffic (presented in the model validation results). Traffic counts were also taken during the sound monitoring periods. This information was used to validate the model, as described in Section 5.2.2, and estimate future sound levels due to the proposed realignment.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****4.3 Biological Environment****4.3.1 Terrestrial Environment**

The Terrestrial Environment includes vascular plant and wildlife (including birds) species and communities, and their habitats, including both upland and wetland habitats. The assessment focuses on important habitats (*i.e.*, wetlands and mature forests), and vascular plant and wildlife Species at Risk (SAR), as defined by the federal *Species at Risk Act (SARA)*, or Species of Conservation Concern (SOCC), defined here as species ranked S1, S2, or S3 by the Atlantic Canada Conservation Data Centre (AC CDC), and with a status rank of At Risk, May Be At Risk, or Sensitive as determined by the Canadian Endangered Species Conservation Council (CESCC). Additional species considered in this assessment as SOCC at the request of Environment Canada include those species that will be assessed by COSEWIC in the fall, and those species on the COSEWIC candidate list. Other species, communities, and habitats in PEI are secure, and although they may be affected by the Project, not of particular sensitivity to the potential environmental effects.

4.3.1.1 Birds

Bird habitat in the PDA includes agricultural land, barns, old field, grasslands, hedgerows, and immature and mature forest. These areas may be used by migratory birds for both nesting and feeding. Migratory birds are protected under the *Migratory Bird Convention Act (MBCA)*, 1994. The *MBCA* states that no person shall disturb, destroy or take a nest, egg, nest shelter, eider duck shelter, or duck box of a migratory bird.

Information on birds in the vicinity of the project site has been gathered from several sources, including a review of the Maritime Breeding Birds Atlas (MBBA; obtained from NatureCounts.org), a review of information obtained by AC CDC, and field surveys conducted in 2012 on April 19 and 20, May 3, and June 8 and 19 during the nesting and breeding periods of most species. April surveys were conducted in mature forest areas in accessible, representative habitats within or near the PDA. June survey locations were selected in consultation with the natural areas biologist of the PEIDAF.

The PDA falls within the MBBA 10 km x 10 km square 20MS71 (Bonshaw) and is close to 20MS72 (Tryon) (MBBA 2010). A summary of birds observed or heard within these squares, as listed in the MBBA, is presented in Table 4.3. These species would be expected in the general vicinity of the Project. The table includes the highest breeding status for each square, by species. These survey squares were covered well during the 5 year atlas, with 32.5 hours and 60.5 hours of surveying, respectively.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 4.3 Maritime Breeding Bird Atlas Bird Species List for Squares 20MS71 and 20MS72

Common Name	Scientific Name	General Status Rank	S Rank	COSEWIC	Highest Breeding Status	
					20MS71	20MS72
Wood Duck	<i>Aix sponsa</i>	Secure	S4B			Confirmed
American Black Duck	<i>Anas rubripes</i>	Secure	S5B,S4N		Confirmed	Confirmed
Mallard	<i>Anas platyrhynchos</i>	Secure	S5B		Confirmed	Confirmed
Gray Partridge	<i>Perdix perdix</i>	Exotic	SNA		Confirmed	Possible
Ruffed Grouse	<i>Bonasa umbellus</i>	Secure	S5		Confirmed	Confirmed
Great Blue Heron	<i>Ardea herodias</i>	Secure	S4B		Possible	
Osprey	<i>Pandion haliaetus</i>	Secure	S5B		Confirmed	Confirmed
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Secure	S4	NAR	Confirmed	Confirmed
Northern Harrier	<i>Circus cyaneus</i>	Secure	S4B	NAR	Confirmed	Possible
Northern Goshawk	<i>Accipiter gentilis</i>	Secure	S4	NAR	Confirmed	Possible
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Secure	S3B	NAR	Possible	Confirmed
American Kestrel	<i>Falco sparverius</i>	Secure	S5B			Possible
Merlin	<i>Falco columbarius</i>	Secure	S4S5B	NAR	Possible	Possible
Sora	<i>Porzana carolina</i>	Secure	S5B		possible	
Killdeer	<i>Charadrius vociferus</i>	Sensitive	S3B	candidate		Confirmed
Spotted Sandpiper	<i>Actitis macularius</i>	Sensitive	S3S4B		Probable	Possible
Common Snipe	<i>Gallinago gallinago</i>	Secure	S5B			Probable
American Woodcock	<i>Scolopax minor</i>	Secure	S5B		Possible	Possible
Rock Pigeon	<i>Columba livia</i>	Exotic	SNA		Possible	Confirmed
Mourning Dove	<i>Zenaida macroura</i>	Secure	S5		Probable	Probable
Barred Owl	<i>Strix varia</i>	Secure	S5		Probable	Confirmed
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	Secure	S4		Possible	Possible
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	Secure	S5B		Probable	Probable
Belted Kingfisher	<i>Ceryle alcyon</i>	Secure	S5B	candidate	Confirmed	Possible
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Secure	S5B		Confirmed	Confirmed
Downy Woodpecker	<i>Picoides pubescens</i>	Secure	S5		Possible	Possible
Hairy Woodpecker	<i>Picoides villosus</i>	Secure	S5		Possible	Probable
Northern Flicker	<i>Colaptes auratus</i>	Secure	S5B		possible	Probable
Pileated Woodpecker	<i>Dryocopus pileatus</i>	Sensitive	S1		Probable	
Olive-sided Flycatcher	<i>Contopus cooperi</i>	At Risk	S3B	threatened		Probable
Eastern Wood-Pewee	<i>Contopus virens</i>	Secure	S4B	pending	possible	Probable
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	Secure	S4B		possible	
Alder Flycatcher	<i>Empidonax alhorum</i>	Secure	S5B		possible	Probable
Least Flycatcher	<i>Empidonax minimus</i>	Secure	S4B		Probable	Possible

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 4.3 Maritime Breeding Bird Atlas Bird Species List for Squares 20MS71 and 20MS72

Common Name	Scientific Name	General Status Rank	S Rank	COSEWIC	Highest Breeding Status	
					20MS71	20MS72
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	Undetermined	SUB			Possible
Eastern Kingbird	<i>Tyrannus tyrannus</i>	Sensitive	S3B	candidate		Possible
Blue-headed Vireo	<i>Vireo solitarius</i>	Secure	S5B		Confirmed	Confirmed
Red-eyed Vireo	<i>Vireo olivaceus</i>	Secure	S5B		possible	Confirmed
Blue Jay	<i>Cyanocitta cristata</i>	Secure	S5		Confirmed	Confirmed
American Crow	<i>Corvus brachyrhynchos</i>	Secure	S5		Confirmed	Probable
Common Raven	<i>Corvus corax</i>	Secure	S5		Confirmed	Possible
Tree Swallow	<i>Tachycineta bicolor</i>	Secure	S4B		Confirmed	Confirmed
Bank Swallow	<i>Riparia riparia</i>	Secure	S4B	pending	Confirmed	
Barn Swallow	<i>Hirundo rustica</i>	Sensitive	S3B	threatened	Possible	Possible
Black-capped Chickadee	<i>Poecile atricapillus</i>	Secure	S5		Confirmed	Confirmed
Boreal Chickadee	<i>Poecile hudsonicus</i>	Secure	S4		Possible	Probable
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Secure	S5		possible	Possible
Brown Creeper	<i>Certhia americana</i>	Secure	S5		possible	Possible
Winter Wren	<i>Troglodytes troglodytes</i>	Secure	S5B		Probable	Possible
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Secure	S5		possible	Probable
Ruby-crowned Kinglet	<i>Regulus calendula</i>	Secure	S5B		possible	Possible
Veery	<i>Catharus fuscescens</i>	Secure	S4B		possible	
Swainson's Thrush	<i>Catharus ustulatus</i>	Secure	S5B		possible	Possible
Hermit Thrush	<i>Catharus guttatus</i>	Secure	S5B		Probable	Probable
American Robin	<i>Turdus migratorius</i>	Secure	S5B		Confirmed	Confirmed
European Starling	<i>Sturnus vulgaris</i>	Exotic	SNA		Confirmed	Confirmed
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Secure	S5B		Possible	Confirmed
Nashville Warbler	<i>Vermivora ruficapilla</i>	Secure	S5B			Possible
Northern Parula	<i>Parula americana</i>	Secure	S5B		possible	Confirmed
Yellow Warbler	<i>Dendroica petechia</i>	Secure	S5B		possible	Possible
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	Secure	S5B		possible	Probable
Magnolia Warbler	<i>Dendroica magnolia</i>	Secure	S5B		possible	Confirmed
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	Secure	S4B		Probable	Possible
Yellow-rumped Warbler	<i>Dendroica coronata</i>	Secure	S5B		Confirmed	Probable
Black-throated Green Warbler	<i>Dendroica virens</i>	Secure	S5B		Probable	Confirmed
Blackburnian Warbler	<i>Dendroica fusca</i>	Secure	S5B		Probable	Confirmed
Blackpoll Warbler	<i>Dendroica striata</i>	Secure	SUB,SN AM		possible	
Black-and-white	<i>Mniotilta varia</i>	Secure	S5B		Probable	Probable

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 4.3 Maritime Breeding Bird Atlas Bird Species List for Squares 20MS71 and 20MS72

Common Name	Scientific Name	General Status Rank	S Rank	COSEWIC	Highest Breeding Status	
					20MS71	20MS72
Warbler						
American Redstart	<i>Setophaga ruticilla</i>	Secure	S5B		Probable	Probable
Ovenbird	<i>Seiurus aurocapilla</i>	Secure	S5B		Probable	Probable
Northern Waterthrush	<i>Seiurus noveboracensis</i>	Secure	S3B		possible	
Mourning Warbler	<i>Oporornis philadelphia</i>	Secure	S4B		possible	Confirmed
Common Yellowthroat	<i>Geothlypis trichas</i>	Secure	S5B		possible	Confirmed
Canada Warbler	<i>Wilsonia canadensis</i>	At Risk	S3B	threatened		Possible
Chipping Sparrow	<i>Spizella passerina</i>	Secure	S5B		Confirmed	Confirmed
Savannah Sparrow	<i>Passerculus sandwichensis</i>	Secure	S5B		possible	Probable
Song Sparrow	<i>Melospiza melodia</i>	Secure	S5B		Confirmed	Confirmed
Lincoln's Sparrow	<i>Melospiza lincolni</i>	Secure	S4B			Possible
Swamp Sparrow	<i>Melospiza georgiana</i>	Secure	S5B			Confirmed
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Secure	S5B		possible	Confirmed
Dark-eyed Junco	<i>Junco hyemalis</i>	Secure	S5		Confirmed	Confirmed
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	Sensitive	S3B		Confirmed	Possible
Bobolink	<i>Dolichonyx oryzivorus</i>	Sensitive	S3B	threatened	possible	Probable
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Secure	S5B		Probable	Probable
Common Grackle	<i>Quiscalus quiscula</i>	Secure	S5B		Confirmed	Confirmed
Brown-headed Cowbird	<i>Molothrus ater</i>	Sensitive	S3B		Possible	
Purple Finch	<i>Carpodacus purpureus</i>	Secure	S5B		Confirmed	Probable
Pine Siskin	<i>Spinus pinus</i>	Secure	S2S3B,S4N		Confirmed	
American Goldfinch	<i>Spinus tristis</i>	Secure	S5		Probable	Probable
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Sensitive	S2B,S4N	candidate		Probable
House Sparrow	<i>Passer domesticus</i>	Exotic	SNA		Confirmed	Confirmed

Source: Naturecounts.org data request dated October 11, 2011

Location information is available for some of the SAR and SOCC recorded in the two MBBA squares. The nearest records of SAR include an Olive-sided Flycatcher more than 2.5 km north of the PDA, and a Canada Warbler more than 3.5 km north of the PDA.

Point count data from the MBBA was included in the NatureCounts data request. A total of 19 point counts were surveyed in either 2008 or 2009, located within 5 km of the PDA (Figure 7, Appendix A). This included four points located within the LAA (within 500 m of the PDA), of

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

which two were off road points located in a privately-owned designated natural area just west of Strathgartney Provincial Park and in the former New Haven Campground property. A summary of the species and total counts recorded in these point counts is provided in Table 4.4. One SOCC was recorded within the LAA: Eastern Wood-Peewee.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 4.4 Birds Recorded in 19 MBBA Point Counts within 5 km of PDA

Common Name	Total Counts		Total
	Within LAA (54 points)	Outside LAA (14 points)	
Great Blue Heron		4	4
Mourning Dove	1	2	3
Ruby-throated Hummingbird	1	1	2
Northern Flicker		1	1
Eastern Wood-Pewee*	2	1	3
Alder Flycatcher		2	2
Great Crested Flycatcher		1	1
Blue-headed Vireo		3	3
Red-eyed Vireo	5	19	24
Blue Jay		6	6
American Crow	1	37	38
Common Raven		2	2
Tree Swallow		3	3
Black-capped Chickadee	2	7	9
Golden-crowned Kinglet		1	1
Veery		1	1
Hermit Thrush	2		2
American Robin	7	32	39
European Starling	3	22	25
Cedar Waxwing		7	7
Northern Parula	3	6	9
Yellow Warbler		6	6
Magnolia Warbler	2	9	11
Yellow-rumped Warbler	1	9	10
Black-throated Green Warbler	6	8	14
Blackburnian Warbler		2	2
Black-and-white Warbler		1	1
American Redstart	4	4	8
Ovenbird	7	8	15
Mourning Warbler		5	5
Common Yellowthroat		1	1
Chipping Sparrow	2	11	13
Savannah Sparrow	3	13	16
Song Sparrow	6	42	48
White-throated Sparrow	1	10	11
Dark-eyed Junco	1	4	5
Rose-breasted Grosbeak		1	1
Bobolink*		2	2
Red-winged Blackbird		9	9
Common Grackle	1	5	6
Purple Finch		1	1
Pine Siskin		1	1
American Goldfinch	6	16	22
House Sparrow		1	1
* SOCC			

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

AC CDC Data

Available information on the known occurrence of rare or uncommon bird species near the PDA was compiled and reviewed using information from an AC CDC data request. Table 4.5 illustrates a list of rare or uncommon bird species that have been previously recorded by the AC CDC within a 5 km radius of the PDA. There are no endangered species protected under the *Species at Risk Act (SARA)* and two species identified as threatened (Canada Warbler and Olive-sided Flycatcher). The remaining uncommon bird species are not specifically protected by endangered species legislation. The AC CDC lists two species as extremely rare in their system with five or less occurrences in the Province, the White-breasted Nuthatch and Eastern Bluebird, the latter being an uncertain classification.

Table 4.5 Bird Species of Conservation Concern Recorded within 5 km of PDA Centre (AC CDC 2012, CESSC 2011, Species at Risk Public Registry 2011)

Common Name	Scientific Name	COSEWIC Rank	SARA Rank	CESSC Rank	AC CDC S-Rank
Canada Warbler	<i>Wilsonia canadensis</i>	Threatened	Schedule 1, Threatened	At risk	S3B
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Threatened	Schedule 1, Threatened	At risk	S3B
Bobolink	<i>Dolichonyx oryzivorus</i>	Threatened	No schedule, no status	Sensitive	S3B
Barn Swallow	<i>Hirundo rustica</i>	Threatened	No schedule, no status	Sensitive	S3B
White-breasted Nuthatch	<i>Sitta carolinensis</i>	Not at Risk	Not at Risk	May be at risk	S1
Eastern Bluebird	<i>Sialia sialis</i>	Not at Risk	Not at Risk	Accidental	S1?B
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Not at Risk	Not at Risk	Sensitive	S2B, S4N
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	Not at Risk	Not at Risk	Sensitive	S3B
Bay-breasted Warbler	<i>Dendroica castanea</i>	Not at Risk	Not at Risk	Sensitive	S3B
Tennessee Warbler	<i>Vermivora peregrina</i>	Not at Risk	Not at Risk	Sensitive	S3B
Eastern Kingbird	<i>Tyrannus tyrannus</i>	Not at Risk	Not at Risk	Sensitive	S3B
Killdeer	<i>Charadrius vociferus</i>	Not at Risk	Not at Risk	Sensitive	S3B

Notes:
S1 = Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
S2 = Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3 = Uncommon throughout its range in the province, or found only in a restricted range, even if abundant in at some locations. (21 to 100 occurrences).
S4 = Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g., watch list). (100+ occurrences).
S#S# = Numeric range rank: A range between two consecutive numeric ranks. Denotes range of uncertainty about the exact rarity of the Element (e.g., S1S2).
? = Inexact or uncertain: for numeric ranks, denotes inexactness, e.g., SE? denotes uncertainty of exotic status. (The "?" qualifies the character immediately preceding it in the SRANK)
B = Breeding: Basic rank refers to the breeding population of the element in the province.
N = Non-breeding: Basic rank refers to the non-breeding (usually wintering) population of the element in the province.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 4.5 Bird Species of Conservation Concern Recorded within 5 km of PDA Centre (AC CDC 2012, CESSC 2011, Species at Risk Public Registry 2011)

Common Name	Scientific Name	COSEWIC Rank	SARA Rank	CESSC Rank	AC CDC S-Rank
Wild Species: The General Status of Wild Species in Canada					
At Risk	Species for which a formal, detailed risk assessment (COSEWIC status assessment or provincial or territorial equivalent) has been completed and that have been determined to be at risk of extirpation or extinction (i.e. Endangered or Threatened). A COSEWIC designation of Endangered or Threatened automatically results in a Canada General Status Rank (Canada rank) of At Risk. Where a provincial or territorial formal risk assessment finds a species to be Endangered or Threatened in that particular region, then, under the general status program, the species automatically receives a provincial or territorial general status rank of At Risk				
May Be At Risk	Species that may be at risk of extirpation or extinction and are therefore candidates for a detailed risk assessment by COSEWIC, or provincial or territorial equivalents				
Sensitive	Species that are not believed to be at risk of immediate extirpation or extinction but may require special attention or protection to prevent them from becoming at risk				
Secure	Species that are not believed to belong in the categories Extinct, Extirpated, At Risk, May Be At Risk, Sensitive, Accidental or Exotic. This category includes some species that show a trend of decline in numbers in Canada but remain relatively widespread or abundant				
Accidental	Species occurring infrequently and unpredictably, outside their usual range				
Source 'Wild Species: The General Status of Wild Species in Canada' website Available at: http://www.wildspecies.ca/ranks.cfm?lang=e (CESSC 2012)					

Twelve bird species at risk or of conservation concern have been previously recorded by AC CDC within a 5 km radius of the PDA. In addition, three other SOCC were recorded during the MBBA within 5 km of the PDA, and/or within square 20MS71. Habitat types generally associated with these species are discussed below.

The Canada Warbler is listed as Threatened by COSEWIC and is on Schedule 1 of SARA. The Canada Warbler is also listed as At Risk by the CESSC and S3B in PEI by the AC CDC. This ground nesting species that is typically found in mixed forests with a dense understory (Reitsma *et al.* 2010). This species was noted in the MBBA as being present in the area.

The Olive-sided Flycatcher is listed as Threatened by COSEWIC and is on Schedule 1 of SARA. The Olive-sided Flycatcher is also listed as At Risk by the CESSC and S3B in PEI by the AC CDC. Their habitat includes coniferous forests where they can be found nesting in trees at forest edges and openings (Cornell Lab of Ornithology 2011a). This species was observed in the area in the MBBA.

The Bobolink is listed as Sensitive by the CESSC and S3B in PEI by the AC CDC, and has been ranked Threatened by COSEWIC. This species typically nests in open areas such as fields and pastures (Seattle Audubon Society 2008). This species was noted in the MBBA as being present in the area.

The Barn Swallow is listed by COSEWIC as Threatened and is ranked as Sensitive by the CESSC and S3B in PEI by the AC CDC. The Barn Swallow nests in barns, sheds, bridges, and other man-made structures. They feed in open habitats from roadway edges to meadows and

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

parks (Cornell Lab of Ornithology 2011b). This species was noted in the MBBA as being present in the area.

The White-breasted Nuthatch is ranked as May be At Risk by the CESSC and is ranked S1 in PEI by the AC CDC; it has no status with COSEWIC or SARA. The White-breasted Nuthatch is a cavity nester typically found in mature, deciduous forests. The can also be found at woodland edges and in open areas so long as there are large trees in the area (Cornell Lab of Ornithology 2011c). This species was identified in the MBBA as being present in the area.

The Eastern Bluebird has a CESSC rank of Accidental and is ranked S1?B in PEI by the AC CDC. It has no status with COSEWIC or SARA. This species can be found in meadows and openings in forests with trees that provide nest holes (Cornell Lab of Ornithology 2011d). This species was identified in the MBBA as being present in the area.

The Evening Grosbeak has a CESSC rank of May be At Risk and is ranked S2B, S4N in PEI by the AC CDC; it has no status with COSEWIC or SARA. They can be found in coniferous forests nesting in trees or large shrubs (Cornell Lab of Ornithology 2011e). This species was identified in the MBBA as being present in the area.

The Rose-breasted Grosbeak has a CESSC rank of Sensitive and is ranked S3B in PEI by the AC CDC; it has no status with COSEWIC or SARA. They can be found nesting in trees, shrubs, and vines in deciduous or mixed woods, typically near forest edges (Cornell Lab of Ornithology 2011g). This species was identified in the MBBA as being present in the area.

The Bay-breasted Warbler has a CESSC rank of Sensitive and is ranked S3B in PEI by the AC CDC; it has no status with COSEWIC or SARA. They can be found in boreal spruce and fir forests, nesting trees (Cornell Lab of Ornithology 2011h). This species was identified in the MBBA as being present in the area.

The Tennessee Warbler has a CESSC rank of Sensitive and is ranked S3B in PEI by the AC CDC; it has no status with COSEWIC or SARA. They can be found in boreal forest, nesting on the ground in open areas with grasses, shrubs, and young deciduous trees (Cornell Lab of Ornithology 2011i). This species was identified in the MBBA as being present in the area.

The Eastern Kingbird has a CESSC rank of Sensitive and is ranked S3B in PEI by the AC CDC; it has no status with COSEWIC or SARA. They are tree nesters typically found in open environments such as forest edges, fields, or orchards (Cornell Lab of Ornithology 2011j). This species was identified in the MBBA as being present in the area.

The Killdeer has a CESSC rank of Sensitive and is ranked S3B in PEI by the AC CDC; it has no status with COSEWIC or SARA. Killdeer are ground nesters that can be found in open areas such as fields and mudflats and are often found in urban areas such as golf courses and

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

parking lots (Cornell Lab of Ornithology 2011k). This species was identified in the MBBA as being present in the area.

The Eastern Wood-Pewee has a CESSC rank of Secure and is ranked S4B by the AC CDC; it has no status with COSEWIC or SARA. The Eastern Wood-Pewee is a tree nesting species that can be found breeding in all types of wooded areas (Cornell Lab of Ornithology 2011l). This species was identified in the MBBA as being present in the area.

The Belted Kingfisher has a CESSC rank of Secure and is ranked S5B by the AC CDC; it has no status with COSEWIC or SARA. The Belted Kingfisher nests in burrows in banks along rivers, lakes, streams, and estuaries (Cornell Lab of Ornithology 2011m). This species was not identified in the area by the MBBA.

The Bank Swallow has a CESSC rank of Secure and is ranked S4B by the AC CDC; it has no status with COSEWIC or SARA. The Bank Swallow is a colonial nesting species that nests in burrows along rivers, streams, and coastal areas (Cornell Lab of Ornithology 2011n). This species was not identified in the area by the MBBA.

Bird Survey Results

On April 19, 2012, six 13 minute point counts were conducted along the PDA for the presence of owl species. Surveys were conducted following protocol established in the Guidelines for Nocturnal Owl Monitoring in North America (2001) document published in-part by Bird Studies Canada. A two minute, silent listening period was followed by a period of broadcasting owl vocalizations (Northern Saw Whet Owl, Barred Owl, and Boreal Owl). All owls, and other nocturnal species detected during the surveys were recorded, along with the time and location of the survey, and the weather conditions encountered at each survey station.

One species of owl was identified during the nocturnal owl surveys. At location Owl 6 (Figure 6), two Barred Owls (*Strix varia*) were heard calling in the area after broadcasting pre-recorded calls in the area. The owls, believed to be a pair, were first heard an estimated 700 m south of the PDA, but by the end of the survey, one individual approached the surveyors. At location Owl 1 (Figure 6), an owl was observed flying overhead prior to the survey. Due to low light conditions it was not positively identified, however, due to its size was determined to be either a Barred Owl or Great Horned Owl (*Bubo virginianus*). At all other locations no owls were detected, and there were no responses to the broadcasted calls. The Barred Owl and Great Horned Owl have no status with COSEWIC or SARA and are ranked as Secure by the CESSC.

On April 20, 2012, eight 10-minute point counts were conducted targeting woodpeckers and other early nesting species. On May 3, 2012, an additional 11 10-minute point counts were conducted, with some overlap of the April surveys. All species of birds observed during these surveys were recorded, including species encountered incidentally between survey locations. A total of 29 bird species, including four woodpecker species were encountered during the

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

surveys. A list of all species is included in Table 4.6 including numbers observed and the highest recorded breeding status. All species are secure.

Table 4.6 Bird Species Encountered within 100 m of April/May Point Count Surveys

Common Name	Scientific Name	CESCC Rank	AC CDC S-Rank	Number Observed	Highest Recorded Breeding Status
American Crow	<i>Corvus brachyrhynchos</i>	Secure	S5	23	Possible
American Goldfinch	<i>Carduelis tristis</i>	Secure	S5	16	Possible
American Robin	<i>Turdus migratorius</i>	Secure	S5B	36	Possible
Belted Kingfisher	<i>Megaceryle alcyon</i>	Secure	S5B	3	Probable
Black-capped Chickadee	<i>Poecile atricapilla</i>	Secure	S5	13	Confirmed
Blue Jay	<i>Cyanocitta cristata</i>	Secure	S5	7	Possible
Blue-headed Vireo	<i>Vireo solitarius</i>	Secure	S5B	1	Possible
Boreal Chickadee	<i>Poecile hudsonica</i>	Secure	S4	1	Observed
Brown Creeper	<i>Certhia americana</i>	Secure	S5	2	Possible
Common Grackle	<i>Quiscalus quiscula</i>	Secure	S5B	4	Possible
Common Raven	<i>Corvus corax</i>	Secure	S5	6	Possible
Dark-eyed Junco	<i>Junco hyemalis</i>	Secure	S5	7	Probable
Downy Woodpecker	<i>Picoides pubescens</i>	Secure	S5	2	Possible
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Secure	S5	10	Possible
Hairy Woodpecker	<i>Picoides villosus</i>	Secure	S5	1	Possible
Herring Gull	<i>Larus argentatus</i>	Secure	S3B,S5N	2	Observed
Mallard	<i>Anas platyrhynchos</i>	Secure	S5B	1	Observed
Mourning Dove	<i>Zenaidura macroura</i>	Secure	S5	2	Possible
Northern Flicker	<i>Colaptes auratus</i>	Secure	S5B	8	Possible
Northern Harrier	<i>Circus cyaneus</i>	Secure	S4B	1	Observed
Purple Finch	<i>Carpodacus purpureus</i>	Secure	S5B	9	Possible
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Secure	S5	9	Possible
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Secure	S5B	1	Possible
Ruby-crowned Kinglet	<i>Regulus calendula</i>	Secure	S5B	1	Possible
Sharp-shinned Hawk	<i>Accipiter striatus</i>	Secure	S4B	1	Observed
Song Sparrow	<i>Melospiza melodia</i>	Secure	S5B	7	Possible
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Secure	S5B	5	Possible
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Secure	S5B	10	Possible
Yellow-rumped Warbler	<i>Dendroica coronata</i>	Secure	S5B	15	Possible

In June, 2012, during the peak of the breeding season, 10-minute point counts targeting breeding bird species were conducted at 12 survey points along the PDA, first on June 8, and then repeated on June 19. All bird species within 100 m of the surveyor were recorded and evidence of breeding was collected for each species. Birds detected further than 100 m from the surveyor were recorded as incidentally observed species. Other data, including habitat information, and weather conditions at the time of survey were also collected.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

A total of 48 species were recorded in June, including species encountered incidentally. Species recorded only incidentally include Common Loon (*Gavia immer*), Killdeer (*Charadrius vociferous*) and Bobolink (*Dolichonyx oryzivorus*), detected more than 100 m from point counts, and Great Blue Heron (*Ardea herodias*), recorded as a flyover. Bird species recorded during point count surveys are listed in Table 4.7, including AC CDC species ranks, general status ranks, numbers observed within 100 m and the highest recorded breeding status noted for each species.

Two SOCCs (Bobolink and Killdeer) were recorded during the June surveys outside of the 100 m survey area. Bobolink (threatened by COSEWIC on Schedule 1 of SARA) was seen and heard singing in an adjacent farm field more than 200 m north of the proposed road centerline, during the first June survey of point count S06. At this point the right-of-way is near the existing TCH, east of Strathgartney. The Killdeer was recorded calling more than 100 m east of point count W12, near a residential property in New Haven.

Table 4.7 Bird Species Encountered within 100 m of June Point Count Surveys

Common Name	Scientific Name	CESCC Rank	AC CDC S-Rank	Number Observed			Highest Recorded Breeding Status
				Early June	Late June	Maximum*	
Ruffed Grouse	<i>Bonasa umbellus</i>	Secure	S5	1	1	2	Possible
Osprey	<i>Pandion haliaetus</i>	Secure	S5B	1		1	Possible
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Secure	S3B		1		Possible
Mourning Dove	<i>Zenaida macroura</i>	Secure	S5	1		1	Possible
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	Secure	S5B		2	2	Possible
Belted Kingfisher	<i>Ceryle alcyon</i>	Secure	S5B	1		1	Possible
Downy Woodpecker	<i>Picoides pubescens</i>	Secure	S5	1		1	Possible
Eastern Wood-Pewee	<i>Contopus virens</i>	Secure	S4B	1	1	2	Possible
Alder Flycatcher	<i>Empidonax alnorum</i>	Secure	S5B	2		2	Possible
Least Flycatcher	<i>Empidonax minimus</i>	Secure	S4B		2	2	Possible
Blue-headed Vireo	<i>Vireo solitarius</i>	Secure	S5B		1	1	Possible
Red-eyed Vireo	<i>Vireo olivaceus</i>	Secure	S5B	13	23	25	Probable
Blue Jay	<i>Cyanocitta cristata</i>	Secure	S5	9	8	15	Possible
American Crow	<i>Corvus brachyrhynchos</i>	Secure	S5	8	3	9	Possible
Common Raven	<i>Corvus corax</i>	Secure	S5	1		1	Possible
Tree Swallow	<i>Tachycineta bicolor</i>	Secure	S4B	1		1	Possible
Black-capped Chickadee	<i>Poecile atricapillus</i>	Secure	S5	3	2	5	Possible
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Secure	S5	6	1	6	Possible
Brown Creeper	<i>Certhia americana</i>	Secure	S5		1	1	Possible

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 4.7 Bird Species Encountered within 100 m of June Point Count Surveys

Common Name	Scientific Name	CESCC Rank	AC CDC S-Rank	Number Observed			Highest Recorded Breeding Status
				Early June	Late June	Maximum*	
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Secure	S5	7	2	8	Confirmed
Ruby-crowned Kinglet	<i>Regulus calendula</i>	Secure	S5B	2	1	2	Possible
Swainson's Thrush	<i>Catharus ustulatus</i>	Secure	S5B	2		2	Possible
Hermit Thrush	<i>Catharus guttatus</i>	Secure	S5B	2	2	4	Possible
American Robin	<i>Turdus migratorius</i>	Secure	S5B	21	29	35	Probable
European Starling	<i>Sturnus vulgaris</i>	Exotic	SNA	21	4	21	Possible
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Secure	S5B	2	1	2	Possible
Northern Parula	<i>Parula americana</i>	Secure	S5B	10	7	11	Probable
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	Secure	S5B	1		1	Possible
Magnolia Warbler	<i>Dendroica magnolia</i>	Secure	S5B	12	13	16	Probable
Yellow-rumped Warbler	<i>Dendroica coronata</i>	Secure	S5B	2	2	3	Possible
Black-throated Green Warbler	<i>Dendroica virens</i>	Secure	S5B	8	13	13	Probable
Blackburnian Warbler	<i>Dendroica fusca</i>	Secure	S5B	4	8	8	Possible
Black-and-white Warbler	<i>Mniotilta varia</i>	Secure	S5B	1	3	4	Possible
American Redstart	<i>Setophaga ruticilla</i>	Secure	S5B	4	3	6	Possible
Ovenbird	<i>Seiurus aurocapilla</i>	Secure	S5B	10	10	16	Probable
Mourning Warbler	<i>Oporornis philadelphia</i>	Secure	S4B	7	1	7	Probable
Common Yellowthroat	<i>Geothlypis trichas</i>	Secure	S5B	4	2	4	Possible
Chipping Sparrow	<i>Spizella passerina</i>	Secure	S5B	1	2	2	Probable
Savannah Sparrow	<i>Passerculus sandwichensis</i>	Secure	S5B	4	5	5	Probable
Song Sparrow	<i>Melospiza melodia</i>	Secure	S5B	3	8	8	Probable
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Secure	S5B	9	9	11	Probable
Dark-eyed Junco	<i>Junco hyemalis</i>	Secure	S5	3	2	5	Possible
Common Grackle	<i>Quiscalus quiscula</i>	Secure	S5B	7	3	7	Possible
Purple Finch	<i>Carpodacus purpureus</i>	Secure	S5B	2	2	4	Possible
American Goldfinch	<i>Carduelis tristis</i>	Secure	S5	7	8	10	Possible

* The sum of the maximum number of individuals of a species recorded at each point count between early and late surveys.

Early morning surveys targeting Common Nighthawk (*Chordeiles minor*) were conducted during the pre-dawn hours of June 8, 2012. Four surveys were completed in areas which had potential to provide habitat for Common Nighthawk. No nighthawks were detected at any of the survey sites.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Incidental bird observations were also recorded during other biological field surveys, including plant, wetland and bat surveys conducted in mid-July. During these surveys, one species not previously recorded near the Project included Solitary Sandpiper (*Tringa solitaria*) recorded along West River. The Solitary Sandpiper has no status with COSEWIC or SARA and is ranked as Secure on PEI by the CESSC. In total, considering all of the field surveys, 58 species were recorded.

Structures including the Bonshaw Bridge over West River and the abandoned house and barn near Station 7+800 (east of Strathgartney) were checked for nests; there was no evidence of nesting of migratory birds at these structures.

4.3.1.2 Other Wildlife

During terrestrial fieldwork conducted between May and mid-July 2012, incidental sightings of wildlife were recorded. A red fox (*Vulpes vulpes*) was observed at Bonshaw Provincial Park on April 20, 2012, during a morning bird survey. A juvenile red fox was seen on July 18th 2012 dead along Route 1 next to the PDA at Station 2+000, likely killed in traffic. Red fox has a General Status rank of Secure in PEI.

A Muskrat (*Ondatra zibethicus*) was observed swimming under Bonshaw Bridge on July 18 and 19, 2012. Tracks and scat from raccoons (*Procyon lotor*) were observed at various locations in the PDA and skunk (*Mephitis mephitis*) odor was detected near Station 2+000. All of these animals have a Secure status in PEI.

Although not reported by the AC CDC, several other wildlife SOCC may potentially occur in the vicinity of the PDA, including northern long-eared bat (*Myotis septentrionalis*), little brown bat (*Myotis lucifugus*), American water shrew (*Sorex palustris*), American pygmy shrew (*Sorex hoyi*), and pickerel frog (*Rana palustris*). These species and their provincial statuses are listed in Table 4.8.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 4.8 Wildlife SOCC with Potential to Exist in the Vicinity of the PDA

Common Name	Scientific Name	COSEWIC Rank	PEI General Status Rank	AC CDC S-Rank
Northern long-eared bat	<i>Myotis septentrionalis</i>	Endangered	Undetermined	S1S2
Little brown bat	<i>Myotis lucifugus</i>	Endangered	Secure	S5
American water shrew	<i>Sorex palustris</i>	-	Sensitive	S1?
American pygmy shrew	<i>Sorex hoyi</i>	-	Secure	S2S3
Pickerel frog	<i>Rana palustris</i>	-	Not assessed	S1

There were no incidental sightings of other wildlife of SOCC such as the water shrew, the American pygmy shrew, or pickerel frogs during field surveys, although all of these species are most active at night. While pickerel frog has been reported in eastern PEI at a few locations, it is not known if PEI has a persistent breeding population of this species. This species is often found in lakes and ponds where it lays its eggs. The pickerel frog is common throughout much of its range; however, the PEI records may be incidental. Nonetheless, no pickerel frogs have been recorded east of the Hillsborough River.

The American water shrew lives around streams and rivers, and forages constantly in and around the water. This species is common throughout much of its range and is difficult to find due to its cryptic nocturnal habits. Consultation with the Natural Areas Biologist of the PEIDAF (pers. comm. Rosemary Curley 2012) indicated that it would be highly unlikely to encounter this species in the vicinity of the PDA. The American pygmy shrew is the smallest North American mammal and can be found in a variety of habitats, but particularly in grassy openings in boreal type forests. This species is ranked Secure.

Bats

The northern long-eared bat and little brown bat were assessed by COSEWIC in February 2012 and given a status of Endangered. Neither species has a SARA schedule. No winter hibernacula are known to exist in PEI, although northern long-eared bat and little brown bat are known to roost and form maternity colonies in PEI during summer months. North American bats have low rates of reproduction, with female *Myotis* spp. typically giving birth to one young each year. Young are reared in colonies; northern long-eared bat typically occurs in tree cavities and little brown bat typically occurs in buildings and other man-made structures, or tree cavities. Buildings are often preferred for use as maternity colonies by little brown bat, where available. The destruction or disturbance of an active maternity colony could potentially result in a considerable reduction in the local population. To assess the status of local breeding bat populations, non-systematic surveys for the two *myotis* species were conducted July 16 through 18, 2012. Prior to fieldwork, Stantec identified areas and features in and around the PDA with

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

potential for use as maternity colonies by myotis bats, such as buildings, bridges, or cavity trees. The features were investigated during a daytime walkover and qualitatively assessed for suitability for use as a maternity colony site.

Potential maternity colony sites consisted of an abandoned camp ground containing several vacant buildings (Station 2+100), an abandoned house and adjacent barn (Station 7+800), Bonshaw Bridge (Station 5+600), and a stand of mature forest along Crawford's Stream (Station 1+500). These areas were surveyed after dusk using a hand-held ultrasonic detector to qualitatively assess species diversity and activity levels at various locations along the PDA. A total of 59 echolocation call sequences were recorded, all identified as belonging to *Myotis* spp.. The majority of the calls were recorded at West River in the vicinity of Bonshaw Bridge, where numerous little brown bat bats could be seen flying low over the water foraging for insects. Activity was also recorded near Crawford's Stream, although only six of the 59 sequences were recorded there. There was no activity recorded at the abandoned house and barn, and none at the abandoned campground. Each area was investigated at dusk and again shortly afterward to determine if bats were emerging from any of the structures. The only structure that showed any sign of roosting was Bonshaw Bridge, which had small amounts of bat guano and culled insect parts under the abutments indicating that foraging bats used the site occasionally as a night roost to process prey. There were no maternity colonies found at any of the sites.

While the calls of little brown bat and northern long-eared bat bats cannot be reliably differentiated using the employed equipment, it is likely that the calls recorded belonged to little brown bat based on the habitat where the calls were recorded and the morphology of the frequency time graph depiction of the calls.

4.3.1.3 Vegetation

For the purposes of this EA, vegetation is defined as vascular plants and their habitats. The lack of baseline botanical surveys on PEI, combined with the high percentage of land devoted to agricultural development have resulted in rare rankings for many species that are common in adjacent provinces, so that there is typically strong potential to find species that are listed as rare on the provincial status list (AC CDC 2010). A search of the AC CDC database (AC CDC 2012) revealed 15 vascular plant SOCC that have been previously recorded within a 5 km radius of the PDA (Table 4.9). None of the plants are listed and protected by SARA. Three are classified extremely rare by AC CDC in PEI.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 4.9 Vascular Plant SOCC Recorded within 5 km of PDA Centre (AC CDC 2012)

Common Name	Scientific Name	PEI General Status Rank	AC CDC S-Rank
Flattened Oat Grass	<i>Danthonia compressa</i>	May Be At Risk	S1
Common Hop	<i>Humulus lupulus var. lupuloides</i>	Undetermined	S1?
Flat-branched Tree-clubmoss	<i>Lycopodium obscurum</i>	May Be At Risk	S1S2
Hairy Sweet Cicely	<i>Osmorhiza claytonii</i>	May Be At Risk	S2
Small Round-leaved Orchid	<i>Platanthera orbiculata</i>	Sensitive	S2
Pink Crowberry	<i>Empetrum eamesii ssp. eamesii</i>	Sensitive	S2
Boreal Stitchwort	<i>Stellaria borealis</i>	May Be At Risk	S2S3
Green Adder's-Mouth	<i>Malaxis unifolia</i>	Sensitive	S2S3
Balsam Poplar	<i>Populus balsamifera</i>	Sensitive	S2S3
Carolina Rose	<i>Rosa carolina</i>	Sensitive	S2S3
Trailing Stitchwort	<i>Stellaria alsine</i>	Sensitive	S2S3
Silvery Glade Fern	<i>Deparia acrostichoides</i>	Sensitive	S3
White Bog Orchid	<i>Platanthera dilatata</i>	Sensitive	S3
Club Spur Orchid	<i>Platanthera clavellata</i>	Sensitive	S3
Upland Bent Grass	<i>Agrostis perennans</i>	Sensitive	S3?

S1 = Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
 S2 = Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
 S3 = Uncommon throughout its range in the province, or found only in a restricted range, even if abundant in at some locations. (21 to 100 occurrences).
 S4 = Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g., watch list). (100+ occurrences).
 S#S# = Numeric range rank: A range between two consecutive numeric ranks. Denotes range of uncertainty about the exact rarity of the Element (e.g., S1S2).
 ? = Inexact or uncertain: for numeric ranks, denotes inexactness, e.g., SE? denotes uncertainty of exotic status. (The "?" qualifies the character immediately preceding it in the SRANK)

During plant surveys conducted in 2011 for a previous alignment for this project, 154 vascular plant species were observed, including three SOCC that are considered rare or uncommon in PEI (Table 4.10). These species were all observed within 1 km of the current PDA.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 4.10 Vascular Plant SOCC Previously Observed within 1 km of the PDA

Common Name	Scientific Name	CESCC Rank	AC CDC s-Rank
Red Pine	<i>Pinus resinosa</i>	Sensitive	S2
Beechdrops	<i>Epifagus virginiana</i>	Sensitive	S3
Upland Bent Grass	<i>Agrostis perennans</i>	Sensitive	S3?
<p>Notes:</p> <p>S1 = Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.</p> <p>S2 = Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.</p> <p>S3 = Uncommon throughout its range in the province, or found only in a restricted range, even if abundant in at some locations. (21 to 100 occurrences).</p> <p>S4 = Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g., watch list). (100+ occurrences).</p> <p>S#S# = Numeric range rank: A range between two consecutive numeric ranks. Denotes range of uncertainty about the exact rarity of the Element (e.g., S1S2).</p> <p>? = Inexact or uncertain: for numeric ranks, denotes inexactness, e.g., SE? denotes uncertainty of exotic status. (The “?” qualifies the character immediately preceding it in the SRANK)</p>			

Additional plant surveys were conducted in support of the Project in on May 29th 2012, to survey for early ephemeral species, and July 17 through 19, 2012. The entire length of the PDA was traversed for both surveys and the July survey was conducted in conjunction with wetland and wildlife surveys. There were 204 plants species identified (see Appendix C for complete list), five of which were SOCC (Table 4.11).

Table 4.11 Vascular Plant SOCC Observed within the PDA in 2012

Common Name	Binomial	AC CDC s-Rank	CESCC Rank
Staghorn sumac	<i>Rhus typhina</i>	S1S2	May Be At Risk
Red pine	<i>Pinus resinosa</i>	S2	Sensitive
Hay sedge	<i>Carex foenea</i>	S2?	May Be At Risk
Jack pine	<i>Pinus banksiana</i>	S3	Sensitive
Eastern white cedar	<i>Thuja occidentalis</i>	S3S4	Sensitive

Staghorn sumac (*Rhus typhina*) is listed as May Be At Risk by the CESCC and S1S2 by the AC CDC. A patch of this species was located within the PDA, in a fallow field east of Peters Road, and was approximately 100 m² in size, with several dozen stems within the patch. Staghorn sumac is a dioecious shrub that occurs in well-drained, previously disturbed sites such as roadsides, forest edges, and fallow fields. It forms dense colonies rhizomatously. This species is common through adjacent New Brunswick, as are the disturbed conditions that it thrives in. Similar habitat is also abundant on PEI, at least superficially, although the underlying soil conditions found on PEI may not favour this species. Staghorn sumac can be spread by planting seed or through root cuttings.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Red pine (*Pinus resinosa*) is listed as Sensitive by the CESSC and S2 by the AC CDC. It was found at two locations within the PDA. Five mature trees were observed on the edge of a clearing just west of Peters Road and were between 16 and 30 cm diameter breast height (DBH) and of approximately the same age (approximately 25 to 35 years). They were found together in surrounding a single mature jack pine (*Pinus banksiana*). At another location, approximately 260 m east of Peters Road, an individual tree was observed within a hedge row that was 27 cm DBH. These trees did not appear to be thriving, and the sites where they were found were not typical of the sandy upland sites where red pine naturally occurs. The locations suggested that they may have been planted. Additional red pine were found in a previous survey in 2011 near this location, on the opposite side of Route 1, on the Strathgarny Homestead Historic Site.

The jack pine was found among the red pines west of Peters Rd, was approximately 18 cm DBH and while healthy, not thriving as the site did not appear to be ideal for that species. The tree may have been planted. Jack pine is listed as Sensitive by the CESSC and S3 by the AC CDC. Jack pine is naturally serotinous, and under natural conditions requires a forest fire to open the seed cones, which are sealed. The stands in the vicinity of this tree did not appear to be of fire origin with the exception of the few red pines around it.

Hay sedge (*Carex foenea*) is listed as May Be At Risk by the CESSC and S2? by the AC CDC. It is located slightly outside the western section of the PDA. The question mark on the rarity ranking indicates that there is some uncertainty around this ranking. This species is typically found along dry, often gravelly, recently disturbed edges. This species, as is typical to sedges, is thought to have a seed viability of many decades where shed achenes survive in the soil seed bank for long periods of time until conditions are suitable for germination. The presence of this species at a location may indicate the presence of additional viable seed bank in the soil that may germinate in the future following disturbance.

Eastern white cedar (*Thuja occidentalis*) is ranked as Sensitive by the CESSC and S3S4 by the AC CDC. It was found near a house within the eastern end of the PDA near Station 3+000. There were several individual trees that were planted as a hedge separating the house from the adjacent agricultural land. Eastern white cedar is commonly used as a horticultural plant for ornamental purposes and as a result this record will not be considered further as a conservation issue.

4.3.1.4 Community Types

Over half of the PDA is currently cleared fields or existing highway, while the remaining areas are wooded. The wooded sections of the PDA include mixedwood forests dominated by red maple (*Acer rubrum*), balsam fir (*Abies balsamea*), white spruce (*Picea glauca*), heart-leaved paper birch (*Betula papyrifera* var. *cordifolia*), and trembling aspen (*Populus tremuloides*), old-field coniferous stands dominated by white spruce, intolerant hardwood stands dominated by

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

trembling aspen, red maple, and blue birch, and one stand dominated by yellow birch (*Betula alleghaniensis*) and mature eastern hemlock (*Tsuga canadensis*). Just west of the yellow birch/hemlock stand is a selectively cut woodlot with mature white pine (*Pinus strobus*). With the exception of the yellow birch/hemlock stand, the wooded sections of the PDA do not represent the pre-European settlement Acadian forests that once dominated the region. The forests of PEI were once composed of red spruce (*Picea rubens*), yellow birch, red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), white pine, red pine (*Pinus resinosa*), American beech (*Fagus grandifolia*), and eastern hemlock. Low lying areas black spruce (*Picea mariana*), larch (*Larix laricina*), and red maple were common. Other less common species included white spruce, white elm (*Ulmus americana*), white ash (*Fraxinus americana*), white birch (*Betula papyrifera*), grey birch (*Betula populifolia*), eastern white cedar (*Thuja occidentalis*), and poplars.

Habitats that are typically considered more ecologically valuable such as tolerant hardwood, wetlands, and mixedwood forest, are represented more heavily in the surrounding area than within the PDA while shrub areas, roadways, and recreational areas are more heavily represented within the PDA.

Sensitive Community Types

The PEI Department of Agriculture and Forestry (PEIDAF) has identified two areas that are considered sensitive ecological communities. The PEIDAF findings are included in Appendix D as a memo. These two sensitive areas consist of the two mature forest stands containing eastern hemlock on PIDs 860031 and 491332. These areas are considered to be representative areas of the early Acadian forests of PEI. The area within PID 491332 is a narrow band of shade tolerant hardwood dominated mixedwood that contains some large trees and represents a typical remnant of un-ploughed ground and a productive forest site. One eastern hemlock that was 75 cm in diameter was found within the PDA in this area. To the east of this stand several red pines and a jack pine was identified although not within the stand. No SOCC were found in this area and the stand, of which this is a part, continues to the north and appears to be considerably more extensive than the area within the PDA.

The PDA within PID 860031 crosses Crawford's Stream and the southern tip of a mature mixedwood forest where the coniferous component is dominated by large eastern hemlock. Some of the trees in this stand are believed to be several hundred years old. The stand, which has recently been delineated by the PEIDAF, is approximately 50 m wide and is associated with two branches of a watercourse which it follows through the stand for approximately 350 m. In total, the stand is approximately 2.5 ha, of which approximately 422 m² or 0.04 ha is within the PDA.

An additional area that was identified as sensitive ecological habitat was the coastal marsh along the West River estuary. This area was relatively rich in avian diversity and activity, was evidently an important bat foraging area, and provides habitat for a population of Atlantic salmon. Coastal estuarine wetlands are highly valued and protected on PEI for their important

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

functions such as erosion control, shoreline protection, biological diversity, and habitat for aquatic life. This particular wetland is currently being affected by the aggressive spread of reed canary grass (*Phalares arundinaceae*) which has become a dominant component of the vegetation community. No SOCC were found within this wetland.

4.3.1.5 Invasive Species

While a large number of the species encountered along the PDA were non-native, some of them were those with potential for aggressive colonization and displacement of native vegetation. These species which are considered invasive in the Maritime region were encountered at various locations along the PDA. PEI is particularly susceptible to the establishment and spread of non-native species which are often colonizers of disturbed areas of which PEI has an abundance. The invasive species encountered within the PDA are described below.

Bittersweet nightshade (*Solanum dulcamara*) is a climbing vine species and was found at numerous locations along the PDA along shaded moist roadside ditches, forest edges and in riparian wetlands. This Eurasian plant has the potential to colonize aggressively in a wide range of habitats and out-compete native vegetation. None of the incidences of this species along the PDA was found to be particularly aggressive in its growth or spread. Increased fragmentation would likely favour the proliferation of this species which is well-adapted to forest edges, however, it does not do well in full sunlight. Its seeds are spread by birds or by moving water, and it can propagate vegetatively from pieces of stem or root.

Smooth bedstraw (*Galium mollugo*) is a Eurasian herbaceous species and is a widespread problem weed of hayfields and other sites throughout the Maritimes. It spreads aggressively in forage crops and greatly reduces the suitability for livestock. Once established, it is difficult to eradicate from agricultural areas. This species was found to be widespread and well-established in active and fallow hayfields across the PDA, as well as along the edges of potato fields.

Multiflora rose (*Rosa multiflora*) is an Asian shrub species of rose, which has become widespread across PEI along moist edges, roadsides, and old pastures. Once established it can form dense impenetrable thickets where native plant species are outcompeted. This species was found at multiple areas along the PDA, but particularly along the sides of Peters Road near Wetland 3 where it is beginning to form dense colonies.

Reed canary grass (*Phalares arundinaceae*) is a species that consists of both native and invasive strains which are often difficult to distinguish. It is a colonial grass that spreads rhizomatously and pollinates profusely aggravating allergies for some. In recent years, this species has begun to spread more aggressively throughout the Maritimes on a variety of sites, but particularly on roadside ditches and riparian areas. It also tends to form dense monocultures in pasturelands and yields poor quality grazing material. In many areas this species is aggressively outcompeting native vegetation. Reed canary grass was identified at numerous locations along roadside ditches and in pastures along the PDA. It has become a dominant

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

component of the cover within Wetland 1 (the coastal marsh along West River) where it has displaced native vegetation and likely reduced wetland function for wildlife. The excavation and transport of topsoil can facilitate the spread of this species, but it is currently widespread throughout the Maritimes.

Creeping buttercup (*Ranunculus repens*) is a species that some consider to be invasive as it has very successfully colonized wet thickets and understories across North America, and can form dense colonies in highly shaded areas. It has been well-established for many decades, it is considered naturalized in most North American jurisdictions. It was found in all wetlands and many roadside ditches within the PDA.

4.3.1.6 Wetlands

Wetland delineation was conducted along the PDA on July 16 through 18, 2012. The extent of each wetland beyond the PDA was interpreted using aerial photography. The wetland delineation was conducted in accordance with the Corps of Engineers "Wetlands Delineation Manual" (Environmental Laboratory 1987) and Wetland Delineation Minimum Requirements: Report Submissions and Field Requirements (NBENV 2009).

The data point locations for the wetlands were sampled in accordance with the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) to evaluate vegetation, hydrology, and soil data to support a determination of wetland or non-wetland status. Munsell Soil Color Charts (Kollmorgen Instruments Co. 1990), Field Indicators of Hydric Soils in the United States Version 6.0 (United States Department of Agriculture, Natural Resources Conservation Service 2006), and the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (U.S. Army Corps of Engineers 2009) were used to aid in the identification of hydric soils within the Survey Area.

The Flora of New Brunswick (Hinds 2000) was consulted for plant identification, and nomenclature for species identified at the site follows that used in the most recently produced AC CDC species ranking documents (AC CDC 2011). Wetland and upland data were recorded on NBENV Wetland Delineation Data Sheets as there is no equivalent data entry form for PEI. The location of these data points was recorded using a Trimble Nomad GPS Unit in conjunction with an SXBlue II GPS receiver, rated for sub-metre accuracy.

Information was also collected pertaining to basic landscape features such as nearby non-wetland habitat and hydrological features such as small streams or watercourses.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

During the field visit, five wetlands were delineated (Table 4.12) which varied between 0.012 and 746.9 ha in size. Upland and wetland data points were collected for representative wetlands of each type encountered and the forms are included in Appendix E. Detailed wetland descriptions and Functional Analysis were completed for each wetland and are included in Appendix E. Refer to Figure 2 (Appendix A) for a map of the wetlands within and around the PDA.

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 4.12 Characteristics of Wetlands within and Adjacent to PDA

Wetland ID	Wetland Type	Total Area (ha)	Area within PDA (ha)	Area within 15m of PDA (ha)	Riparian (Y/N)	Watercourse Name	Dominant Vegetation	Presence of Fish (Y/N)	Data Points Collected (Y/N)
1	coastal estuarine brackish marsh	746.9	0.025	0.14	Y	West River	Soft stemmed bulrush, reed canary grass, queen of the meadow, broad fruited burreed	Y	Y
2	Shrub riparian wetland	0.068	0.068	0	Y	Unnamed intermittent stream	Speckled alder, sensitive fern creeping buttercup, spotted touch-me-not, wrinkleleaf goldenrod	N	N
3	Spring/Seep	0.012	0.012	0	N	-	spotted touch-me-not, sensitive fern, seep sedge	N	N
4	Shrub riparian wetland	3.29	0.57	0.21	Y	Crawford's Stream, Crawford's Brook	Creeping buttercup, wrinkle-leaved goldenrod, speckled alder, seep sedge	Y	Y
5	Shrub riparian wetland	0.08	0.039	0.04	Y	Unnamed	Speckled alder, sensitive fern, creeping buttercup, spotted touch-me-not, Baltic rush	N	N

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****Wetland Function**

Wetlands are generally considered to perform several hydrological, ecological, and social functions, and these functions can be particularly important in a highly developed landscape where wetlands can comprise a significant proportion of the remaining undeveloped land, and serve to buffer surface water systems from runoff and other influences from the surrounding developed upland. This is the case on PEI where widespread agricultural development and scant watercourse buffers regularly threaten fresh water life as evident by periodic fish kills in PEI's watercourses.

All wetlands encountered within the PDA have been affected by invasive species and anthropogenic influence. The wetland with the largest area within the PDA is Wetland 4, which is a large riparian wetland that surrounds Crawford's Brook and Crawford's Stream and is crossed by the PDA at three locations. Only this wetland and Wetland 1 have some notable functional importance.

Wetland 1 is the coastal marsh along the West River estuary. This wetland plays a role in shoreline protection in the area and appears to provide sediment control, having a positive effect on water quality of the river. Water quality in West River is important as it is known to support populations of Atlantic salmon (*Salmo salar*). The wetland also provides habitat and a food source (*i.e.*, blueberries), for a variety of birds, fish, mammals, and insects. This wetland is an important area for recreational fishing and non-motorized boating.

Wetland 4 is a riparian wetland that extends along Crawford's Brook and Crawford's Stream. The wetland helps maintain base flow within Crawford's Stream, as evident by the good baseflow at the time of the survey (*i.e.*, during a drought). The good baseflow is important to maintain healthy fish populations that occur in Crawford's Stream. The wetland is uncommonly large for a freshwater wetland on PEI.

Only a very small area of the wetlands encountered fall within the PDA and in all instances only a very small portion of individual wetlands are affected by the Project. Refer to Appendix E for a detailed description of function for each wetland.

4.3.2 Freshwater Environment**4.3.2.1 Fish Habitat**

Fish habitat surveys were conducted at Encounter Creek on June 13, 2012, and at Crawford's Brook and Crawford's Stream on June 19, 2012. Encounter Creek, Crawford's Brook, and Crawford's Stream (and its tributaries) are predominantly run habitats with some riffle areas and occasional pools. Key habitat characteristics are provided and discussed for each watercourse in the sub-sections below. See Figure 2 (Appendix A) for reach locations.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****Encounter Creek**Reach 1

Reach 1 of Encounter Creek (EC-R1) begins in the wetland located south of the abandoned wave pool and runs south until it meets with another tributary. The reach begins in a wetland and has no defined stream channel. Deposits of gravel and cobble are found throughout the wetland. Reach 1 is a 1st order stream; the average wetted width is approximately 40 cm, while the average bankfull width is approximately 80 cm. The substrate is a mixture of gravel and small cobble with very small amounts of silty sand. Little to no embeddedness was observed along the stream. The canopy cover over the stream is approximately 80 to 90%; there is no overhanging vegetation along the stream and there is very little instream woody debris. Almost half of the reach had erodible stream banks. Portions of this reach had large sections of fallen trees spanning the stream. The end of this reach runs through a wetland; the stream has a defined channel through the wetland.

Reach 2

Reach 2 of Encounter Creek (EC-R2) begins in the main branch of the stream where it meets with another tributary and ends where the stream meets an unnamed pond. Reach 2 is a 2nd order stream; the average wetted width of the stream channel in this reach is approximately 1 m, while the bankfull width is approximately 1.2 m. The substrate is a mixture of gravel, cobble, and small amounts of silty sand. Little to no embeddedness was observed along the stream. The canopy cover over the stream is approximately 90%; there is no overhanging vegetation and limited instream woody debris.

Crawford's BrookReach 1

Reach 1 of Crawford's Brook (CB-R1) is located west of Peter's Road. Crawford's Brook (all reaches) is a 1st order stream; the average wetted width of the stream channel in this reach is approximately 40 cm, while the average bankfull width is approximately 80 cm. The substrate is predominantly silty sand in some areas and a mixture of silty sand, cobble, and gravel in other areas. A low level of embeddedness was observed along the stream. Dry patches of gravel are found intermittently along the streambed. The canopy cover over the stream is approximately 80%; there is no overhanging vegetation along the stream and the occurrence of instream woody debris is limited. The stream banks are stable with undercut banks along only approximately 20% of the left stream bank. The western section of the stream has several large sections that are currently dry at the time of the survey. Within the footprint of the watercourse crossing much of the streambed is dry.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**Reach 2

Reach 2 of Crawford's Brook (CB-R2) is located east of Peter's Road. The stream runs through an open wetland. The average wet width of the stream is approximately 35 cm, while the average bankfull width is approximately 90 cm. The substrate is predominantly silty sand with small amounts of gravel. There is no canopy cover over the stream in this area; however, there are overhanging grasses.

Reach 3

Reach 3 of Crawford's Brook (CB-R3) is located between the wetland east of Peter's Road and the existing TCH. The average wet width of the stream is approximately 45 cm, while the average bankfull width is approximately 70 cm. The substrate is predominantly silty sand with small amounts of cobble. There is very little canopy cover in the area. Small sections of the stream have overhanging grasses and undercut banks (<20%).

Crawford's StreamReach 1

Reach 1 of Crawford's Stream (CS-R1) is located between the TCH and watercourse crossing structure A. The main branch of Crawford's Stream (*i.e.*, Reach 1 through Reach 4) is a 3rd order stream. The average wet width of the reach is approximately 1.3 m, while the bankfull width is approximately 2 m. The substrate is a mixture of gravel and cobble with silty sand. A low level of embeddedness was observed along the stream. The canopy cover along the majority of the reach is approximately 60-75%, while near the watercourse crossing structure cover decreases to approximately 40-50%. Approximately 20% of the reach has overhanging vegetation. The banks are stable throughout much of the area, with erodible sections present at localized points. A small amount of instream woody debris is present throughout the reach.

Reach 2

Reach 2 of Crawford's Stream (CS-R2) is located within the footprint of watercourse crossing structure A. The average wet width of the reach is approximately 2.2 m, while the average bankfull width is approximately 2.6 m. The substrate along the reach is composed entirely of silty sand. There are no large trees in the area and there is approximately 70% coverage by alders. There is instream woody debris throughout the reach.

Reach 3

Reach 3 of Crawford's Stream (CS-R3) is located between watercourse crossing structures A and B. The average wet width of the reach is approximately 2.5 m, while the average bankfull width is 2.7 m. The substrate is predominantly silty sand with occasional small patches of

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

gravel, and a small amount of boulder. The canopy cover along the reach is approximately 40%, with minimal overhanging vegetation. There is a small amount of instream woody debris throughout the reach.

Reach 4

Reach 4 (CS-R4) is located within the footprint of watercourse crossing structure B. The average wet width ranges from approximately 1.2 to 2.7 m, the bankfull width ranged from approximately 1.5 to 2.9 m. The substrate along the majority is predominantly silty sand with occasional patches of gravel, while the eastern end of the reach is predominantly gravel. The gravel areas had a very low percentage of embeddedness. At the eastern end of the reach the stream braids into two channels with a dry patch of gravel with vegetation and woody debris in the center. The canopy cover along the reach is approximately 60%. There is a small amount of undercut bank along this reach.

Reach 5

Reach 5 (CS-R5) is a tributary of Crawford's Stream running east immediately after watercourse crossing structure B. The tributary is a 2nd order stream; the average wet width is approximately 80 cm, while the bankfull width is approximately 1.2 m. The substrate is predominantly gravel and cobble, with little to no embeddedness. The canopy cover along the reach is approximately 80-90%. There is a small amount of instream woody debris and undercut bank along the reach.

Reach 6

Reach 6 (CS-R6) is the south branch off of the eastern tributary of Crawford's Stream. This branch is a 1st order stream; the average wet width is approximately 30 cm, while the average bankfull width is approximately 40 cm. The substrate is a mixture of silty sand, cobble, and gravel with moderate to low embeddedness. The stream is located in a hedgerow and the canopy cover is approximately 90%. There is overhanging vegetation above some sections of the reach.

Reach 7

Reach 7 (CS-R7) is the tributary of Crawford's Stream running north immediately after watercourse crossing structure B. This tributary is a 2nd order stream; the average wet width is approximately 2 m, while the bankfull width is approximately 2.7 m. The substrate is predominantly silt with occasional patches of gravel; little to no embeddedness was observed. The canopy cover is approximately 60-70%. There are undercut banks on both sides of the stream (approximately 30%) and a small amount of instream woody debris.

Water quality data including dissolved oxygen (DO), pH, and water temperature were collected at Crawford's Stream. Temperature and DO were measured using a YSI 55 water quality

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

meter. The pH of the water was measured using a PCTestr 35 multi-parameter pH meter. Both instruments were calibrated before use. Water quality data collected at Crawford's Stream is as follows:

- Temperature – 8.5 °C
- DO – 11.7 mg/L
- pH – 7.6

The water quality data were interpreted using the Canadian Council of the Minister of Environment (CCME) "Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater)" (CCME 1999). The Canadian water quality guidelines for the lowest acceptable DO concentrations in cold water ecosystems are 9.5 mg/L for early life stages and 6.5 mg/L for other life stages. The Canadian water quality guidelines for pH range from 6.5 to 9. Salmonid fishes can tolerate lower pH levels, although a pH below 5.0 is likely to harm the eggs and fry of salmonids and possibly adult fish when the water is soft (CCME 1987). Temperature conditions are considered in relation to the preferred ranges for native cold water species. In particular, brook trout (*Salvelinus fontinalis*) prefer summer water temperatures from 14 to 16°C, and Atlantic salmon (*Salmo salar*) prefer summer temperatures from 15 to 17°C.

4.3.2.2 Fish

Fish survey locations were selected to include representative fish bearing sections of the aquatic habitat in the local assessment area. These locations were selected in consultation with the provincial Freshwater Fisheries Biologist from the PEIDAF. Fish surveys were not conducted at Crawford's Brook due to two blockages to fish passages in the stream. Although during the stream habitat survey young of the year (YOY) were observed in the southern section of CB-R3 before the first barrier. Electrofishing surveys were also not conducted at Encounter Creek as there was an insufficient amount of water to use an electrofisher; however, during the stream habitat survey, young-of-the-year trout were observed at the southern end of EC-R1 and beginning of EC-R2. The purpose of the fish surveys was to gain an understanding of the composition of fish communities and provide an estimate of the fish population and density within the local assessment area.

Qualitative fish surveys were conducted on June 12 and 22, 2012 and were undertaken using a Smith-Root Model LR-24 backpack electrofishing unit. Barrier nets were used to isolate each selected area. Within each isolated area, electrofishing was conducted; multiple "passes" through the habitat were completed, and the number and characteristics of fish collected during each pass were recorded. Collected fish were kept in aerated buckets until electrofishing was completed. All fish collected were identified, measured, and released unharmed to downstream habitat. Fish surveys were one-time sampling events and represent a characterization of the fish species present at the time of the surveys. Table 4.13 illustrates the results of the fish surveys. See Figure 2 (Appendix A) for the locations of the three fish survey sites (*i.e.*, FS-A, FS-B and FS-C).

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI**

Table 4.13 Quantitative Stations and Fish Species Collected During Electrofishing Surveys, June 12 and 22, 2012

Station	Fish Species Collected	Number	Area Fished (m ²)	Total Catch Per Electrofishing Pass (all fish) (1 st / 2 nd / 3 rd pass)	Density (all fish) (fish /100 m ²)	Population Estimate (all fish)	95% Confidence Interval (all fish)	Capture Probability (all fish)
FS-A	Brook Trout	50	64	36 / 4 / 8 / 2	78.1	50	48-52	0.658
FS-B	Brook Trout Rainbow Trout	106 2	107	65 / 30 / 13	100.9	117	106-128	0.565
FS-C	Brook Trout	50	95	31 / 12 / 7	52.6	54	47-61	0.568
Notes:								
1) Scientific names of species caught are as follows: brook trout (<i>Salvelinus fontinalis</i>) and rainbow trout (<i>Oncorhynchus mykiss</i>).								

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

The density of brook trout were highest at FS-B with 100.9 fish/100m², which is located outside the PDA between watercrossing A and B. Downstream of the PDA at Station A, the density of fish was 78.1 fish/100 m², while upstream of the PDA at Station C it was 52.6 fish/100 m². The reduction in fish density upstream of the PDA could be related to stream order; Stations A and B were located on a 3rd order stream, while Station C was located on a 2nd order stream.

Brook trout were most abundant and the only native species observed during the electrofishing surveys. Rainbow trout (*Oncorhynchus mykiss*) are an introduced salmonid from western North America. The lengths of brook trout captured during the surveys are summarized in Table 4.14. The length ranges of brook trout caught were broadly similar throughout the Study Area.

Table 4.14 Length Ranges of Brook Trout Captured During Electrofishing Surveys, June 12 and 22, 2012

Station	Date of Sampling	Number of Brook Trout Caught	Length Range (mm)
A	June 12, 2012	50	2.5 to 16.4
B	June 12, 2012	106	1.8 to 19
C	June 22, 2012	50	3 to 15.7

4.3.3 Human Environment

4.3.3.1 Land Use

The Project crosses approximately 71 acres, of which 32 acres are forested, 18 acres have the potential for agriculture, and 21 acres are scrub land (*i.e.*, areas of uncultivated land covered with sparse grasses and/or trees). Of the 32 properties affected, there are 9 residential homes, 2 commercial properties (one of which is technically two parcels), 2 subdivision properties, 5 vacant residential properties, 8 farmland properties, and 6 woodlots.

Within 100 m of the PDA, there are 2 institutional (*i.e.*, Churchill Presbyterian Church and Bonshaw Baptist Church) and 7 commercial properties (CBC, New Haven Campground (currently not operating and for sale), Island Coastal Services, Gass’s General Store and Gas Station, Newman’s Garage, Crosby’s Construction and Bonshaw Amusement Park). An operating shale pit is located in the vicinity of the PDA; the Project will affect access to the shale pit.

The Project will divide two woodlot properties used for wood production; one of which is managed for personal use while the other is used as a small home business. Buildings on nine of the residential properties and one commercial property (New Haven Campground, not operational) will be removed/demolished for the Project.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Agriculture in the area mainly consists of hay and grains. There are also pasture fields and limited potato production. Potato production includes a three year crop rotation that typically includes growing hay or legumes.

Strathgartney Provincial Park along with the neighbouring provincial property to the east (16.2 ha) and the neighbouring privately owned property to the west (12.2 ha) are designated as Natural Areas under the PEI *Natural Areas Protection Act*. The Act offers legal protection for designated sites to protect their ecological integrity. The Provincial Park property was designated in 1992 due to the old growth stands of sugar maple (*Acer saccharum*) and American beech (*Fagus grandifolia*), the marsh located at the tip of the property, and to protect the general landscape of the area. The other provincial property was also designated due to the old growth stands of trees and general landscape. The privately owned property to the west was designated as a natural area in 1998 due to its hardwood forests dominated by sugar maple and beech trees and to preserve the general landscape of the area. Only the entrance area of the Park is being realigned to make access to the park safer and to allow for a new parking area and scenic lookout. The rest of the Park will not be directly affected by the Project.

The Department of Biology at the University of PEI and the Wildlife Conservation Technology Program at Holland College currently lease provincial lands in the area as part of their biology field programs. The property is located between Stations 0+550 and 0+800 west of the existing Peters Road. The Project will divide these lands.

Bonshaw Provincial Park is located along West River near the southwestern end of the Project. The park is not likely to be directly affected by the Project. The Project does not interact with federal Crown lands.

Recreational activities in the area include the use of trails (e.g., hiking, biking), snowmobiling, the use of all-terrain vehicles (ATVs), recreational fishing, and boating. The Project will divide private property currently used for snowmobiling and ATVs near Peters Road, which is used for access. The end of Peters Road that currently exits onto the existing highway will be decommissioned and re-routed east of the existing location. Project activities will not affect access to hiking and biking trails located off Green Road in the west end of the Project area.

4.3.3.2 Archaeological, Heritage, or Cultural Resources

A site visit by the provincial archaeologist was conducted along the proposed alignment, including access roads, the proposed footprint, and several pre-existing test pits in the area. The visual survey determined that the probability of for archaeological, heritage, or cultural resources in this area is low. Any discovery of an archaeological, heritage, or cultural resource as part of the Project would be an unplanned event.

According to the Canadian Register of Historic Places (Canada's Historic Places nd), there is one registered significant historic site in the vicinity of the PDA; the Strathgartney Homestead

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

National Historic Site of Canada. The homestead is located on the south side of the existing highway and therefore will not be affected as a result of the Project.

The Historic Places of Prince Edward Island Mapping Application (Historic Places of Prince Edward Island nd) indicates that there are two sites of historic importance in the vicinity of the Project, and an additional site more than 600 m from the PDA. The Strathgartney Homestead Cemetery is located off the TCH in Churchill and was constructed in 1871 (Government of PEI 2011b). The Strathgartney Homestead Cemetery is located within 100 m of the Project. The Bonshaw Pioneer Cemetery is a small cemetery situated on the south side of the TCH in Bonshaw between the intersections of St. Catherine's Road and Bonshaw Road (Government of PEI 2011c). The McArthur Family Cemetery is located near Peters Road in Churchill and was constructed in 1879 (Government of PEI 2011a); it is located more than 600 m north of the PDA. Project activities are not expected to interact with any of these sites of historic importance.

4.3.3.3 Transportation

The existing TransCanada Highway (TCH) is a two lane provincial arterial highway which runs from Wood Islands, Kings County, PEI through Charlottetown to the Confederation Bridge in Borden-Carleton, Prince County, PEI. As a link between the Confederation Bridge and the provincial capital, the TCH is a major transportation corridor for private and commercial vehicle traffic. The Project site is located between New Haven and Bonshaw, Queens County, PEI along the TCH. Vehicle traffic data collected reports average daytime traffic rate of 297.6 vehicles per hour and an average nighttime rate of 29.8 vehicles per hour in New Haven, at the eastern most end of the project boundary. In Bonshaw, at the western end of the project boundary the average daytime vehicle traffic rate has been reported at 282.6 vehicles per hour with an average nighttime traffic rate of 33 vehicles per hour.

5.0 ENVIRONMENTAL EFFECTS ASSESSMENT

5.1 Project Interactions with the Environment

The Project activities being carried forward for the assessment are described in Table 5.1

Table 5.1 Scope of Project – Summary Table

PROJECT PHASES/ COMPONENTS	DESCRIPTION
Construction:	
Site Preparation	Site Preparation includes activities associated with preparing the site for road and structure development (including access roads), such as surveying and geotechnical investigations, vegetation clearing, grubbing, installation of sediment control structures, and removal or modification of buildings.
Roadbed Preparation	Roadbed Preparation includes the activities associated with preparing the roadbed to base elevation (including access roads), such as excavation, placement of fill material, and ditching and drainage management.
Installation of Structures	Installation of Structures includes permitting and installation of watercourse crossings, and widening of the Bonshaw Bridge.
Surfacing and Finishing	Surfacing and Finishing includes activities such as paving, highway marking, and installation of signs, guardrails, and lighting.
Temporary Ancillary Elements	Temporary Ancillary Elements includes development, use, and removal of temporary ancillary structures and facilities.
Operation:	
Project Presence	The Presence of the Project includes everyday use of the highway by motorists.
Infrastructure Maintenance	Infrastructure Maintenance activities will include repair of the asphalt concrete surface, replacement or repair of drainage culverts, shoulder grading, and line repainting.
Winter Maintenance	Winter Maintenance will involve snow removal as well as deicing activities including salt and sand application.
Vegetation Management	Vegetation Management within the PDA will include clearing/mowing to maintain sight lines. Herbicide application will not be used to control vegetation.

The potential for and the nature of interactions between the Project and the environment, were determined by the Study Team by employing a qualitative rating system. The Study Team rated each interaction between the Project and each VEC based on the following rating system, with a rating assigned for each interaction based on the professional judgment and experience of the Study Team, as follows.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

- 0 = No interaction. The environmental effects are not significant and not considered further in this assessment.
- 1 = Interaction occurs; however, based on past experience and professional judgment the interaction would not result in a significant environmental effect, even without mitigation; or interaction would not be significant due to application of codified environmental protection practices that are known to effectively mitigate the predicted environmental effects. The environmental effects are not significant and not considered further in this report.
- 2 = Interaction could result in an environmental effect of concern even with mitigation; the potential environmental effects are considered further in this report.

Where a potentially significant Project-VEC interaction (*i.e.*, a rating of 2) may occur, further analysis is provided to assess the environmental effect more thoroughly. Where no interaction or no significant interaction is identified (*i.e.*, a rating of 0 or 1) the rationale of why no interaction exists, or why a limited interaction can be adequately mitigated without resulting in significant environmental effects, is provided, but the environmental effects are rated not significant and are not considered beyond that discussion in this assessment.

The assessment is provided in a tabular format for ease in evaluation and communication.

5.1.1 Project-Environment Interaction Matrix

Based on the activities in the Project Description and the methodology described above, the potential interactions between the Project and the environment were ranked and these are summarized in Table 5.2.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.2 Potential Interactions of the Project with the Environment

Project Phase, or Activities/Physical Works Associated with the Project	Atmospheric Environment			Freshwater Environment	Terrestrial Environment	Marine Environment	Groundwater Resources	Land Use	Archaeology and Heritage Resources	Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons	Transportation	Public Health and Safety	Effects of Environment on the Project
	Air Quality	Noise	Greenhouse Gasses										
Construction													
Site preparation	2	2	2	2	2	1	1	2	1	1	1	1	2
Roadbed preparation	2	2	2	2	2	1	1	2	1	1	1	1	2
Installation of structures	1	2	1	2	2	1	1	2	1	1	1	1	2
Surfacing and finishing	1	1	1	1	1	1	0	1	0	1	1	1	1
Temporary Ancillary Elements	2	1	1	1	2	0	0	2	1	1	1	1	1
Materials and Equipment	1	1	1	1	1	0	0	2	0	1	1	1	2
Operation and Maintenance													
Project Presence	1	1	1	1	1	0	0	1	0	1	1	1	1
Infrastructure maintenance	1	1	1	1	1	1	0	1	0	1	1	1	1
Winter maintenance	1	1	1	1	1	1	1	1	0	1	1	1	1
Vegetation management	1	1	1	0	1	0	0	1	0	1	1	1	0
<p>KEY</p> <p>0 = No interaction. The environmental effects are not significant and not considered further in this report.</p> <p>1 = Interaction occurs; however, based on past experience and professional judgment the interaction would not result in a significant environmental effect, even without mitigation; or interaction would not be significant due to application of codified environmental protection practices that are known to effectively mitigate the predicted environmental effects. The environmental effects are not significant and not considered further in this report.</p> <p>2 = Interaction could result in an environmental effect of concern even with mitigation; the potential environmental effects are considered further in this report.</p> <p>NOTES: First Nations consultation has not been conducted at this time. Once completed, this section will be updated.</p> <p>Field surveys for Freshwater Environment, Terrestrial Environment, and Groundwater Resources have not been conducted at this time. Once completed, this section will be updated accordingly.</p>													

5.1.2 VECs with No Interaction with the Project (Ranking of 0)

Based on the ratings provided in Table 5.2 above, there are no VECs that are expected to have no interaction with the environment.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.1.3 VECs with No Significant Interaction with the Project (Ranking of 1)**

Based on past experience and the professional judgment of the study team, the interaction of the Project with the following VECs would not result in a significant environmental effect, even without mitigation, and/or due to application of codified environmental protection practices that are known to effectively mitigate the predicted environmental effects:

- Marine Environment
- Groundwater Resources
- Archaeology and Heritage Resources
- Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons
- Transportation
- Public Health and Safety

Further discussion is provided in the sub-sections that follow.

5.1.3.1 Marine Environment

The Interaction between the Project and Marine Environment has been ranked as a 1 in Table 5.2.

The majority of Project activities will have no interaction with the Marine Environment, with the potential exception of a lane addition on the north side of the Bonshaw Bridge. The bridge widening activities will be spanning but not entering a tidal portion of West River. During Construction, steel H-piles will be driven to accommodate and support the additional lane. This activity is anticipated to occur within the footprint of the existing shoreline armourstone protection and will not cross the high water mark.

As the structure is not entering the Marine Environment, potential interactions are not anticipated. Driving piles will only occur once, and related construction activities will be short term in nature. As a siltation and erosion mitigation measure, a silt curtain will be installed surrounding the area. Visual monitoring of the area will occur to ensure the silt curtain is functioning properly. No significant residual environmental effects are expected and no substantial changes to the Marine Environment are expected during Construction of the Project. During Operation and Maintenance of the Project, interactions with the Marine Environment are limited to occasional inputs of salt due to deicing activities. No significant residual environmental effects are expected with respect to these activities and no significant changes to the Marine Environment are expected during Operation and Maintenance of the Project.

Based on the above information, no substantive interactions between the Project and the Marine Environment are anticipated. Therefore, the environmental effects of the Project on the Marine Environment during all phases of the Project (including cumulative environmental effects) are rated not significant, and are not considered further in this EA.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.1.3.2 Groundwater Resources**

The interaction between the Project and Groundwater Resources has been ranked as a 1 in Table 5.2.

All potable and domestic water supplies for residential, commercial establishments and farms within the Study area are derived from groundwater through drilled water supply wells. There are approximately 50 wells along the proposed PDA and there are no known dug wells within 100 m of the PDA and only 1 residential well within 100 m of a major cut area in the PDA. Wells potentially at risk to Project-related environmental effects include those within the PDA and those within 200 m hydraulically down gradient of the PDA. The primary concern relates to change in water quality due to the use of road salt. Based on the absence of blasting, the type of wells (drilled), and casing lengths (mean 16.8 m), and proximity of wells to major cut areas, permanent damage to water supply wells is considered unlikely.

Potential environmental effects of the Project on Groundwater Resources may occur as a result of Project Construction and to a lesser extent during Operation and Maintenance of the completed highway. During Project Construction vibrations from heavy equipment and excavation can temporarily affect well water quality (turbidity, discoloration). Increases in conductivity, salinity, sodium, chloride and TDS due to winter de-icing during Operation can adversely affect the chemistry of water supply wells. Finally, accidental releases of petroleum hydrocarbons during Construction and Operation can adversely affect down-gradient wells. The environmental effects of accidental releases of petroleum or other chemicals to groundwater are addressed in Section 4.6. Because the water supplies in this area are known to be derived from drilled wells and the width of the PDA, no significant issues with shallow groundwater flow modification due to ditching and other civil works are anticipated.

Prior to construction surveys of all the wells within 100m of areas with major cuts will be conducted. There is one residential dwelling located within the survey area.

Based on the above information, no substantive interaction with groundwater resources resulting in a permanent change in either water quantity or water quality is anticipated. Therefore, the environmental effects of the Project on Groundwater Resources during all phases of the Project (including cumulative environmental effects) are rated not significant, and are not considered further in this EA.

5.1.3.3 Archaeology and Heritage Resources

Interaction between the Project and Archaeological and Heritage Resources has been ranked as a 1 in Table 5.2, due to the potential for an unplanned disturbance to or discovery of significant heritage resources.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Results of an archaeological visual survey conducted by the provincial Archaeologist presented no evidence of archaeological sites in the examined areas, and stated that the probability of archaeological site detection is low within the PDA.

The PDA was observed but could not be fully accessed until vegetation has been removed exposing the road bed. For this reason, periodic visual inspection of the site by a qualified archaeologist has been requested.

Based on the above information, no substantive interactions between the Project and Archaeological and Heritage Resources are anticipated. Therefore, the environmental effects of the Project on Archaeological and Heritage Resources during all phases of the Project (including cumulative environmental effects) are rated not significant.

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

Interactions between the Project and Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons has been ranked as 1 in Table 5.2, because of the potential for historical use of lands in the PDA.

The Project lies within traditional territory of the Mi'kmaq on land that is primarily privately owned, excluding one parcel of Crown land. Most of the land in the PDA has been developed for residential or agricultural use. Therefore, although traditional activities such as hunting may be permitted in some areas of the PDA, it is likely that few of these activities are currently carried out. Information from the Aboriginal Affairs Secretariat indicates that there are no records of current Aboriginal land use in the area. Consultation by PEITIR with the Aboriginal community (chiefs and MCPEI) has not indicated at the time of writing, any current Aboriginal land and resource use. As well, there are no known sites of historic or cultural importance within the PDA, as indicated by the Aboriginal Affairs Secretariat. The Project involves a highway upgrade and realignment and is not likely to substantively interfere with traditional Aboriginal land and resource use. There are no unique features of the natural environment such that traditional land and resource use could not be pursued elsewhere with no substantive interference with such activities. The ongoing presence of the upgraded highway would not substantively affect the current use of land and resources for traditional purposes by Aboriginal persons.

In consideration of federal and provincial policy and regulatory frameworks relating to Aboriginal land and resource use, the environmental effects (including cumulative environmental effects) of the Project on Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons during all phases of the Project are rated not significant, and are not be assessed further in this EA.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.1.3.5 Transportation**

Interaction between the Project and Transportation has been ranked as a 1 in Table 5.2.

During Operation, the long term environmental effects of the Project will be positive with an improved transportation network and an increase in public safety. Environmental effects on Transportation resulting from the Construction Maintenance phases of the Project are anticipated to be localized, short term, and minimal in number. Construction and Maintenance activities may result in temporary traffic disruptions or disturbances. Where possible, these disruptions will be minimized and timed to avoid both daily and seasonal peak traffic periods.

No substantive adverse interaction between the Project and Transportation has been identified and overall the environmental effect of the Project on Transportation is positive; therefore, the environmental effects (including cumulative environmental effects) of the Project on Transportation during all phases of the Project are rated not significant.

5.1.3.6 Public Health and Safety

Interactions between the Project and Public Health and Safety have been ranked as 1 in Table 5.2. Project activities, if not carried out in a careful and safe manner, could result in risks to the public or workers. As with any project in PEI, Construction of the Project is subject to provincial occupational health and safety legislation that is aimed at the protection of public and worker safety.

The Project will comply with all requirements of the PEI Occupational Health and Safety Act, thus the environmental effects of the Project on Public Health and Safety will not be significant from the perspective of worker safety and occupational exposure.

Overall, the Project will have a long term positive environmental effect on public health and safety as it will improve the safety of the provinces transportation network. As mentioned in the Project description, the section of the TCH to be realigned has higher accident rates than similar highway sections and the realignment will eliminate 5 sharp curves and 35 potentially dangerous driveway accesses.

The interactions between the Project and Public Health and Safety are anticipated to be effectively managed from an occupational health and safety perspective, and to be positive overall from a public health and safety perspective. Therefore, in consideration of existing regulatory frameworks and policies and the positive environmental effect of improved traffic safety, the environmental effects of the Project on Public Health and Safety during all phases of the Project (including cumulative environmental effects) are rated not significant.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.1.4 Determination of Significance**

As identified in Table 5.2, all VECs for which no interaction (*i.e.*, ranked as 0) or no substantive interaction (*i.e.*, ranked as 1) with the Project are foreseen during Construction and Operation, the environmental effects of the Project are rated not significant, with a high level of confidence. This includes the Marine Environment, Labour and Economy, Archaeology and Heritage Resources, Transportation, Current Use of Land and Resources for Traditional Use by Aboriginal Persons, Public Health and Safety.

5.1.5 VECs Which May Result in an Interaction with the Project that Requires Further Assessment (Ranking of 2)

Based on the ratings provided in Table 5.2 above, the Project may result in an interaction with the following VECs that requires more detailed assessment in this EA:

- Atmospheric Environment
- Freshwater Environment
- Terrestrial Environment
- Land Use
- Effects of the Environment on the Project

These potential Project-environment interactions require further evaluation, and are thus discussed in the sections that follow.

5.2 Atmospheric Environment

The Atmospheric Environment is considered a VEC for a number of reasons, as follows:

- The atmosphere has an intrinsic or natural value, in that the atmosphere and its constituents are needed to sustain life.
- The atmosphere is a pathway for the transport of air contaminants to the freshwater, marine, and terrestrial environments, presenting the contaminants in the form of varying atmospheric concentrations or particle phase or gas phase deposition.
- If not properly managed, releases of air contaminants to the atmosphere from the Project may cause adverse environmental effects on the air, the land and the waterways in the vicinity of the Project.
- Emissions of GHGs accumulate in the atmosphere and are a major factor in producing the greenhouse effect, which is believed to influence climate.
- If not properly managed, sound emissions in the form of unwanted sound (noise) from the Project may cause adverse environmental effects on the sound quality in the vicinity of the Project. These environmental effects could include annoyance and sleep disturbance of nearby residents.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

5.2.1 Scope of Assessment

This environmental assessment of Atmospheric Environment includes consideration of the potential environmental effects associated with the Project over the life of the Project.

The potential environmental effects to be assessed are associated with Project-related emissions of air contaminants, GHG, and noise to the atmosphere during Construction, and Operation and Maintenance of the Project.

In this EA, the approach to the assessment of Atmospheric Environment is to select the environmental effects, select the associated measurable parameters to be considered (concentrations and/or emissions rates of air contaminants, GHG, and noise emissions), establish boundaries for the environmental effects assessment, establish the significance criteria, characterize the environmental effects, assess the residual environmental effects (with mitigation such as emissions control equipment in place), determine the significance of the environmental effects, and prepare a follow-up and monitoring program, as applicable.

5.2.1.1 Rationale for Selection of Valued Environmental Component and Regulatory Setting

The Atmospheric Environment has been selected as a VEC for reasons noted above and due to the potential for interactions between the Project and Atmospheric Environment.

On this basis, the potential environmental effects on Atmospheric Environment associated with the Project-related emissions to the atmosphere have been selected as:

- a Change in Air Quality
- a Change in GHG Emissions
- a Change in Sound Quality

The potential environmental effects to the Atmospheric Environment are summarized in Table 5.3.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.3 Environmental Effects on Atmospheric Environment

Environmental Effect	Issues Considered
Change in Air Quality	The following will be qualitatively assessed: <ul style="list-style-type: none"> • emissions of air contaminants, including total suspended particulate matter (TSP), particulate matter less than 10 microns (PM₁₀), particulate matter less than 2.5 microns (PM_{2.5}), SO₂, NO_x, carbon monoxide (CO), VOCs and PAHs • ambient air quality, including the ground-level concentrations of TSP, PM₁₀, PM_{2.5}, SO₂, NO_x, and CO; and the potential environmental effects of Project-related Construction, and Operation and Maintenance activities on air quality
Change in GHG Emissions	The following will be qualitatively assessed: <ul style="list-style-type: none"> • emissions of GHGs from the Project
Change in Sound Quality	The following will be assessed: <ul style="list-style-type: none"> • ambient sound pressure levels in the Assessment Area • the potential environmental effects of Project-related Construction and Operation and Maintenance activities on sound quality

While the release of GHGs to the atmosphere is not currently regulated in PEI, in 2008, the provincial government released a strategy for dealing with climate change titled “Prince Edward Island and Climate Change - A Strategy for Reducing the Impacts of Global Warming”. As part of this publication, PEI has committed to reduce CO₂e emissions to 75-85% below 2001 levels by 2050 (Government of PEI 2008). The *Ozone Layer Protection Regulation* under the *Environmental Protection Act* also exists to protect local and global air quality in respect of emissions of these types of substances; however, in the context of the Project, this regulation is not applicable.

Air quality in PEI is subject to the *Air Quality Regulation* issued under the *Environmental Protection Act*. The requirements for facilities that are sources of air contaminants are described in the regulation and the permit application process. Ambient air quality objectives for regulated air contaminants are presented in Schedule B of the regulation.

Federally, the *Canadian Environmental Protection Act (CEPA)* and its suite of regulations and guidance documents (*i.e.*, National Ambient Air Quality Objectives, Government of Canada 1999) is the main regulatory instrument for managing air quality. Canada Wide Standards (CWS) developed by the CCME are also applied and overseen federally, in concert with the provinces. The CWS may include qualitative or quantitative standards, guidelines or objectives for protecting the environment and human health. A number of these exist to protect air quality, including those for benzene (not an ambient standard); dioxin and furans for specific industries, mercury for specific industries, and ambient air quality objectives for PM_{2.5} and ozone. The National Ambient Air Quality Objectives (NAAQO) have also been developed and implemented federally through the Canadian Environmental Quality Guidelines of the CCME. Recently, Environment Canada and stakeholders released a proposed strategy to improve air quality in Canada (Comprehensive Air Management Steering Committee 2010). This is an alternative to the Turning the Corner Plan issued in 2008. In this new framework, there are plans to develop

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

new Canadian Ambient Air Quality Standards, to establish air zones and regional air sheds, to establish base level industrial requirements, to control emissions from transportation, and to use *CEPA* as the instrument to provide regulatory assurance. This approach and associated regulatory direction are presented for information purposes only, as they are only proposed at this stage and are therefore considered only briefly in this assessment.

Noise is not defined as an air contaminant, nor are there any regulations or requirements in place regarding ambient sound pressure levels.

5.2.1.2 Selection of Environmental Effects and Measurable Parameters

The Atmospheric Environment is the component of the environment that comprises the layer of air near the earth's surface to a height of approximately 10 km. The Atmospheric Environment is typically categorized by:

- air quality, which is characterized by the measure of the constituents of ambient air, and includes the presence and the quantity of air contaminants in the atmosphere. The relevant air contaminants of interest selected for the Project are TSP, PM₁₀, PM_{2.5}, SO₂, NO_x, CO, VOCs and PAHs.
- climate, which is characterized by the composite or generally prevailing meteorological conditions of a region, including temperature, air pressure, humidity, precipitation, sunshine, cloudiness, winds and sea state, throughout the seasons, averaged over a series of years (typically a 30-year period). The emissions of GHGs from the Project are used in this EA as an indicator of potential environmental effects on climate. The potential environmental effects of a change in climate on the Project are addressed in Section 5.6 (Effects of the Environment on the Project). The measurable parameters for Climate are GHG emissions of CO₂, N₂O and CH₄.
- sound quality, which is characterized by the type, character, frequency, intensity, and duration of noise (unwanted sound) in the outdoor environment. The measurable parameters for Sound are A-weighted sound pressure levels in decibels (dB_A).

5.2.1.3 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on the Atmospheric Environment include the periods of Construction (approximately one year beginning in September 2012) and Operation and Maintenance (in perpetuity, following Construction).

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.2.1.4 Spatial Boundaries**

The spatial boundaries for the characterization of potential environmental effects, including cumulative environmental effects, for each key aspect of the Atmospheric Environment are formed by the zone of influence associated with the Construction and Operation and Maintenance of the Project. The spatial boundaries have been defined based on a combination of experience with similar projects and professional judgment, as detailed below.

5.2.1.4.1 Change in Air Quality

The potential for environmental effects associated with a Change in Air Quality is generally not expected to extend beyond approximately 500 m around the perimeter of the Project Site. This area will generally provide for sufficient dispersion of emissions generated by Project-related activities, such as dust and combustion gas emissions from heavy equipment and vehicle traffic.

As such, the Local Assessment Area (LAA) for the characterization of a Change in Air Quality is identified as a zone extending to approximately 500 m around the perimeter of the PDA.

The RAA for Air Quality includes all of PEI.

5.2.1.4.2 Change in GHG Emissions

With respect to a Change in GHG Emissions, in recognition of the global nature of the potential environmental effects of a Change in GHG Emissions on global climate, the Assessment Area for the assessment of the environmental effects of a Change in GHG Emissions on the Atmospheric Environment is, by definition, the global environment. However, carbon sequestration and Project-related changes to carbon sinks are assessed on a regional and provincial basis.

Thus, the LAA for GHG Emissions includes all of PEI while the RAA includes all of Canada.

5.2.1.4.3 Change in Sound Quality

The potential for a Change in Sound Quality due to the Project is generally not expected to extend beyond approximately 1 km around the perimeter of the PDA. At a distance of 1 km from Project-related sources of sound emissions (heavy equipment, trucks, passenger vehicles), there is sufficient distance for the sound to naturally attenuate such that it would be (for the most part) not detectable over background sound pressure levels, even in the case of low background sound pressure levels (e.g., in rural and isolated areas). Thus, the LAA for the assessment of a Change in Sound Quality is identified as a zone extending to approximately 1 km around the perimeter of the PDA.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

The RAA for Sound Quality is approximately consistent with the LAA as cumulative effects on Sound Quality are not expected beyond that range.

5.2.1.5 Administrative and Technical Boundaries

The technical and administrative boundaries for Atmospheric Environment and its key aspects pertain mainly to regulatory limits and standards for ambient concentrations of air contaminant and ambient sound pressure levels, where such limits and standards exist. These limits are set by regulatory authorities to reflect environmental protection objectives, with the intent of being protective of air quality and human and environmental health.

5.2.1.5.1 Change in Air Quality

A Change in Air Quality is assessed in the context of both the release of potential Project-related air contaminants to the atmosphere and the concentrations of these at ground level in the Assessment Area. For the purposes of this EA, the Project-related air contaminants of interest consist of TSP (including dust), PM₁₀, PM_{2.5}, SO₂, NO_x, and CO. Due to regulatory interest as demonstrated in past EAs for other projects in PEI, these are further augmented by total emissions of VOCs and PAHs from Project-related sources, even though there are currently no PEI regulatory limits or standards for emissions or ground-level concentrations of these parameters.

The federal National Ambient Air Quality Objectives and the provincial PEI Maximum Permissible Ground-Level Concentrations for the selected air contaminants are presented in Table 5.4. These are supplemented, where required or available, by other national initiatives such as the CWS from the CCME, as well as standards and objectives from other provincial jurisdictions.

Ambient air quality is monitored in PEI at three locations. These locations are Charlottetown, Southampton, and Wellington. The nearest ambient air quality monitoring station to the Project is located in Charlottetown, approximately 17 km to the east of the Project site.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.4 Canadian and Prince Edward Island Ambient Air Quality Objectives

Air Contaminant	Averaging Period	PEI Maximum Permissible Ground-Level Concentrations ¹ (µg/m ³)	National Ambient Air Quality Objectives, Maximum Desirable/Acceptable Levels ² (µg/m ³)	Other Ambient Air Quality Standards or Objectives (µg/m ³)
Total Suspended Particulate Matter (TSP)	24-hour	120	--/120	--
	Annual	70	60/70	--
Particulate Matter Less than 10 Microns (PM ₁₀)	24-hour	--	--	50 ³
Particulate Matter Less than 2.5 Microns (PM _{2.5})	24-hour	--	--	30 ⁴
Sulphur dioxide (SO ₂)	1-hour	900	450/900	--
	24-hour	300	150/300	--
	Annual	60	30/60	--
Nitrogen dioxide (NO ₂)	1-hour	400	--/400	--
	Annual	100	--/-- 60/100	--
Carbon monoxide (CO)	1-hour	35,000	--	--
	8-hour	15,000	--	--
Volatile Organic Compounds (VOCs)	--	--	--	--
Ozone (O ₃)	1-hour	--	100 (50 ppb)/163 (82 ppb)	--
	8-hour	--	--	130 (65 ppb) ⁴
	24-hour	--	30 (15 ppb)/50 (25 ppb)	--
	Annual	--	--/30 (15 ppb)	--

Notes:

-- No standard or objective available.

Source:

¹ Government of PEI (2004).

² CCME (1999), National Ambient Air Quality Objectives, Maximum Acceptable Levels.

³ BCWLAP (1995), Interim Air Quality Standard for Fine Particulate PM₁₀.

⁴ CCME (2000), Canada Wide Standards for Particulate Matter and Ozone.

5.2.1.5.2 Change in GHG Emissions

There are currently no standards or guidelines for GHG concentrations in ambient air (provincial or federal), nor are there any emission limits with respect to GHG releases from individual sources or sectors in place provincially or federally at this time. The provincial government has prepared *A Strategy for Reducing the Impacts of Global Warming* (Government of PEI 2008) which outlines plans to reduce GHG emissions by 500,000 tonnes of CO₂e per year to meet its target to reduce GHG emissions to 75 to 85% below 2001 levels by 2050. The plan includes reductions in GHG emissions in the following areas: Energy Efficiency and Conservation; Renewable Energy; Transportation; Agriculture; Adaptation and Resilience; Public Education and Awareness and; Government Leading by Example (Government of PEI 2008).

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

The federal government released the Regulatory Framework for Industrial Greenhouse Gas Emissions in 2008 (Government of Canada 2008). This framework outlines a regulatory regime involving 18 target industrial sectors and the draft regulations were scheduled to be published in the Canada Gazette in the fall of 2008. This was followed by an announcement in July 2009, that the GHG reporting threshold for emitters was reduced to 50,000 t CO₂e. Any facility emitting more than the 50,000 t CO₂e threshold in the 2010 calendar year must report to Environment Canada via the Electronic Data Reporting (EDR) a system managed by Statistics Canada. In May 2010, the House of Commons passed the proposed *Climate Change Accountability Act* (NDP 2010); however, in November 2010, the proposed *Act* did not receive Senate approval (Galloway 2010). While the status of these proposed acts, regulations, and frameworks are uncertain at this time, no additional federal Canadian regulations have been issued in this regard as of December 2010.

The scope of this Project does not contain any aspects that are currently regulated for GHG emissions provincially or federally. The latest guidance from the Canadian Environmental Assessment Agency titled *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners* (CEA Agency 2003) was followed for this EA. As summarized in the introduction of that document, greenhouse gases as precursors to climate change constitute a global phenomenon rather than a local issue, and the science of this phenomenon is not yet developed to the stage where global contributions from a single project of this nature can be measured against the problem. This presents a technical boundary in that the contribution of the Project to global climate change ultimately cannot be known at this time; therefore the determination of the significance of the contribution of the Project to global climate change is not possible under current guidance. In consideration of this, the Agency recommends that significance criteria not be set for the assessment of GHG within an environmental assessment conducted under *CEAA*. Instead, the steps outlined in the Agency's guidance document are followed for the assessment.

In consideration of the relatively limited scale of the Project as defined in the Project Description (Section 2), the potential environmental effects of the Project on local, regional, and global climate are not expected to be measurable. Thus, the emissions of GHGs from Construction and Operation are not quantified.

5.2.1.5.3 Change in Sound Quality

Sound quality is assessed in the context of the potential environmental effects caused by increased sound pressure levels in the Assessment Area resulting from Project-related activities.

Sound quality can be characterized in terms of the type, character, frequency, intensity, and duration of sound emissions. Since the human ear does not respond to sound on a linear scale, ambient sound pressure levels are characterized using a logarithmic decibel (dB) scale, with the A-weighted (dB_A) scale being the most commonly used for environmental sound assessments.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Measured parameters for environmental sound or noise (defined as unwanted sound) are often expressed as an “equivalent sound level” (L_{eq}) which represents an equivalent energy level over a specified period of time (e.g., 1-hour or 24-hours).

Natural factors typically influence sound pressure levels in the outdoor environment (e.g., wind, waves, birds, other wildlife) and human activities generally also have an influence (e.g., construction equipment, vehicle traffic, farming equipment, sporting events). Weather conditions such as temperature, humidity, wind direction and wind speed also affect somewhat the distance that sound travels through the atmosphere. In addition, changes in the physical properties of the environment (such as a change in land cover, or the removal or construction of physical structures such as buildings) can also result in changes to the sound propagation characteristics of the environment. Sound levels naturally decrease with increasing distance from the sound emission source and local topographical features such as hills or heavily wooded areas may also serve to reduce the transmission of sound.

A number of jurisdictions, including the province of Ontario and the United States Environmental Protection Agency (USEPA), have established specific regulatory limits for sound pressure levels from industrial or construction activities. The province of PEI has not established an ambient sound pressure level guideline or limit for general application. Generally, provincial requirements dictate that noise should be controlled such that it does not cause substantial loss of enjoyment of the normal use of any property, or substantial interference with the normal conduct of business.

The Health Canada EA guidance recommends the separate assessment of potential environmental effects on sound quality for daytime and nighttime and estimation of percent highly annoyed (Health Canada 2008b). Noise during the nighttime hours is sometimes perceived as more intrusive and is also of concern with regard to the potential for sleep disturbance. The World Health Organization (WHO) has established a guideline of 30 dB_A inside a dwelling to avoid sleep disturbance (WHO 1999).

Nova Scotia Environment (NSE), formerly the Nova Scotia Department of Environment and Labour (NSEL), has established a guideline with criteria for ambient sound levels based on time of day (NSE 1989). The criteria are written in terms of hourly L_{eq} , which is used to represent the overall sound pressure levels during the hour. The criteria established by the NSE are as follows:

- an L_{eq} of 65 dB_A between 0700 to 1900 hours
- an L_{eq} of 60 dB_A between 1900 to 2300 hours
- an L_{eq} of 55 dB_A between 2300 to 0700 hours

For the purpose of this EA, sound pressure levels as a result of Project activities will be compared to the Nova Scotia criteria. The potential for sleep disturbance will also be evaluated using the WHO guideline as criteria.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.2.1.6 Residual Environmental Effects Rating Criteria**

With respect to a Change in Air Quality, a *significant residual adverse environmental effect* is one that causes a Change in Air Quality such that the maximum Project-related emissions of the air contaminants of interest (as defined in Table 5.3) result in ambient concentrations that frequently exceed the PEI or federal ambient air quality standards, as defined in Table 5.4. The term “frequently” is defined for 1-hour standards as once per week, and for 24-hour standards, once per month.

With respect to a Change in GHG Emissions, following the CEA Agency guidance, “*the environmental assessment process cannot consider the bulk of GHG emitted from already existing developments. Furthermore, unlike most project-related environmental effects, the contribution of an individual project to climate change cannot be measured*” (CEA Agency 2003). While it is not possible to assess significance related to a measured environmental effect on climate change on a project-specific basis, it is recognized that global emissions of GHG and consequent changes to global climate generally represent a significant cumulative environmental effect. Project emissions of GHG will minimally contribute to these significant cumulative environmental effects, and will be very small in a regional or provincial context, and immeasurable in a global context. A Change in GHG Emissions is assessed by considering the magnitude, intensity and duration of Project emissions as directed by the Agency guidance (CEA Agency 2003), without specifically identifying a significance criterion for environmental effects of a Change in GHG Emissions. Three categories are described in the CEA Agency guidance: low, medium, and high.

With respect to a Change in Sound Quality, a *significant residual adverse environmental effect* is one that causes a Change in Sound Quality where the noise guideline level is frequently exceeded at a NSA, with “frequent” defined as an aggregate period of 12 days per year. As noted above, the current criteria established by the NSE between 55 dB_A and 65 dB_A (Section 5.2.1.5.3) are used as the noise guideline levels in this EA.

5.2.1.7 Existing Conditions

The existing conditions of the Atmospheric Environment were discussed in Section 4.1.3.

5.2.1.8 Potential Project-VEC Interactions

The Project activities during Construction, and Operation and Maintenance may result in emissions of air contaminants, GHG, and sound to the atmosphere in the vicinity of the Project. These emissions may cause adverse environmental effects on the Atmospheric Environment, specifically a Change in Air Quality, Change in GHG Emissions, and/or a Change in Sound Quality.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

The Project interactions on each environmental effect are ranked as 0, 1, and 2 based on anticipated quantities of emissions, project experience, and on the professional judgment of the Study Team. Some of the Project activities result in nominal (*i.e.*, essentially zero) emissions of air contaminants, GHG, or sound and are ranked as 0. Other activities have measurable emissions but are not considered to be substantive and these are ranked as 1. Some activities are anticipated to have substantive emissions and have the potential to cause significant environmental effects; these require more in-depth analysis and discussion, and are ranked as 2.

Each Project activity and physical work for the Project is listed in Table 5.5 below. Each interaction is ranked as 0, 1, or 2 based on the level of interaction each activity or physical work will have with the Atmospheric Environment.

During Construction, dust and noise from heavy equipment and heavy trucks are the main concerns.

During Operation and Maintenance, the emissions of air contaminants, GHGs, and sound are likely to remain consistent with or be slightly lower than that from the existing highway, since the traffic volumes are not expected to vary substantively from the existing route and distance of the new route is less than that of the current route.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.5 Potential Project Environmental Effects to the Atmospheric Environment

Project Activities and Physical Works	Potential Environmental Effect		
	Change in Air Quality	Change in GHG Emissions	Change in Sound Quality
Construction			
Site preparation	2	1	2
Roadbed preparation	2	1	2
Installation of structures	1	1	2
Surfacing and finishing	1	1	1
Temporary ancillary elements	2	1	1
Materials and equipment	1	1	1
Operation and Maintenance			
Project presence	1	1	1
Infrastructure maintenance	1	1	1
Winter maintenance	1	1	1
Vegetation management	1	1	1
Key			
Project-related Environmental Effects were ranked as follows:			
0 No interaction. The environmental effects are not significant and not considered further in this report.			
1 Interaction will occur. However, based on past experience and professional judgment, the interaction would not result in a significant environmental effect, even without mitigation, or the interaction would clearly not be significant due to application of codified practices. The environmental effects are not significant and not considered further in this report.			
2 Interaction may, even with codified mitigation, result in a potentially significant environmental effect and/or is important to regulatory and/or public interest. Potential environmental effects are considered further and in more detail in the EA.			

The ranking of these Project interactions including the selection of 0, 1 or 2 is described in more detail in the following sections.

5.2.1.8.1 Interactions Ranked as 0

There are no interactions between a Change in Air Quality, a Change in GHG Emissions, or a Change in Sound Quality and Project activities that have been ranked as 0 in Table 5.5.

5.2.1.8.2 Interactions Ranked as 1 and 2

Site preparation and roadbed preparation activities during Construction involve vegetation clearing, grubbing, excavation, earth movement and removal or modification of existing buildings. These activities are likely to generate emissions of air contaminants (primarily as dust) from heavy equipment operation, and GHG from fuel combustion. Further, these activities will also generate sound associated with the use of heavy equipment. These interactions with a Change in Air Quality and a Change in Sound Quality may be substantive and are ranked as 2,

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

and are discussed in more detail in the next section. These interactions with a Change in GHG Emissions are ranked as 1, and not discussed further in the EA.

Installation of structures during Construction involves the installation of culverts and widening of the Bonshaw Bridge. These activities are likely to generate some emissions of air contaminants (combustion gases, PM and GHG) from heavy equipment operation and fuel combustion. As well as, some sound emissions associated with the use of heavy equipment operation are likely to occur. Based on past experience, the emissions of air contaminants and GHGs are expected to be nominal and are unlikely to:

- cause the ambient air quality standards to be exceeded
- result in GHG emissions that are considered important on the regional or provincial scale

These interactions with a Change in Air Quality and a Change in GHG Emissions are therefore ranked as 1, and not considered further in the EA. However, the potential interactions of these activities on a Change in Sound Quality may be substantive and are ranked as 2, and are discussed in more detail in the next section.

Surfacing and finishing activities during Construction involve paving, highway marking and installation of signage lighting and guardrails. These activities are likely to generate some emissions of air contaminants (combustion gases, PM, VOCs, PAHs and GHG) from heavy equipment operation, surfacing and fuel combustion. As well as, some sound emissions associated with the use of heavy equipment operation are likely to occur. However, given the relatively small scale of the Project, the emissions of air contaminants, GHGs and sound are expected to be nominal and are unlikely to cause the ambient air quality or noise standards to be exceeded or result in GHG emissions that are considered important on the regional or provincial scale. These interactions with a Change in Air Quality a Change in GHG Emissions and a Change in Sound Quality are therefore ranked as 1, and not considered further in the EA.

The installation of temporary ancillary elements during Construction involves the development of temporary access roads, petroleum storage areas and materials and equipment transportation, storage and handling. These activities are likely to generate emissions of air contaminants (primarily as dust) from heavy equipment operation, and GHG from fuel combustion. Further, these activities will also generate sound associated with the use of heavy equipment. These interactions with a Change in Air Quality may be substantive and are ranked as 2, and are discussed in more detail in the next section. These interactions with a Change in GHG Emissions and Change in Sound Quality are ranked as 1, and not considered further in the EA.

During Operation of the Project, vehicle traffic on the proposed highway realignment will result in emissions of air contaminants (primarily combustion gases), and GHG from fuel combustion. Further, vehicle traffic will also generate sound emissions. However, the emissions of air contaminants, GHG and sound are likely to be similar to or slightly less than that of the existing route. Noise from the Project is not expected to increase as the existing highway is in close

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

proximity. Therefore, the emissions are not considered to be substantive and the interactions with a Change in Air Quality, Change in GHG Emissions, and a Change in Sound Quality are therefore ranked as 1, and not considered further in the EA.

5.2.2 Assessment of Project-Related Environmental Effects

The Project interactions with those aspects of Atmospheric Environment that were previously ranked as 0 or 1 were assessed to be not significant due to no interaction or no substantive interaction with the Atmospheric Environment or because of planned mitigation that would result in the environmental effects being rated as not significant. Only the interactions ranked as 2 in Table 5.5 are considered further in the environmental effects assessment.

A summary of the environmental effects assessment and prediction of residual environmental effects resulting from interactions with the Atmospheric Environment that are ranked as 2 is provided below. The activities assessed include site and roadbed preparation (air contaminants and noise), installation of structures (noise) and temporary ancillary elements (air contaminants).

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 5.6 Summary of Residual Project-Related Environmental Effects on the Atmospheric Environment													
Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic					
Change in Air Quality	Construction: <ul style="list-style-type: none"> Site Preparation Roadbed Preparation Temporary Ancillary Elements 	<ul style="list-style-type: none"> Apply dust suppressants as required Follow equipment maintenance schedules Environmental awareness training with Key Contract Personnel will include vehicle idling Minimize activities that generate large quantities of dust during high winds 	A	L	L	ST / O	R	D	N	H	L	N	None recommended.
Change in Sound Quality	Construction: <ul style="list-style-type: none"> Site Preparation Roadbed Preparation Installation of Structures 	<ul style="list-style-type: none"> Work will be limited to the daytime hours Use well maintained equipment with quality mufflers Complaint follow-up and response procedure 	A	L	L	ST / C	R	D	N	M	L	N	None recommended.
Change in Sound Quality	Operation <ul style="list-style-type: none"> Project Presence 	<ul style="list-style-type: none"> None needed (negligible change predicted) 	A	L	L	ST / C	R	D	N	M	L	N	None recommended.
KEY		Geographic Extent:			Reversibility:			Prediction Confidence:					
Direction: P Positive A Adverse		S Site-specific: Within the PDA. L Local: Within the LAA.			R Reversible I Irreversible			Based on scientific information and statistical analysis, professional judgment and effectiveness of mitigation L Low level of confidence					

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 5.6 Summary of Residual Project-Related Environmental Effects on the Atmospheric Environment													
Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic					
<p>Magnitude:</p> <p>L Low: GHG Emissions <10⁵ t/a CO₂e; Air Quality or Sound Quality is not affected or slightly affected but is well below objectives, guidelines or standards.</p> <p>M Medium: GHG Emissions >10⁵ and <10⁶ t/a CO₂e; Air Quality or Sound Quality is affected to values that are near but largely below the objectives, guidelines or standards.</p> <p>H High: GHG Emissions >10⁶ t/a CO₂e; Air Quality or Sound Quality is degraded to values that may substantively exceed objectives, guidelines or standards.</p>		<p>Duration:</p> <p>ST Short term MT Medium Term LT Long Term P Permanent – will not change back to original condition</p> <p>Frequency:</p> <p>O Occasionally, once per month or less. S Sporadic, once per week R Regular, more than once per week intervals. C Continuous.</p>			<p>Ecological/Socio-economic Context:</p> <p>U Undisturbed: Area relatively or not adversely affected by human activity D Developed: Area has been substantially previously disturbed by human development or human development is still present N/A Not Applicable</p> <p>Significance:</p> <p>S Significant N Not Significant</p>			<p>M Moderate level of confidence H High level of confidence</p> <p>Likelihood: Based on professional judgment L Low probability of occurrence M Medium probability of occurrence H High probability of occurrence</p> <p>Cumulative Environmental Effects? Y Potential for environmental effect to interact with other past, present or foreseeable projects or activities in the area of the Project N Environmental effect will not or is not likely to interact with other past, present or foreseeable projects or activities in the area of the Project.</p>					

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.2.2.1 Project Environmental Effects Mechanisms**

The Project-related activities that were ranked as 2 in Table 5.5 have the potential to cause significant environmental effects on the Atmospheric Environment, and are discussed below.

During Construction, the potential for adverse environmental effects exists due to the release of combustion gases, GHGs, and sound emissions from heavy equipment (including earth movers, excavation equipment, and grading equipment) as well as from fugitive dust (particulate matter) that may be generated during the earth-moving activities and building demolition associated with Site Preparation. Overall, Site preparation activities may result in emissions of air contaminants, GHG, and noise. The interactions of Site Preparation, Roadbed Preparation, and Temporary Ancillary Elements with a Change in Air Quality and a Change in Sound Quality are therefore ranked as 2.

Also during Construction, the potential for adverse environmental effects exists due to sound emissions associated with installation of structures. The interaction of installation of structures with a Change in Sound Quality is therefore ranked as 2.

5.2.2.1.1 Construction

As discussed in the Project Description, Site Preparation and Roadbed Preparation activities associated with construction have the potential to cause changes in Air Quality and Sound Quality. Further, during construction, the installation of structures has the potential to cause changes in Sound Quality and the development of Temporary Ancillary Elements has the potential to cause changes in Air Quality. These are described below.

Change in Air Quality

The emissions of combustion gases from heavy construction equipment (*e.g.*, trucks, front-end loaders, pavers, and other equipment) will occur from the operation of internal combustion engines, which are typically diesel-fuelled.

In addition to combustion gases, there is potential for fugitive dust emissions from activities during Construction. Fugitive dust is particulate matter that originates primarily from the movement of mobile equipment on unpaved surfaces, especially during dry and windy periods. These activities include site preparation (*e.g.*, clearing), excavation, and similar earth-moving activities. The activities are transient in nature (both in time and space) and are dependent on factors such as the moisture in the soil, the level of activity at a particular location, and meteorological conditions at the time. The potential for dust generation would occur most frequently during periods of high winds or extreme dry periods. Mitigation during dry periods or high wind events, such as water application or other approved dust suppressants, would be used to reduce the generation of fugitive dust. In light of mitigation, these episodes are

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

expected to be of low frequency and relatively short duration at the site. The emissions are therefore predicted to be nominal, and are expected to occur intermittently.

It is anticipated that air contaminant emissions during Construction are likely to represent a very small fraction of emissions when compared to the existing emissions in the province.

Although the specific Construction activities noted above may result in air contaminant emissions (primarily fugitive dust and combustion gases) to be released, given the small scale of the Project and the short duration of the Construction period, with the proposed mitigation the emissions are not expected to be substantive. Thus, air contaminant emissions during Construction of the Project were not quantified.

The number and distribution of heavy equipment during typical construction practices are not expected to result in substantive emissions to the Assessment Area and are not expected to noticeably influence ambient air contaminant concentrations during most atmospheric conditions. The use of properly maintained vehicles and equipment during Construction, and following the project specific EPP will minimize vehicle emissions, such that adverse environmental effects to Air Quality are unlikely. Further, the magnitude, frequency and duration of Construction are such that the applicable ambient air quality standards and objectives are very unlikely to be exceeded. Consequently, ambient concentrations of air contaminants in the Assessment Area are not likely to exceed air quality standards and objectives due to emissions from Project Construction.

Fugitive dust from the movement of equipment on unpaved surfaces during Construction has the potential to cause adverse environmental effects to ambient air quality if dust mitigation measures are not used. Dust suppressants such as water or other approved applicants will therefore be used during Construction when dry and windy conditions occur. In consideration of the proposed mitigation, exceedance of the ambient particulate matter objective due to Project Construction is not expected.

During Site Preparation, Roadbed Preparation activities, and development of Temporary Ancillary Elements it is recommended that approved dust suppressants such as water be applied as needed to minimize emissions of dust. It is recommended, for Occupational Health and Safety purposes, that the Proponent periodically conduct breathing zone testing to confirm that mitigation methods are successful.

Based on consideration of the potential environmental effects of the Project-related activities during Construction, the proposed mitigation, and the residual environmental effects rating criteria, the residual environmental effects of Project-related activities during Construction on a Change in Air Quality are rated not significant.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

A Change in GHG Emissions

As noted above, GHG emissions resulting from activities associated with Construction are not likely to result in an interaction with a Change in GHG Emissions.

A Change in Sound Quality

The use of heavy machinery during Construction may increase sound pressure levels in the vicinity of the Project.

Typical sound pressure levels of some commonly used construction equipment is provided in Table 5.7.

Table 5.7 Typical Construction Equipment Sound Pressure Levels

Equipment Powered By Internal Combustion Engines	Sound Pressure Level (dB_A at 15 m)
Roller	85
Front loader	80
Backhoe	80
Excavator	85
Bulldozer	85
Scraper, grader	85
Paver	85
Pickup Truck	55
Concrete Mixer Truck	85
Concrete Pump Truck	82
Crane	85
Pump	81
Generator	82
Generator (<25KVA, VMS signs)	70
Compressor (air)	80
Pneumatic Tools	85
Jackhammer	89
Blasting	94
Effect Pile drivers (peak levels)	101
Concrete Saw	90
Chain Saw	84
Welder	74

Source: Federal Highway Administration (FHWA) 2006

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Preliminary construction information indicates that equipment such as excavators, loaders, bulldozers, and various trucks will be required for Site Preparation. Roadbed Preparation will require trucks and paving machines. The installation of structures may require some pile driving (for the bridge work).

Based on the typical sound pressure levels provided in Table 5.7, and the heavy machinery assumed to be in use, sound levels during the daytime may on occasion exceed the daytime sound pressure level guideline of 65 dB_A. As construction will be transient along the route, it is not expected that the guideline will be frequently exceeded at any one residential receptor.

Mitigation of noise has also been considered and the following practices will be implemented during construction:

- use scheduling restrictions where warranted and feasible
- all equipment shall be maintained in good working order according to manufacturer's specifications
- include in tenders, employment contracts, subcontractor agreements and work method statements clauses that assure the minimization of noise during Construction
- give preference to the use of quieter technologies or other mitigation methods
- ensure that site managers periodically check the site, nearby receptors and other sensitive receptors for noise issues so that they can be quickly addressed
- notify residents within 500 metres of major Construction activities of planned schedule for activities and how to communicate any complaints

Pile driving will be limited to 10 hours or less per day, and will not take place in the early morning or evenings.

Based on the types of equipment proposed, the time frame of operation, and the distance between the active construction site and nearby receptors, and in light of mitigation, the noise levels at off-site receptors are expected to be discernible over the existing urban noise but are not expected to be frequently objectionable, nor are these sound levels expected to frequently exceed the guideline.

5.2.2.1.2 Operation**A Change in Air Quality**

During Operation of the Project, vehicle traffic on the proposed highway realignment will result in emissions of air contaminants (primarily combustion gases) from fuel combustion. As previously noted, the emissions of air contaminants are likely to be similar to or slightly less than that from the existing route, since traffic volumes are not expected to vary substantively from the existing highway route. Further, since the realignment would result in a slightly shorter route, air contaminant emissions may be slightly lower than that from the existing highway. Therefore,

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

the emissions are not considered to be substantive and are not likely to result in a Change in Air Quality.

A Change in GHG Emissions

Vehicle traffic on the proposed highway realignment will result in emissions of GHG from fuel combustion during Operation of the Project. Similar to air contaminant emissions, the emissions of GHG are likely to be similar to or slightly less than that from the existing route, since traffic volumes are not expected to vary substantively from the current route. Further, since the realignment would result in a slightly shorter route, GHG emissions may be slightly lower than that from the existing highway. Therefore, the emissions are not considered to be substantive and are not likely to result in a Change in GHG Emissions.

5.2.2.2 Mitigation of Project Environmental Effects

The mitigation measures that will be implemented during the Project are described previously and listed in Table 5.6. The key mitigation measures to reduce environmental effects of the Project, including cumulative environmental effects, on the Atmospheric Environment are noted below. These mitigation measures will be implemented wherever technically and economically feasible to minimize potential adverse environmental effects of the Construction of the Project on the Atmospheric Environment:

- apply dust suppressants, as required
- follow equipment maintenance schedules
- environmental awareness training with Key Contract Personnel will include vehicle idling
- minimize activities that generate large quantities of dust during high winds
- use well maintained equipment with quality mufflers
- notify residents at NSAs of major Construction activities and update on progress
- use scheduling restrictions where warranted
- minimize the use of engine brakes and engine idling
- discuss noise minimization practices with workers and contractors
- complaint follow-up and response procedure

5.2.3 Assessment of Cumulative Environmental Effects

Other projects and activities presently in operation or planned for the immediate future (*i.e.*, other projects and activities that have been or will be carried out, as referred to in Section 16(1)(a) of *CEAA*), may result in interactions with a Change in Air Quality, GHG emissions, and/or a Change in Sound Quality. These other projects and activities, alone or in combination with the Project, may contribute to cumulative environmental effects in the RAA. The potential cumulative environmental effects in the RAA are primarily related to the air contaminant emissions or GHG emissions of other existing or planned projects and activities, and the sound pressure levels due to existing and planned projects and activities in the area as

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

well as the sound pressure levels due to existing vehicle traffic. The other projects and activities which could interact cumulatively with the Project to cause an environmental effect on the Atmospheric Environment are discussed below.

5.2.3.1 Change in Air Quality

Air contaminant and fugitive dust emissions from forestry and agricultural practices in the Assessment Area are expected to be small and are not thought to contribute noticeably to ambient air contaminant concentrations.

Recreational land use involving the use of motorized vehicles (e.g., all-terrain vehicles and, snowmobiles) can result in air contaminant emissions and fugitive dust emissions in the Assessment Area. Air contaminant emissions from these sources are not considered substantive and are not likely to noticeably influence ambient air contaminant concentrations in the RAA.

Air contaminant emissions from existing linear features, mainly the surrounding roadways, in combination with air contaminant emissions from Operation are not expected to result in a noticeable increase in emissions in the RAA, as traffic will be displaced with no noticeable increase in overall traffic volumes through the PDA, LAA, or RAA. However, the expected traffic improvements from this Project in combination with other planned highway upgrade projects could result in reduced idling in the area, thereby improving ambient air quality over the long-term and resulting in a positive environmental effect.

PEITIR is planning an additional realignment of the Trans-Canada Highway between the communities of Crapaud and Tryon to be carried out in the near future. Other planned projects in the vicinity of the Project are relatively short-term construction projects. With proper mitigation no future projects are expected to have substantive air contaminant emissions associated with their completion. As the air contaminant emissions from Project Construction are likely to be relatively low, it is very unlikely that emissions from Project Construction will act cumulatively with emissions from other projects to cause an adverse environmental effect on Air Quality. Overall, the cumulative environmental effects of the Project, in combination with other past, present or future projects and activities that have been or will be carried out, on a Change in Air Quality, during all phases of the Project, are rated not significant.

5.2.3.2 Change in Sound Quality

The assessment of traffic related noise from the Project Operation included the following:

- validation of the model by comparing modeled sound pressure levels based on traffic counts on the existing highway to measured sound pressure levels
- use of the model to predict future sound pressure levels at the nearest residential receptors
- comparison of guidelines and existing sound pressure levels to future predictions

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

5.2.3.2.1 Model Validation Results

Noise modeling was conducted to predict existing and future sound pressure levels at the baseline monitoring locations to assist in the assessment of the potential changes on sound quality from the Project Operation.

The modeling was conducted using the CADNA-A computer modeling software and combined with local data on vegetation, traffic volumes, and traffic composition (in terms of fraction of heavy trucks). To ensure a high degree of accuracy in the model predictions used in the assessment, model validation was conducted at the monitoring locations by comparing model results to the measured sound pressure levels (at baseline Locations 2 and 4).

During the monitoring events, the traffic volumes were recorded for approximately 3 days, and these traffic volumes were used as inputs in the CADNA-A model. Stantec selected and compared measured 1-hour L_{eq} during traffic counts to the noise model predictions to validate the accuracy of the model predictions. The hours chosen were during periods of low wind speed, thereby decreasing measured wind-induced noise. The results of the model validation are presented in Table 5.8.

Table 5.8 Noise Model Validation

Validation Measurement Location	Traffic Count Date	Start Time	End Time	Measured 1-hour L_{eq} (dB_A)	Modeled 1-hour L_{eq} (dB_A)	Difference L_{eq} (dB_A)
2 – West transect, 10 m	March 20, 2012	21:00	22:00	62.5	62.2	0.3
4 – East transect, 17 m	March 7, 2012	10:00	11:00	59.8	62.3	-2.5

The lower limit of human perception of a change in sound is 3 dB_A (Bruel and Kjaer 1984), below which a change in sound would be inaudible to most humans. Overall, the model predictions show good agreement with the measured values. Therefore, the noise model is considered to be capable of providing a representative prediction of sound pressure levels at the monitoring locations due to nearby vehicle traffic.

5.2.3.2.2 Project Operation Model Results

Motor vehicle traffic and maintenance equipment traffic on the realigned route may affect sound quality at nearby receptors, as the sound from vehicle engines and tires on the road may be perceptible to occupants of nearby residences.

The average daytime (7:00 to 19:00) traffic counts and nighttime traffic counts (23:00 to 7:00) on the existing TransCanada Highway as measured during the baseline monitoring were used to model future sound pressure levels. Location 1 (Bolger Park) and location 3 (Cameron Road)

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

were identified as sensitive receptors as they are the nearest existing residential areas to the new alignment and will be approximately 25 m and 40 m closer to the highway respectively following realignment.

The model predictions for both existing alignment and future alignment (same traffic levels assumed) at the sensitive locations, based on the CadnaA model predictions for the Project, are presented in Table 5.9 and in Figure 5.1.

Table 5.9 Summary of Measured and Modelled Sound Pressure Levels at Sensitive Receptors

Location	Existing Measured L _{eq} dB _A		Existing Modelled L _{eq} (dB _A)		Future Modelled L _{eq} (dB _A)		Predicted Change(based on model, dB _A)	
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
Bolger Park	44	38	37	29	38	30	1	1
Cameron Road	47	46	48	42	49	43	1	1

Based on the model results, the sound pressure levels on average at the two sensitive receptors are not expected to noticeably increase for either the daytime or nighttime periods due to the Project presence and are expected to remain below the NSE guidelines. Note that the measured sound pressure levels were higher than the modeled existing conditions for these two locations. This could be due to a number of factors including non-traffic sources contributing to the measured values (only vehicles are included in the model). The modeled results consider only the traffic noise with the highway at the current location and the future location and are directly comparable since the level of traffic on the highway will not change substantively due to the realignment.

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
 COUNTY, PEI

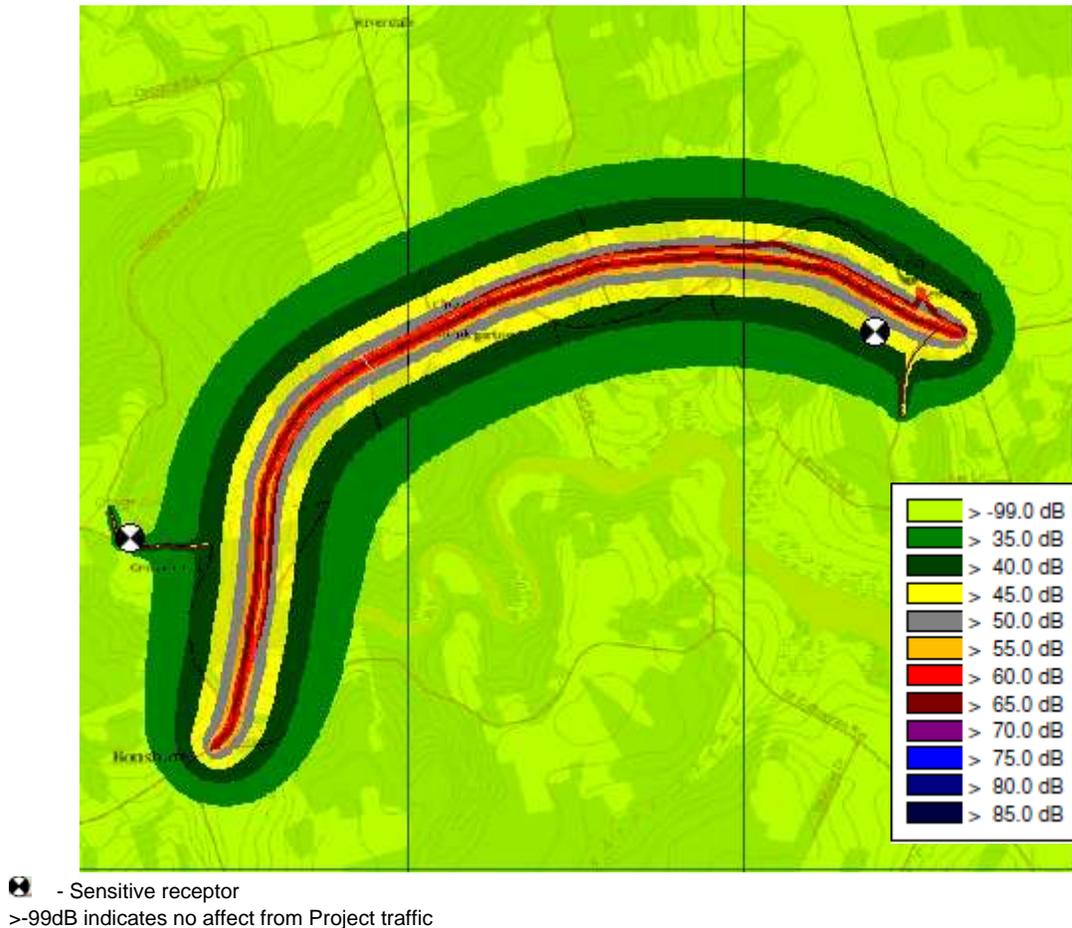


Figure 5.1 Daytime Noise Model Predictions after Realignment (Project Operation)

Vibration from the Project Operation (heavy trucks on the road) is also considered very unlikely to noticeably influence the nearest residences. The reasoning for this conclusion is explained below.

There are two ways in which highway traffic can induce vibration in nearby buildings/structures.

- **Ground-borne vibration** caused by the dynamic impact forces of tires on the pavement surface that can propagate and excite footings and foundation walls below ground. Vibration of footings and foundation walls can induce vibration in other building components below or above ground.
- **Air-borne vibration** caused by low frequency sound that can excite building components above ground.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Specific pavement surface irregularities, such as potholes and stepped transverse cracks, can significantly increase the force of the tire striking the pavement. Compared to the static force, the dynamic force may be up to 50 to 80 percent higher. The higher dynamic forces result in proportionately higher ground-borne vibration. Consequently, main generators of highway traffic induced vibration are specific surface irregularities (Hajek, Blaney, Hein 2006). As the Project will be a new highway, irregularities will be reduced compared to the existing route.

According to the article by Hajek, Blaney, and Hein, presented at the 2006 Annual Conference of the Transportation Association of Canada, based on experience with the nature of complaints received from residents living near highways and an extensive literature review, highway traffic induced vibration may cause minor superficial or architectural damage to houses only in very extreme circumstances. An example of such a circumstance is a heavy truck travelling at a speed of more than 60 km/hr over a pavement surface with a discontinuity caused by a wooden plank (25 mm high and 600 mm wide) spanning a traffic lane, and the location of an exterior wall less than 10 m from the pavement edge (Hajek, Blaney, Hein 2006). As the nearest residences will be 300 m or more away and the Project will be designed using current best practices and codes, it is considered very unlikely that vibrations from passing vehicles will cause issues related to vibration at the nearest structures.

5.2.3.3 Characterization of Residual Project Environmental Effects

If not carefully carried out or suitably mitigated, the Project could affect the Atmospheric Environment due to a Change in Air Quality, a Change in GHG Emissions, and/or a Change in Sound Quality. Effective Project planning, design, avoidance, and the application of known and proven mitigation measures will reduce the environmental effects of the Project on the Atmospheric Environment so that they are not substantive.

In summary, with the proposed mitigation, the residual environmental effects of a Change in Air Quality, a Change in GHG Emissions, and a Change in Sound Quality during all phases of the Project are not substantive. This conclusion has been established with a high level of confidence as a result of the planned implementation of proposed proven mitigation measures described above.

5.2.4 Determination of Significance

In determining the significance of the potential environmental effects (including cumulative environmental effects) on Atmospheric Environment, consideration is given to a Change in Air Quality, Change in GHG Emissions, and a Change in Sound Quality.

5.2.4.1 Residual Project Environmental Effects

The residual environmental effects for Construction and Operation are characterized by the following descriptors: Direction; Magnitude; Geographic Extent; Duration and Frequency;

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Reversibility; Ecological/Socio-economic Context, Significance, and Prediction Confidence. These descriptors are further explained in Table 5.6.

The residual environmental effects of Construction (Site Preparation, Roadbed Preparation, and Temporary Ancillary Elements) on a Change in Air Quality are expected to be adverse, of low magnitude, limited to the site in extent, short term duration, occasional frequency, and reversible. The environmental effects are not significant and there is a high level of confidence in the prediction of these ratings, low level of likelihood, and no anticipated cumulative environmental effects.

The residual environmental effects of Construction (Site Preparation, Roadbed Preparation, and Installation of Structures) on a Change in Sound Quality are expected to be adverse, of low magnitude, limited to the local assessment area, short term duration, continuous frequency, and reversible. The Project is occurring in an already developed area. The environmental effects are not significant and there is a moderate level of confidence in the prediction of these ratings, low level of likelihood, and no anticipated cumulative environmental effects.

The residual environmental effects of Operation and Maintenance (Project Presence) on a Change in Sound Quality are expected to be adverse, of low magnitude, limited to the local assessment area, short term duration, continuous frequency, and reversible. The Project is occurring in an already developed area. The environmental effects are not significant and there is a moderate level of confidence in the prediction of these ratings, low level of likelihood, and no anticipated cumulative environmental effects.

Overall, given the nature of the Project and the proposed mitigation, the potential environmental effects of the Project-related activities on Atmospheric Environment during all phases of the Project are rated not significant, with a high level of confidence.

5.2.4.2 Residual Cumulative Environmental Effects

The potential environmental effects of the Project on the Atmospheric Environment are not expected to overlap with those of other projects or activities that have been or will be carried out, including the future highway realignment between the communities of Crapaud and Tryon, in any substantive way. Therefore, the residual cumulative environmental effects of a Change in Air Quality, Change in GHG Emissions, and a Change in Sound Quality as a result of past, present and reasonably foreseeable projects and activities in the RAA, in combination with the environmental effects of the Project during all phases, are rated not significant. This determination has been made with a high level of confidence because of the limited nature and extent of the Project and the lack of substantive overlapping with other projects or activities that have been or will be carried out.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.2.5 Follow-up and Monitoring**

There are no follow-up and monitoring programs suggested or deemed required for Atmospheric Environment in light of the proposed mitigation as the nature expected interactions between the Atmospheric Environment and this Project are relatively well understood based on past experience.

5.3 Freshwater Environment

In this section, the environmental effects of Project activities on the Freshwater Environment resulting from Construction and Operation and Maintenance are assessed. The Freshwater Environment consists of watercourses (rivers and streams) that provide habitat for fish and other freshwater aquatic species. The Freshwater Environment VEC includes fish and fish habitat and surface water quality as indicators of the overall VEC. Fish habitat includes physical (e.g., substrate, temperature, flow velocity and volumes, water depth), chemical (e.g., dissolved oxygen, pH, nutrients), and biological (e.g., fish, benthic invertebrates, aquatic plants) attributes of the environment that are required by fish to carry out life cycles processes (e.g., spawning, rearing, feeding, overwintering, migration). Project activities are not anticipated to have significant environmental effects on the Freshwater Environment because of planned mitigation.

5.3.1 Scope of Assessment

The scope of the environmental assessment of the Freshwater Environment in consideration of the regulatory setting, potential Project-VEC interactions, and existing knowledge, is defined in the sections that follow.

5.3.1.1 Rationale for Selection of Valued Environmental Component and Regulatory Setting

The Freshwater Environment has been selected as a VEC due to its importance in supporting aquatic life, and the potential for interaction between Project activities and the Freshwater Environment. The Freshwater Environment is valued as a biological and natural resource by the public and by federal and provincial regulatory authorities.

For the purposes of this EA, the current interpretation of the federal *Fisheries Act* has been applied. Changes to the Act will come into effect in January 2013. Planned mitigation with respect to the Freshwater Environment will not be affected by any changes to the Act. The federal *Fisheries Act* defines “fish” to mean all fish, shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans, or marine animals, and the eggs, sperm, spawn, larvae, spat, and juvenile stages of fish, shellfish, crustaceans, and marine animals. The federal *Fisheries Act* defines “fish habitat” as spawning grounds and any other areas including, nursery, rearing, food supply, and migration areas on which fish directly or indirectly depend on. Fish habitat includes physical (e.g., substrate, temperature, flow velocity and volumes, water depth), chemical (e.g., dissolved oxygen, pH, nutrients), and biological (e.g., fish, benthic invertebrates,

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

plankton, aquatic plants) attributes of the environment that are required by fish to carry out life cycles processes (e.g., spawning, rearing, feeding, overwintering, migration).

Fish and fish habitat are protected through federal and provincial legislation. Currently, fish habitat is protected under the *Fisheries Act*, as per the DFO's Policy for the Management of Fish Habitat (DFO 1986). This policy applies to all projects and activities in or near water. The guiding principle of this policy is to achieve no-net-loss of the productive capacity of fish habitats. Fish and fish habitat are regulated by Sections 20, 21, 22, 30, 32, 35, 36, 37, 40, and 43 of the *Fisheries Act* which is administered by DFO as follows:

- Sections 20, 21, and 22 relate to the obstruction of fish passage, and state that where fish passage is obstructed, a fish pass or passage must be provided, and sufficient water must flow to allow for fish migration and movement past the obstruction.
- Section 30 requires that if deemed necessary by the Minister of Fisheries, screens will be placed on artificially created ditches to prevent fish from entering.
- Section 32 prohibits the killing of fish from means other than fishing.
- Section 35 prohibits the harmful alteration, disruption or destruction (HADD) of fish habitat by any persons unless authorized by the Minister of Fisheries.
- Section 36 prohibits the release of deleterious substances into any river or harbour or in any water where fishing is carried on.
- Section 37 states that anyone undertaking work that may cause HADD must submit their works for review by the Minister. The Minister can then refuse the works, grant permission for the works providing changes are made, or grant permission for the works to take place.
- Section 40 outlines the consequences of contravening section 35 of the Fisheries Act.
- Section 43 outlines the regulations for carrying out the purposes and provisions of the Fisheries Act.

With respect to watercourse crossing structure installations, the various sections of the *Fisheries Act* require that construction activities must not be destructive to fish, alter or be damaging to fish habitat. Following construction, the operation of the Project must likewise not be destructive to fish, alter or be damaging to fish habitat, or create an obstruction to fish passage where fish habitat is present.

Fish and fish habitat are also protected indirectly in PEI through the *Environmental Protection Act* (PEI EPA). Regulations set out in the PEI EPA (Chapter E-9, Section 5) require that a Watercourse, Wetland, and Buffer Zone Activity permit be acquired for all Construction activities within 15 m of a watercourse or wetland boundary.

Surface water quality is managed through federal guidelines and provincial legislation. The Canadian Council of the Ministers of the Environment (CCME) maintains guidelines for the protection of aquatic life for many water quality parameters. These guidelines are generally accepted as best practice in environmental assessment to mitigate project activities such that the CCME guidelines are not exceeded, where it is considered technically and economically

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

feasible to do so. The water quality of watercourses in PEI is protected under the PEI *EPA* (Chapter E-9).

Aquatic species at risk (SAR) are protected federally under *SARA*. There is no provincial ranking system in place for fish species of special concern.

The above-noted provisions of provincial and federal legislation, policy, and guidance provide the basis for establishing thresholds for the determination of significance of the potential environmental effects of the Project on the Freshwater Environment.

5.3.1.2 Selection of Environmental Effect and Measurable Parameter

Potential environmental effects of the Project on the Freshwater Environment may occur as a result of Construction and to a lesser extent during Operation and Maintenance. Accordingly, the environmental assessment of the Freshwater Environment is focused on the following environmental effect:

- change in the Freshwater Environment

Table 5.10 provides the measurable parameters used for the assessment of the selected environmental effect, and the rationale for selection.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.10 Measurable Parameters for Freshwater Environment

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in freshwater environment	Fish Population, Presence/Absence (species, number of individuals, density, mortality)	<ul style="list-style-type: none"> • The presence or absence of fish in a given watercourse, the species present, and the density of fish per 100 m² are qualitative measures of Change in the Freshwater Environment. The disappearance of fish, reduction in species diversity, or reduction in the density would indicate a potential Change in the Freshwater Environment. • The presence of fish in the watercourse and the species of fish present in the PDA will influence the types of mitigation measures undertaken (e.g., fish passage would not be required on a non-fish bearing stream). • Fish mortality is an important parameter, as it is the ultimate measure of an environmental effect on fish populations and would contravene the <i>Fisheries Act</i>.
	Fish Habitat (m ²)	<ul style="list-style-type: none"> • Habitat area is a broad measure of the potential for fish populations to exist. Various habitat measures are collected to assess habitat quality. The amount of HADD of fish habitat as a result of the Project is typically measured in area (m²).
	Water Quality (CCME Guidelines for the Protection of Aquatic Life)	<ul style="list-style-type: none"> • Water quality suitable for fish populations to live can be measured by using several key parameters that include total suspended sediments (TSS), dissolved oxygen (DO), temperature, and pH. DO, temperature and pH are measured <i>in-situ</i>, while TSS is measured using laboratory analytical methods. • TSS (mg/L) is an indicator of the amount of suspended sediment in a watercourse. It can be a good measure of the quality or viability of fish habitat. • DO (mg/L) is an indicator of the quality of habitat. DO in water is necessary to sustain fish populations. • Water temperature (Celsius degrees) is also an important measure of the quality of water as fish habitat. Fish are limited in various life stages by minimum and maximum temperatures. Changes in temperature can affect the quality of habitat and, in the extreme, can result in mortality. • pH is an indicator of fish habitat. Optimal fish habitat exists within a range of pH, outside of which levels can be stressful for fish and their habitat (including other biota on which they rely for food) or result in mortality.

The selection of the measurable parameters in Table 5.10 was based on the professional judgment of the Study Team and discussions with regulatory agencies for similar projects.

5.3.1.3 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on the Freshwater Environment include the periods of Construction (approximately one year beginning September 2012) and Operation and Maintenance. The estimated service life of the new highway is in perpetuity; maintenance will include resurfacing and repair periodically

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

over its lifespan. In general, potential Project environmental effects on the Aquatic Environment begin and peak during Construction, but diminish during Operation and Maintenance.

5.3.1.4 Spatial Boundaries

The spatial boundaries for the environmental effects assessment of the Freshwater Environment include the Project Development Area (PDA), Local Assessment Area (LAA), and Regional Assessment Area (RAA) as described below.

Project Development Area (PDA): The PDA is defined as the physical area within which all construction activities associated with the Project will take place, in proximity of watercourses.

Local Assessment Area (LAA): The LAA includes an area 150 m upstream and downstream of each watercourse crossing that will be constructed or upgraded as part of the Project, extending from the Project centerline and includes the PDA within those boundaries at the watercourse crossings. With respect to the Aquatic Environment, the LAA represents the area where indirect or secondary environmental effects of Construction and Operation and Maintenance are likely to be most pronounced or discernible. Cumulative environmental effects of the Project in combination with other projects or activities that have been or will be carried out may also be manifest within the LAA.

Regional Assessment Area (RAA): The RAA includes the LAA and all confluent watercourses downstream to the West River. For the Freshwater Environment, consideration of the regional area within which cumulative environmental effects may be manifest generally extends to the next major confluence of watercourses downstream of the PDA. In this case, each of the streams with a water crossing ultimately discharges into West River.

5.3.1.5 Administrative and Technical Boundaries

The administrative boundaries for a Change in the Freshwater Environment pertain mainly to regulatory limits, guidelines, and standards for:

- the *Fisheries Act* (particularly Sections 32 and 35) which requires the protection of fish habitat in all watercourses that bear fish
- the DFO (1986) Policy for the Management of Fish Habitat (a new policy is currently being developed and will be in effect by January 2013)
- the PEI *EPA*, which governs the Watercourse and Wetland Alteration Guidelines

The technical boundaries for a Change in the Freshwater Environment pertain mainly to season and timing in which the field assessments will be undertaken. It should be understood that not all fish species or habitat conditions may be present or collected during a single field survey. Reasonable efforts were made to identify fish species presence and habitat conditions through the field survey, as well as through review of existing information, consultation with regulators, and professional judgment. Additionally, there are technical limitations of sampling equipment

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

and personnel (e.g., measurement error, reproducibility). The fish habitat and fish population surveys were one time sampling events and can only provide a characterization of the fish habitat and fish species present at the time of survey. Therefore, survey results cannot be considered to be complete or indicative of all fish species that may be present throughout different times of the year (e.g., rainbow smelt).

5.3.1.6 Residual Environmental Effects Rating Criteria

A significant adverse residual environmental effect on a Change in the Freshwater Environment is defined as a Project related environmental effect that results in any of the following:

- an unmitigated or non-compensated net loss of fish habitat as defined under the *Fisheries Act* and DFO's associated no net loss policy for fish habitat
- a Project-related destruction of fish that was not authorized under Section 32 of the *Fisheries Act*
- a Project-related release of a deleterious substance as defined in Section 36 of the *Fisheries Act*
- a Project-related alteration or release that would contravene PEI's environmental legislation, including:
- an alteration to a watercourse or wetland within 15 m that is not given approval under the *PEI Environmental Protection Act*
- a Project-related decrease in water quality to a level that is unacceptable, as per relevant water quality guidelines (CCME Guidelines for the Protection of Aquatic Life, PEI *EPA* Chapter E-9), such that water quality does not return to previous levels within one season
- a Project-related change in fish populations in such a way as to cause a decline in abundance or change in distribution such that populations will not be sustainable within the region

5.3.2 Existing Conditions

The existing conditions of the Freshwater Environment were discussed in Section 4.3.2.

5.3.3 Potential Project-VEC Interactions

Table 5.11 below lists each Project activity and physical work for the Project, and ranks each interaction as 0, 1, or 2 based on the level of interaction each activity or physical work will have with the Freshwater Environment.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.11 Potential Project Environmental Effects to the Freshwater Environment

Project Activities and Physical Works	Potential Environmental Effect
	Change in Freshwater Populations
Construction	
Site preparation	2
Roadbed preparation	2
Installation of structures	2
Surfacing and finishing	1
Temporary Ancillary Elements	1
Materials and Equipment	1
Operation and Maintenance	
Project Presence	1
Infrastructure maintenance	1
Winter maintenance	1
Vegetation management	0
KEY	
Project-Related Environmental Effects were ranked as follows:	
0 No interaction. The environmental effects are not significant and not considered further in this report.	
1 Interaction will occur. However, based on past experience and professional judgment, the interaction would not result in a significant environmental effect, even without mitigation, or the interaction would clearly not be significant due to application of codified practices. The environmental effects are not significant and not considered further in this report.	
2 Interaction may, even with codified mitigation, result in a potentially significant environmental effect and/or is important to regulatory and/or public interest. Potential environmental effects are considered further and in more detail in the EA.	

Interactions between Vegetation Management and the Freshwater Environment were ranked as 0 in Table 5.11 as no substantive interactions are anticipated. No components of this activity will result in changes to freshwater populations in the PDA, LAA, or RAA.

Interactions between Surfacing and Finishing, Temporary Ancillary Elements, Materials and Equipment, Project Presence, Infrastructure Maintenance, and Winter Maintenance and the Freshwater Environment have been ranked as 1 in Table 5.11 as these activities will occur in the vicinity of freshwater streams and may have interactions with the Freshwater Environment. These Project activities have some potential to increase erosion, causing increased TSS in streams, and sedimentation of streambeds. These activities can also result in the release of deleterious substances (including fuel spills, or releases of other potentially toxic substances). Construction also creates an increase in non-permeable surfaces in watersheds, potentially resulting in a change to hydrology (greater or more variable water inputs to watercourses). A change in hydrology may be a long term issue but mitigated by vegetated buffers, drainage ditches that do not flow directly into watercourses, or in extreme cases, construction of retention ponds.

Buffer zones around watercourses and wetlands, and erosion and sediment controls (as outlined in the Environmental Protection Plan and Project Specific Sedimentation and Erosion Control Plan) will be implemented in order to mitigate the environmental effects of construction activities. Visual monitoring of the Freshwater Environment will be conducted and if project related runoff is observed, work will stop and sedimentation control measures will be re-

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

evaluated. The Project is unlikely to result in a substantial change in hydrology, as the additional surface area to be added to the current infrastructure is nominal in comparison to the existing infrastructure or infrastructure required for a new highway.

Surfacing and Finishing has the potential for finishing products, such as paint and protective coatings to enter the Freshwater Environment. Although the application of paint and protective coatings on the highway will be conducted as per applicable industry standards, it is possible that some trace amounts of residual paint or coatings (*i.e.*, overspray and run-off) may enter the Freshwater Environment, thus resulting in a Change in Freshwater Environment. The application of paint and protective coatings during Surfacing and Finishing is considered an “occasional” event of short duration and low frequency (*i.e.*, one time during construction, with periodic maintenance thereafter), and would result in minimal quantities entering the watercourse. The possibility of large quantities of paint or protective coatings entering the watercourse (*e.g.*, a spill into a roadside ditch, or entry of a vehicle carrying such materials into the watercourse) is unlikely but considered an accidental event and is assessed in Section 5.7. Winter Maintenance has the potential for salt to enter the Freshwater Environment. Application of salt to roadways is applied as per the PEITIR’s Salt Management Plan. Typically, quantities of salt that enter the Freshwater Environment would be of small quantities. The possibility of large quantities of salt entering the watercourse (*e.g.*, a spill into a roadside ditch, or entry of a vehicle carrying such materials into the watercourse) is considered an accidental event and is assessed in Section 5.7.

In consideration of proven and planned mitigation during Surfacing and Finishing, Temporary Ancillary Elements, Materials and Equipment, Infrastructure Maintenance, and Winter Maintenance will have no substantive interaction with the Freshwater Environment resulting in a Change in Freshwater Environment and their environmental effects on the Freshwater Environment are rated not significant with a high degree of confidence.

Overall, given the nature of the Project and the proposed mitigation, the potential environmental effects of all Project-related activities that were ranked as 0 or 1 in Table 5.11, are rated not significant with a high level of confidence.

5.3.4 Assessment of Project-Related Environmental Effects

All other interactions that were previously ranked as 0 or 1 were determined to be not significant due to no interaction or no substantive adverse interaction with the Freshwater Environment or because of planned implementation of mitigation of well-established and proven measures that would result in the environmental effects being rated as not significant.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

A summary of the environmental effects assessment and prediction of residual environmental effects resulting from interactions with the Freshwater Environment that were ranked as 2 in Table 5.11 is provided below in Table 5.12. Only the interactions ranked as 2 in Table 5.11 were considered further in the environmental effects assessment. Activities with the potential to result in substantive residual environmental effects are Site Preparation, Roadbed Preparation, and Installation of Structures.

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 5.12 Summary of Residual Project-Related Environmental Effects on the Freshwater Environment													
Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
Change in freshwater environment	Construction: <ul style="list-style-type: none"> • Site Preparation • Roadbed Preparation • Installation of Structures 	<ul style="list-style-type: none"> • The Project may result in the harmful alteration, disruption, or destruction (HADD) of fish habitat, and will likely require an Authorization under Section 35(2) of the <i>Fisheries Act</i>. If required, a habitat compensation plan will be developed and implemented by the proponent pending DFO-Habitat approval. • Erosion and sediment control measures will be implemented (PEITIR Sediment and Erosion Control Plan). • All barren soil will be stabilized for over-wintering. Measures will 	A	M	L	ST/ C	R	U/D	N	H	L	N	<ul style="list-style-type: none"> • Monitoring to confirm that mitigation measures are carried out correctly during construction. • Monitoring of habitat compensation implementation, if required.

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
		include placing flexible growth medium (e.g., Flexterra® or similar product) within 30 m of water courses/ wetlands as well as hydroseeding and hay mulching the remaining areas. Rip-rap lined ditches leading to sediment traps may be installed in the steepest areas. Instream sediment traps may be also installed in these areas. <ul style="list-style-type: none"> • Flexterra® or similar product will be placed with 100 m of all watercrossing structures. • Hazardous materials will be properly stored at least 30 m away from all 											

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
		wetlands/watercourses. <ul style="list-style-type: none"> Visual monitoring in the vicinity of the project to ensure the turbidity is limited; if an excessive change occurs due to construction activities, work will stop and sediment control measures will be re-evaluated. Any construction debris or other material (e.g., plastic, food scraps, etc.) that enters the freshwater environment must be removed immediately and disposed in a provincially approved manner. The Proponent will consult with DFO to ensure that Project activities will be 											

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
		conducted, where possible, outside of biologically sensitive life stages of resident fish species. If construction activities are required in waters during these periods, DFO may require additional mitigation. <ul style="list-style-type: none"> • Project Specific EPP has been prepared for the construction project. • Construction Contractor is required to have an Environmental Control Manager on site at all times during Construction. • A water quality monitoring program for total suspended solids (TSS) will be conducted during 											

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI**

Table 5.12 Summary of Residual Project-Related Environmental Effects on the Freshwater Environment													
Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
		construction to ensure sedimentation and erosion controls are working.											

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 5.12 Summary of Residual Project-Related Environmental Effects on the Freshwater Environment												
Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics					Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility					
<p>KEY</p> <p>Direction: P Positive A Adverse</p> <p>Magnitude L Low: No change in freshwater fish populations or one requiring a HADD authorization. M Moderate: Changes in freshwater fish populations that require a HADD authorization. H High: Unauthorized HADD, non-compensable.</p>		<p>Geographic Extent: S Site-specific: Within the PDA. L Local: Within the LAA.</p> <p>Duration: ST Short term MT Medium Term LT Long Term P Permanent – will not change back to original condition</p> <p>Frequency: O Occasionally, once per month or less. S Sporadic, once per week R Regular, more than once per week intervals. C Continuous.</p>		<p>Reversibility: R Reversible I Irreversible</p> <p>Ecological/Socio-economic Context: U Undisturbed: Area relatively or not adversely affected by human activity D Developed: Area has been substantially previously disturbed by human development or human development is still present N/A Not Applicable</p> <p>Significance: S Significant N Not Significant</p>			<p>Prediction Confidence: Based on scientific information and statistical analysis, professional judgment and effectiveness of mitigation L Low level of confidence M Moderate level of confidence H High level of confidence</p> <p>Likelihood: Based on professional judgment L Low probability of occurrence M Medium probability of occurrence H High probability of occurrence</p> <p>Cumulative Environmental Effects? Y Potential for environmental effect to interact with other past, present or foreseeable projects or activities in the area of the Project N Environmental effect will not or is not likely to interact with other past, present or foreseeable projects or activities in the area of the Project.</p>					

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.3.4.1 Project Environmental Effects Mechanisms**

During Construction Changes in Freshwater Populations could occur as a result of Site Preparation, Roadbed Preparation, and Installation of Structures associated with construction activities.

The Project has the potential to affect the Freshwater Environment due to: HADD, the unplanned or accidental release of deleterious substances or sediments into watercourses (assessed in Section 5.7), and potential indirect mortality of fish. Construction of the highway will result in the temporary disturbance and loss of fish habitat in the PDA as a result of the Project. These activities could also release sediment or other hazardous substances into the water. High concentrations of suspended sediment in water may be deemed a deleterious substance under the *Fisheries Act*, may adversely affect fish habitat, and may injure fish, larvae, and eggs as well as other aquatic organisms. Fish mortality could occur directly or indirectly as a result of these construction activities.

5.3.4.2 Mitigation of Project Environmental Effects

Alternative alignments were considered during the early design phases of the Project. Redesign of the Project during the planning phases resulted in the avoidance of designated natural areas, a National Historic Monument Site, a provincial park, the majority of a hemlock stand, and a wetland.

The application of known and proven mitigation measures will be implemented as part of the Project to avoid or minimize the environmental effects on the Freshwater Environment. The following mitigation measures will be employed along with other mitigation described in Table 5.12:

- implementation of well-established and proven erosion and sedimentation control measures, including silt fences, mulching, and hydroseeding (as per the PEITIR Project Specific Sediment and Erosion Control Plan).
- Project Specific EPP
- all barren soil will be stabilized for over-wintering. Measures will include the use of flexible growth medium.
- proper storage and use of hazardous materials
- visual monitoring in the vicinity of the Project to ensure that turbidity in waterways is limited
- removal of any construction debris or other material that enters the freshwater environment
- if required, compensation for HADD in accordance with the DFO Policy for the Management of Fish Habitat

5.3.5 Assessment of Cumulative Environmental Effects

In association with the Project-related environmental effects discussed above, an assessment of the potential cumulative environmental effects was conducted for other projects or activities that

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

have potential to interact with the Project. Table 3.2 identified the potential for overlap between the Project activities and cumulative environmental effects of other projects and activities conducted or to be conducted in the RAA. Table 5.13 presents the potential cumulative environmental effects to the Freshwater Environment, and ranks each interaction with these other projects or activities as 0, 1, or 2 with respect to the nature and degree to which important Project-related environmental effects overlap with those of other projects or activities.

Table 5.13 Potential Cumulative Environmental Effects on the Freshwater Environment

Other Projects and Activities With Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects
	Change in the Freshwater Environment
Past or Present Projects or Activities That Have Been Carried Out	
Resource Land Use	1
Existing Highway Infrastructure	1
Recreational Land Use	0
Future Highway Projects	1
<p>KEY <u>Cumulative environmental effects were ranked as follows:</u> 0 Project environmental effects do not act cumulatively with those of other Projects and Activities. 1 Project environmental effects act cumulatively with those of other Project and Activities, but are unlikely to result in significant cumulative environmental effects OR Project environmental effects act cumulatively with existing significant levels of cumulative environmental effects but will not measurably change the state of the VEC. 2 Project environmental effects act cumulatively with those of other project and activities, and may result in significant cumulative environmental effects OR Project environmental effects act cumulatively with existing significant levels of cumulative environmental effects and may measurably change the state of the VEC.</p>	

Interactions between the Project and Recreational Land Use were ranked as 0 in Table 5.13, as no interaction between the Project and these activities is expected to result in an overlapping cumulative environmental effect to the Freshwater Environment.

Resource Land Use was ranked as a 1 for cumulative effects particularly as past and present land use has altered the landscape and resulted in fish habitat changes over the past century. Erosion from agriculture and agricultural runoff of sediment and pesticide is a well-known issue in PEI. The status of brook trout populations in the streams proximal to the Project appear to be healthy and the habitat appears to be in good condition, despite substantial changes in the landscape due to these land use practices. Given the planned mitigation associated with the Project, it is not likely to contribute substantively to cumulative environmental effects on the Freshwater Environment.

Interaction between the Project and the Existing Highway Infrastructure (existing Route 1) and Future Highway Projects (Highway realignment from Crapaud to Tryon) were ranked as 1 for cumulative environmental effects in Table 5.13. Development of the existing Route 1 resulted in habitat loss, potential fish passage issues and habitat alteration due to culvert installation,

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

increased flows from increased hard surfaces, and possibly environmental effects due to Winter Maintenance; future highway development is likely to result in similar environmental effects. The environmental effects of the Project are likely to be cumulative in relation to these existing and future environmental effects. Loss of habitat (HADD) will be mitigated through compensation and restoration as required by authorization under the *Fisheries Act*. Other projects or activities will also be mitigated in a similar manner to mitigate the environmental effects of run-off and increased sedimentation in watercourses. The Project is not expected to result in significant cumulative environmental effects, or to cause a substantive change from existing conditions for water quality, fish habitat, or fish populations within the RAA.

The potential cumulative environmental effects of the Project in combination with all other projects or activities that have been or will be carried out that were ranked as 0 or 1 in Table 5.13 are rated not significant.

5.3.5.1 Characterization of Residual Project Environmental Effects

The Project has the potential to affect the Freshwater Environment due to the harmful alteration, disruption or destruction of fish habitat (HADD) primarily from sedimentation and necessary in-stream work. Residual environmental effects likely to occur from the Project are the permanent loss of habitat and potential environmental effects to fish and fish habitat due to the release of sediment during Construction. Release of sediment or other deleterious substances into a watercourse would contravene the *Fisheries Act* and must be prevented.

Fish habitat in the PDA will be disturbed; however, lost and disturbed habitat will be mitigated through detailed design of watercourse crossings and if necessary through HADD compensation. Implementation of the Project Specific EPP and Sediment and Erosion Control Plan will be important for managing the potential environmental effects of sedimentation. With proper implementation of mitigation measures, the environmental effects of the Project including the cumulative environmental effects on the Freshwater Environment are rated not significant. The residual environmental effects of a Change in Freshwater Environment during all phases of the Project are rated not significant. This conclusion has been determined with a high level of confidence as a result of Project planning, design, and mitigation measures described above.

5.3.6 Determination of Significance**5.3.6.1 Residual Project Environmental Effects**

The residual environmental effects for Construction are characterized by the following descriptors: Direction; Magnitude; Geographic Extent; Duration and Frequency; Reversibility; Ecological/Socio-economic Context, Significance, and Prediction Confidence. These descriptors are further explained in Table 5.12.

The residual environmental effects of Construction (Site Preparation, Roadbed Preparation, and Installation of Structures) on a Change in Freshwater Environment are expected to be adverse,

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

of moderate magnitude likely requiring HADD authorization, limited to the local assessment area, short term duration, continuous frequency, and reversible. Sections of the Project are occurring in already developed areas, while other sections are occurring in previously undisturbed areas. The environmental effects are not significant and there is a high level of confidence in the prediction of these ratings, low probability of occurrence, and no anticipated cumulative environmental effects.

With the proposed mitigation, the residual environmental effects of a Change in Freshwater Environment during all phases of the Project are rated not significant. There is a high level of confidence in the assessment of environmental effects and significance prediction because of the nature of mitigation outlined in this assessment and the collective professional judgment of the Study Team, which has local knowledge based on involvement with other projects within the region.

5.3.6.2 Residual Cumulative Environmental Effects

The potential environmental effects of the Project on a Change in the Freshwater Environment are not significant, but will overlap with the environmental effects of other projects and activities that have been or will be carried out. The principal activities of concern are agriculture which is a well regulated practice with respect to sediment erosion and pesticide runoff. The residual cumulative environmental effects of a Change in the Freshwater Environment, as a result of past, present, and reasonably foreseeable projects or activities that have been or will be carried out, in combination with the environmental effects of the Project, during all phases is rated not significant. This determination has been made with a high level of confidence.

5.3.7 Follow-up and Monitoring

Continued monitoring of sediment controls is suggested during all phases of Construction. Water quality monitoring for TSS within the LAA during Construction is recommended in the event that visible sediment plumes are observed. The Canadian Water Quality Guidelines for Protection of Aquatic Life (for TSS) should be consulted for guidance in this event. Monitoring of the HADD compensation project, if required, would be conducted after the Project is implemented.

5.4 Terrestrial

The Terrestrial Environment VEC encompasses all aspects of the terrestrial environment, focusing on vegetation and vegetation communities (including mature forests), and wildlife (including migratory birds) and wildlife habitat, including wetlands. It also includes Species at Risk and Species of Conservation Concern.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

5.4.1 Scope of Assessment

This section defines the scope of the environmental assessment of the Terrestrial Environment in consideration of the regulatory setting, potential Project-VEC interactions, and existing knowledge.

5.4.1.1 Rationale for Selection of Valued Environmental Component and Regulatory Setting

The Terrestrial Environment was identified as a VEC due to its importance for flora and fauna species and habitats. It includes vegetation, wildlife (including migratory birds), as well as forests, wetlands, and other vegetated features that perform important water and air purifying functions, carbon and nutrient cycling functions. The Terrestrial Environment contains natural and anthropogenic landscapes (e.g., forest, fields) that provide habitat for wildlife, including those that support rare or uncommon species. Migratory birds and their habitats also form part of the Terrestrial Environment.

The Project has the potential to interact with the Terrestrial Environment by changing terrestrial habitats, including wetlands, and/or populations of vascular plants and/or wildlife species that are important in a socio-economic or environmental context, including Species at Risk (SAR), as defined by the federal *Species at Risk Act (SARA)*, or Species of Conservation Concern (SOCC), defined here as species ranked S1, S2, or S3 by AC CDC, and with a General Status rank of May Be At Risk, or Sensitive), or that have undergone an assessment by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), but not yet included on Schedule 1 of SARA. SOCC are species that, unlike SAR, are not afforded direct protection by legislation. SOCC are placed on lists as a precautionary measure that reflects an observed trend in their provincial population status.

5.4.1.2 Selection of Environmental Effect and Measurable Parameters

The environmental assessment of the Terrestrial Environment is focused on the following environmental effects:

- change in Terrestrial Populations
- change in Wetlands

The Project has the potential to affect the Terrestrial Environment through changes in abundance of wildlife and wildlife habitat, and degradation in habitat quality, all of which influence terrestrial populations of wildlife and plants. These potential changes could possibly influence the loss, or sustained presence of terrestrial populations and the maintenance of biodiversity in the region. In light of the value placed on terrestrial populations and wetlands by regulatory agencies, stakeholders, and the public, the environmental assessment of the

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Terrestrial Environment is focused on these environmental consequences which encompass the critical aspects of the VEC.

Table 5.14 provides the measurable parameters used for the assessment of the selected environmental effects, and the rationale for their selection.

Table 5.14 Measurable Parameters for Terrestrial Environment

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in Terrestrial Populations	Loss of vascular plant SAR or SOCC (number of individuals)	Addresses loss of known locations of rare vascular plants within the province that are disturbed as a result of the Project.
	Loss of wildlife SAR or SOCC (number of individuals)	This includes species that have a special status including those protected by law.
	Loss of migratory birds (number of individuals)	Addresses the concern of loss of individuals of migratory birds, including their nests, eggs, and young.
	Direct habitat loss (ha)	This includes habitats for many wildlife and vascular plant species (such as mature forests) and will also include an evaluation of the rarity of habitats affected.
	Loss of old mature forest (ha)	Concern over loss of a stand of mature hemlocks, a rare habitat in PEI.
	Loss of interior forest (ha; proportion)	This concern is due to the loss of uncommon or sensitive habitat that many wildlife and vascular plant species require.
Change in Wetlands	Loss of wetland area (ha)	Wetlands provide habitat for many wildlife and vascular plant species and will also include an evaluation of the rarity and proportion of wetlands affected.
	Loss of wetland function	Wetlands can provide a number of functions, including hydrological, socio-economic, and ecological.

The measurable parameters in Table 5.14 were based on the professional judgment of the Study Team and the scoping document. Measurable parameters have clear units of measurement and are indicative of change in terrestrial populations and wetlands. Secure species are addressed through the evaluation of direct habitat loss, and species sensitive to disturbance are addressed through the assessment of interior forest.

5.4.1.3 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on the Terrestrial Environment include the periods of Construction (approximately one year beginning in 2012), and Operation and Maintenance (several decades, following Construction). The temporal boundaries for establishing existing conditions include the summer

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

of 2012, during which data requests from existing information clearinghouses and field reconnaissance will be collected.

5.4.1.4 Spatial Boundaries

The spatial boundaries for the environmental effects assessment of Terrestrial Environment are defined and described below.

Project Development Area (PDA): The PDA for the Terrestrial Environment includes the area within which all physical construction activities associated with the Project will take place. The PDA includes 6.2 km of new and upgraded highway, and modification of approximately 3 km of secondary roads.

Local Assessment Area (LAA): The LAA for the Terrestrial Environment is a 500 m wide buffer around the PDA.

Regional Assessment Area (RAA): The RAA for the Terrestrial Environment includes all of PEI.

5.4.1.5 Administrative and Technical Boundaries

The assessment of the potential environmental effects of this Project on the Terrestrial Environment includes a consideration of populations of species that are listed under various federal and provincial acts and regulations. Existing habitat information used for the EA includes the PEIDELJ forest inventory layers and aerial photography, AC CDC occurrences for species of special status within 5 km of the Project, and information on Environmentally Significant Areas (ESAs). Information used for the assessment of potential environmental effects on the Terrestrial Environment was obtained from the *SARA*, PEI *EPA*, PEI *Wildlife Conservation Act*, the *Migratory Bird Convention Act* (MBCA), 1994, the *Federal Policy on Wetland Conservation*, the PEIDELJ, PEIDAF, AC CDC, and aerial photography. Additional knowledge of terrestrial populations potentially affected by the Project is based on other information provided by the above sources, and the professional judgment of the Study Team.

Canada's indigenous species, subspecies, and distinct populations that are considered "at risk" are protected under the *Species at Risk Act* (*SARA*). The *SARA* provides legal protection to species and the conservation of their biological diversity. The purposes of the Act are to prevent species from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species, and encourage the management of other species to prevent them from becoming at risk. Designation under the Act follows recommendation and advice provided by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to the Government of Canada. The COSEWIC is responsible under the *SARA* for assessing the biological status of each rare species in Canada. Under the *SARA*, the Governor in Council may accept the assessment and add the species to Schedule 1 of the *SARA*, decide not to add the species to

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Schedule 1, or may refer the assessment back to COSEWIC for further information or consideration.

Subsection 79(1) of the *SARA* stipulates that every person who is required by or under an Act of Parliament to ensure that an assessment of the environmental effects of a project is conducted must, without delay, notify the competent minister or ministers in writing of the project if it is likely to affect a listed wildlife species or its critical habitat. Additionally, *SARA* subsection 79(2) states that where a federal environmental assessment is being carried out in relation to a project that may affect a listed wildlife species or its critical habitat, the person responsible for ensuring the assessment is conducted must:

- identify potential adverse effects on the listed wildlife species and its critical habitat
- if the project is carried out:
 - ensure that measures are taken to avoid or lessen those adverse effects and to monitor them
 - ensure that such measures are consistent with any applicable recovery strategy and action plans

Under the *SARA*, there are three schedules; species officially protected are listed under Schedule 1 of the *SARA* and designated as “extinct, extirpated, endangered, threatened, and special concern” by COSEWIC are protected by that Act. Species listed as “special concern” are not protected by the prohibitions of Sections 32-36 of the *SARA*; however, they do not require that provincial or regional management plans are developed to protect the species. Species of special concern are considered species at risk as Section 79 requirements of the Act apply to these species. “Listed species” refer to species listed in Schedule 1 of the *SARA* and includes species designated as extirpated, endangered, threatened, or of special concern. Listed species are identified on the Species at Risk Public Registry.

Schedule 1 of the *SARA* is the official list of wildlife species at risk. Once a species is “listed”, the measures to protect and recover a listed wildlife species are implemented. Species that were designated at risk by the COSEWIC prior to the existence of the *SARA* require reassessment before being placed on Schedule 1. These species are listed on Schedule 2 if they were previously assessed by COSEWIC as endangered or threatened, and on Schedule 3 if they were previously assessed by COSEWIC as special concern. Both Schedules 2 and 3 are not provided with legal protection under the *SARA*.

Endangered plant and wildlife species are protected provincially under the PEI *Wildlife Conservation Act*. The purpose of this Act is to provide protection to endangered species and their habitats, as listed in the Federal *SARA*. The PEI *Wildlife Conservation Act* is administered by the PEIDELJ.

Migratory birds are protected federally under the *Migratory Bird Convention Act*, 1994, which states that “no person shall disturb, destroy or take a nest, egg, nest shelter, eider duck shelter,

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

or duck box of a migratory bird” without a permit. The Act includes prohibition of “incidental take” of migratory birds or their nests as a result of activities such as those required for the Project.

Designated Natural areas are protected by the *Natural Areas Protection Act*, administered by the PEIDELJ. The Act offers legal protection for designated sites to protect their ecological integrity.

The *Recreation Development Act* illustrates the regulations with respect to provincial parks. The Act states that:

“Except with the permission of the Minister, no person shall in a provincial park:

- (a) remove any flower, shrub or plant
- (b) willfully deface any natural object or injure a tree, shrub, flower or grass
- (c) remove, deface, damage or destroy a sign board, sign which may be posted or placed in a park, or a public building or structure
- (d) remove or displace any rock, sand, mineral, fossil or other object of natural curiosity or interest
- (e) pollute or obstruct any stream or body of water
- (f) display an advertisement
- (g) sell or offer for sale an article or service, or carry on a business
- (h) deposit or discard rubbish or matter of an offensive nature anywhere in a provincial park, except in an incinerator or trash

Wetlands are protected provincially under the PEI *EPA* and federally under the *Federal Policy on Wetland Conservation*. The PEI *EPA* states that activities taking place within 15 m of a wetland or watercourse require Watercourse, Wetland, or Buffer Zone Activity Permit and must adhere to all conditions and terms set out in the permit. There is also a Wetland Conservation Policy for PEI which has been put in place to protect wetland function and suggest mitigation measures so that there is no net loss of wetlands and wetland functions. Details regarding wetland compensation are determined on a case by case basis. Wetland conservation is federally promoted by the *Federal Policy on Wetland Conservation*. The objective of this policy is to “promote the conservation of Canada’s wetlands to sustain their ecological and socio-economic function now, and in the future.” Coordination of implementation of the policy is the responsibility of Environment Canada, specifically the Canadian Wildlife Service and the Environmental Conservation Branch. Although there is no specific federal legislation regarding wetlands, they may be protected federally under the *SARA*, if they contain critical species habitat for Species At Risk, the *MBCA*, 1994, if they contain nests of migratory birds, and/or the *Fisheries Act*, if the wetland contributes to existing or potential fish habitat.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

5.4.1.6 Residual Environmental Effects Rating Criteria

Residual environmental effects rating criteria for the potential environmental effects of the Project on the Terrestrial Environment are applied to the evaluation of a loss of Terrestrial habitat, SAR or SOCC, or migratory birds.

A significant residual adverse environmental effect on the Terrestrial Environment is defined as a Project-related environmental effect that results in any of the following:

- On secure species, one that affects terrestrial populations or habitat in such a way as to cause a decline in abundance or change in distribution of common and secure population(s) such that populations will not be sustainable within the RAA.
- On any Endangered or Threatened Species at Risk, one that results in a non-permitted contravention of any of the prohibitions stated in Sections 32-36 of SARA. Sections 32-36 stipulate that it is an offence to capture, take, possess, collect and sell endangered or threatened species. It is also illegal to damage or destroy the residence, for example the nest or den, of an endangered or threatened species.
- On any species of special status (SAR or SOCC), one that alters the terrestrial habitat within the spatial boundaries physically, chemically, or biologically, in quality or extent, in such a way as to cause a change or decline in the distribution or abundance of a viable plant or wildlife population that is dependent upon that habitat such that the likelihood of the long-term survival of these populations within the RAA is substantially reduced as a result.
- On any species of special status (SAR or SOCC), one that results in the direct mortality of individuals or communities such that the likelihood of the long-term survival of these rare, uncommon and/or non-secure population(s) within the RAA is substantially reduced as a result.
- For wetland environments, one that results in a non-compensated net loss of wetland area and function.

5.4.2 Existing Conditions

The existing conditions for the Terrestrial Environment were discussed in Section 4.3.1.

5.4.3 Potential Project-VEC Interactions

Table 5.15 below lists each Project Activity and Physical Work for the Project, and ranks each interaction as 0, 1, or 2 based on the level of interaction each activity or physical work will have with the Terrestrial Environment.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.15 Potential Project Environmental Effects on the Terrestrial Environment

Project Activities and Physical Works	Potential Environmental Effect	
	Change in Terrestrial Populations	Change in Wetlands
Construction		
Site Preparation	2	2
Roadbed Preparation	2	2
Installation of Structures	2	2
Surfacing and Finishing	1	1
Temporary Ancillary Elements	2	1
Materials and Equipment	1	1
Operation and Maintenance		
Project Presence	1	1
Infrastructure Maintenance	1	1
Winter Maintenance	1	1
Vegetation Management	1	1
KEY		
Project-Related Environmental Effects were ranked as follows:		
0 No interaction. The environmental effects are not significant and not considered further in this report.		
1 Interaction will occur. However, based on past experience and professional judgment, the interaction would not result in a significant environmental effect, even without mitigation, or the interaction would clearly not be significant due to application of codified practices. The environmental effects are not significant and not considered further in this report.		
2 Interaction may, even with codified mitigation, result in a potentially significant environmental effect and/or is important to regulatory and/or public interest. Potential environmental effects are considered further and in more detail in the EA.		

5.4.3.1 Construction Related Project Activities and Physical Works

During Construction, Surfacing and Finishing has been ranked as 1 for both potential environmental effects and is unlikely to interact substantively with terrestrial populations or wetlands. For this activity, the PDA will have been previously disturbed through Site Preparation and Roadbed Preparation activities. Surfacing and Finishing will produce some noise, which may temporarily affect habitat quality in habitat adjacent to the PDA, but the extent of this interaction is expected to be limited and not significant, and not requiring mitigation beyond that contained in the EPP.

Temporary Ancillary Elements has been ranked as 1 for potential environmental effects associated with wetlands. It is unlikely that Temporary Ancillary Elements will interact with wetlands during Project activities. The locations of all wetlands within the PDA have been identified and as such, all temporary elements of the Project will be stationed away from these areas.

Materials and Equipment has been ranked as 1, and will potentially interact with terrestrial populations. The interaction between terrestrial populations and this activity will be mitigated by the use of standard best management practices, or will be low enough in magnitude as to not result in a significant adverse environmental effect on terrestrial populations. Potential

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

environmental effects of Materials and Equipment are limited to indirect environmental effects such as noise associated with heavy machinery and truck traffic, which will be temporary and limited in magnitude. The location of storage of excavated material and aggregates will be chosen such that sensitive areas and habitats, as well as known locations of SOCC, are avoided.

5.4.3.2 Operation and Maintenance Related Project Activities and Physical Works

The following Project Activities and Physical Works associated with Operation and Maintenance have been ranked as 1 and will potentially interact with the terrestrial environment:

- Project presence
- Infrastructure maintenance
- Winter maintenance
- Vegetation management

The presence of the Project could interact with the Terrestrial Environment through noise disturbance from traffic, as well as a barrier to movement of wildlife. Indirect environmental effects could be associated with Accidents, Malfunctions, and Unplanned Events. As bypass is being located up to approximately 300 m from the current location, traffic noise is not expected to impact wildlife in the area substantively more than current traffic along the TCH. Traffic levels are expected to be similar to those on the current TCH. Interruption of movement for wildlife is expected to be localized and mortality of wildlife is expected to be comparable with that of other sections of the TCH. Any changes in the Terrestrial Environment associated with the project presence are rated not significant.

The interaction between the Terrestrial Environment and infrastructure maintenance is limited to maintenance of roadway drainage systems, including culvert replacement or repair, which could result in erosion and sedimentation and changes in hydrology in wetlands. Implementation of established and effective erosion and sedimentation controls will be used during all maintenance of roadway drainage systems, limiting the magnitude of any potential interactions. Any hydrological changes in wetlands will be temporary and limited in extent, and thus are rated not significant.

Winter Maintenance activities, such as the application of salt and sand to road surfaces, have the potential to result in a Project-related change to the terrestrial environment. Salt and sand are applied to road surfaces to aid in melting snow and ice, and to improve road conditions, but can enter surface water, groundwater, and soils, potentially impacting vegetation populations and communities, and wetlands. Potential damage to vegetation includes osmotic (*i.e.*, concentration induced dehydration) injuries as well as direct chloride ion toxicity. Salt deposited on soils can adversely affect plant growth by changing the structure of soil (*e.g.*, through the development of salt crusts) or by reducing soil fertility (*e.g.*, replacing calcium and potassium ions by sodium ions). Best management practices outlined in the PEITIR EPP will be followed

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

in order to most efficiently apply salt and sand when necessary. Because the effects of road salt are generally observed within 10 m of the edge of the road (although rarely detected at distances of up to 80 m from the road) (Transportation Research Board 1991), any changes to vegetation communities are expected to be limited to areas directly adjacent to the roadway, and are thus rated not significant.

The interaction between the Terrestrial Environment and Vegetation Management is limited to clearing and mowing activities within the PDA in order to maintain lines of sight. These activities are restricted to areas that will have been previously cleared and disturbed through site preparation activities. As these areas will have been previously disturbed, and PEITIR does not use herbicides for vegetation management, this interaction is rated not significant.

In consideration of the nature of the interactions and the planned implementation of known and proven mitigation, the potential environmental effects of all Project activities and physical works that were ranked as 0 or 1 in Table 5.15 for the terrestrial environment during any phase of the Project are rated not significant.

5.4.4 Assessment of Project-Related Environmental Effects

Only the interactions ranked as 2 in Table 5.15 were considered further in the assessment of Project-related environmental effects. A summary of the environmental effects assessment and prediction of residual environmental effects resulting from interactions ranked as 2 on the terrestrial environment is provided in Table 5.16.

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
Change in Terrestrial Populations	Construction: <ul style="list-style-type: none"> • Site Preparation • Roadbed Preparation • Installation of Structures Temporary Ancillary Elements	<ul style="list-style-type: none"> • Avoid known locations of plant and wildlife SAR and SOCC, where feasible. • Conduct clearing activities in fall and/or winter, outside the breeding season of migratory birds, also when bats are no longer roosting. • Establish buffers and protect active migratory bird nests until fledging, upon their discovery in work areas. • Include any SAR or SOCC found within or adjacent to the PDA in post-construction monitoring and follow-up plans. • Flag any vascular plant SAR or SOCC found within 30 m of the PDA, and minimize Construction adjacent to the plants whenever feasible. • Keep litter and garbage contained. 	A	L	S	ST / O	R	D/U	N	H	L	N	

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
		<ul style="list-style-type: none"> • Use designated roadways and access roads • Limit the extent of clearing to the outside toe of slope in important habitats, such as old hemlock stands and wetlands, when feasible. • Flag off environmentally sensitive areas prior to site clearing and construction. • Limit Project-related activity outside of the PDA. • Use designated roadways and access roads • Follow Project Specific EPP. • Construction Contractor is required to have an Environmental Control Manager on site at all times during Construction • If active nests are discovered during the Project, a vegetated buffer zone around the nest will be established and activities 											

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
		will be minimized in the immediate area until nesting is complete and chicks have fledged and left the area. <ul style="list-style-type: none"> • Clean construction machinery prior to entering and leaving areas known to contain invasive species to reduce their spread • Native species will be used, where possible, for re-vegetation efforts. Where not possible, species used will be non-invasive. 											

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
Change in Wetlands	Construction: <ul style="list-style-type: none"> • Site Preparation • Roadbed Preparation • Installation of Structures 	<ul style="list-style-type: none"> • Follow conditions of any environmental permits. • Follow the mitigation sequence of avoidance, minimization, and compensation • Employ standard erosion and sediment control measures outlined in PEITIR Project Specific Sediment and Erosion Control Plan. • Design culverts to accommodate water level equalization to allow peak and low flows in wetland areas. • Minimize channeling near wetlands. • Use clean, coarse fill materials within and near wetland areas. 	A	L	S	ST / O	R	D/U	N	H	L	N	<ul style="list-style-type: none"> • Wetland monitoring recommended for wetlands within 15 m of the PDA.

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 5.16 Summary of Residual Project-Related Environmental Effects on the Terrestrial Environment												
Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics					Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility					
		<ul style="list-style-type: none"> • Clean construction machinery prior to entering and leaving wetlands to reduce the spread of potential invasive species • Use designated roadways and access roads • Follow Project Specific EPP. 										

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
<p>KEY</p> <p>Direction P Positive. A Adverse.</p> <p>Magnitude L Low: Change of terrestrial populations that do not affect the sustainability or biodiversity of populations within the RAA.; no change in wetland function M Moderate: Change in populations that affect the sustainability of populations or biodiversity within the RAA.; change in wetland function after the application of mitigation and compensation H High: Change in populations that affect the sustainability of populations or biodiversity within the region.; non-compensated loss of wetland function</p> <p>Geographic Extent S Site-specific: Within the PDA. L Local: Within the region</p> <p>Duration ST Short term: Occurs and lasts for short periods (e.g., days/weeks/months). MT Medium term: Occurs and lasts for extended periods of time (e.g., years). LT Long term: Occurs during Construction and/or Operation and lasts for the life of Project. P Permanent: Occurs during Construction and Operation and beyond.</p> <p>Frequency O Occurs once. S Occurs sporadically at irregular intervals. R Occurs on a regular basis and at regular intervals. C Continuous.</p> <p>Reversibility R Reversible. I Irreversible.</p> <p>Ecological/Socio-economic Context U Undisturbed: Area relatively or not adversely affected by human activity. D Developed: Area has been substantially previously disturbed by human development or human development is still present. N/A Not Applicable.</p> <p>Prediction Confidence Based on scientific information and statistical analysis, professional judgment and effectiveness of mitigation: L Low level of confidence. M Moderate level of confidence. H High level of confidence.</p> <p>Likelihood Based on professional judgment: L Low probability of occurrence. M Medium probability of occurrence. H High probability of occurrence.</p> <p>Significance S Significant. N Not Significant.</p>													

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.4.4.1 Potential Project Environmental Effects Mechanisms**

The following Project Activities and Physical Works associated with construction that were ranked as 2 will interact with the terrestrial environment and have potential to result in significant adverse residual environmental effects, and will thus be considered in more detail in this EA:

- Site Preparation
- Roadbed Preparation
- Installation of Structures
- Temporary Ancillary Elements (change in terrestrial populations only)

The interaction between these Project Activities and the Terrestrial Environment will be discussed in the context of the measurable parameters for the potential environmental effects. Many of the Project Activities associated with construction (*i.e.*, Site Preparation, Roadbed Preparation, Installation of Structures, and Temporary Ancillary Elements) have potential to result in a change in terrestrial populations through habitat loss and degradation (including wetlands), loss of individuals of plant and wildlife SAR and SOCC, and mortality to migratory birds.

Construction activities within the PDA will result in the permanent loss of habitat for some plant and wildlife species, and the creation of edge habitat along the PDA, through vegetation removal, grubbing, and excavation. The PDA will result in the loss of approximately 422 m² or 0.04 ha of an old hemlock stand (approximately 1.7% of the total area of the stand (2.5 ha) within the LAA), representing direct loss of a habitat type that is not common in PEI. Hemlock forest makes up approximately 0.8% of forests in PEI (pers. comm. Mike Montigny 2012), making the hemlock stand in the LAA approximately 1.2% of the hemlock forest in PEI.

The PDA will also result in the loss of 25 m² or 0.025 ha of mapped wetland habitat, and an estimated 0.7 ha of combined mapped and field-delineated wetland habitat. A summary of the types and amounts of the various habitats within the LAA, and the predicted amount that will be lost (within the PDA) is provided in Table 5.17. Although the relative loss of some habitat types within the LAA is greater than 10% (*e.g.*, clearcut, shrub), these habitats are not ones that are important for the majority of SAR and SOCC with potential to be found within the PDA. The relative loss of more important habitats, such as wetlands, forests (overall), and the hemlock stand, is less than 5%.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.17 Habitat and Land Use Types and Areas Within the LAA and PDA

Habitat Type	Area within LAA		Area within PDA		
	ha	% of LAA	ha	% of PDA	% of LAA
Agriculture	505.1	50.0	17.8	36.6	3.5
Coniferous Forest	82.0	8.1	6.9	14.2	8.4
Intolerant Hardwood Forest	59.4	5.9	3.9	8.0	6.6
Mixedwood Forest	236.0	23.4	4.8	9.9	2.0
Tolerant Hardwood Forest	11.9	1.2	0.0	0.0	0.0
Shrub	1.7	0.2	0.3	0.6	17.6
Clearcut	7.5	0.7	1.6	3.3	21.3
Wetland	23.7	2.3	0.7	1.4	3.0
Road	30.3	3.0	8.9	18.3	29.4
Residential	23.0	2.3	1.3	2.7	5.7
Recreation	9.5	0.9	2.5	5.1	26.3
Developed Industrial	20.3	2.0	0.0	0.0	0.0
Total Area	1010.3	100.0	48.7	100.0	4.8

An interior forest analysis was completed for an area surrounding the PDA that encompassed approximately 4,900 ha; 2,355 ha of this area is forested. Interior forest was defined as continuous patches of mature forest greater than 10 ha and at least 100 m away from non-vegetated land such as roads, residential, industrial, and agricultural lands as well as open water and wetlands. The forest developmental stage inventory was not available in the forest inventory obtained from the PEIDELJ.

The total area of interior forest is 627 ha, divided among 17 individual patches with an average size of 36.9 ha. Following completion of the Project, one patch will be reduced from 16.1 ha to 13.2 ha.

Mature forest was defined as forest stands greater than 8 m in height and those that were not identified as plantations within the forest inventory. The total area of mature forest is 1,891 ha, composed of 96 patches with an average size of 19.7 ha. Clearing of the PDA will result in the fragmentation of five patches, reducing total mature forest area by 9.4 ha and average patch size to 16.8 ha, and increasing total number of patches to 112.

The Project will result in minimal loss to interior and mature forest areas as the PDA travels predominantly along the edge of these habitats. The new alignment makes use of an existing section of the TCH near Strathgartney, and is no more than 300 m from the existing TCH. The bird community identified during surveys along the route is unlikely to change dramatically within the LAA, given the current level of fragmentation, which will not change dramatically with the bypass. Within the RAA there are alternative habitats for migratory birds that have been

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

avoided with the current alignment and, in some cases, would be preferred habitat for many species (*i.e.*, Strathgartney Provincial Park).

Loss and degradation of habitat through the creation of edge habitat will occur following clearing when abiotic habitat features, such as increased light availability, temperature, and humidity change. Blowdown of trees on the edge of forested stands, such as the old hemlock stand on the edge of the PDA represents habitat degradation. Although not a complete loss of habitat, changes to abiotic conditions and blowdown of trees can make the edge habitat unusable or less desirable to some plant and wildlife species. Degradation of wetland habitat adjacent to the PDA could also occur through siltation and sedimentation resulting from increased runoff and erosion, and changes in hydrology. Changes in biotic habitat features at edges may also occur, including an increase in predation rates resulting from increased access, making these areas potentially less useable by some wildlife species.

Vegetation removal activities will also result in a loss of habitat through fragmentation (*i.e.*, discontinuity in preferred habitat leading to the reduction or loss of freedom of movement between patches of preferred habitat). Loss of habitat through fragmentation will result in an environmental effect that may be significant for species that are found in the vicinity of the PDA and currently move through and within the PDA to access preferred habitat. Components of Construction contributing to these mechanisms include Site Preparation, Roadbed Preparation, Installation of Structures, and Temporary Ancillary Elements.

Construction activities within the PDA will result in a loss of individuals of plant or wildlife SAR and SOCC, if those species are found within the area of activities. Loss of individuals of non-mobile SAR and SOCC (such as plants or very immature mammals or birds) may occur as the result of Project activities associated with Construction either directly on individuals that occur in the PDA through ground disturbance, or indirectly on individuals that are found adjacent to the PDA, as removal of vegetation within the PDA may change abiotic and biotic habitat features (*e.g.*, light availability) within the area. Furthermore, wildlife species which are displaced by loss of habitat may eventually succumb if they are unable to establish new home ranges due to lack of suitable or unoccupied habitat. Mortality of bat SOCC, such as little brown bat and northern long-eared bat, could result from clearing activities such as vegetation removal, if they are roosting in the area at the time. No maternal colonies were identified within the PDA.

Plant SOCC recorded during plant surveys conducted in 2012 include staghorn sumac, red pine, jack pine, hay sedge, and eastern white cedar. Hay sedge was found outside the PDA at one location. This species is typically found in recently disturbed areas and is believed to have seed viability of several decades. The eastern white cedar observed during the survey was found near a house as a hedge on the property. Although uncommon, its use as an ornamental hedge in this case does not raise any conservation concerns. A single jack pine was observed in a stand of red pine within the PDA, in habitat that was not well suited for the species. Red pine was observed at two locations within the PDA. One location had a group of five mature trees, while the other location had a single mature tree. At both locations the habitat was not

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

typical of the species and suggests there may have been some anthropogenic influence on their occurrence. A large patch of staghorn sumac was observed within the PDA. This species is typically found in previously disturbed sites such as roadsides and forest edges, habitat types that are commonly found on PEI.

The only bird SOCCs recorded during bird surveys conducted in 2012 were Bobolink and Killdeer, both recorded incidentally (more than 100 m from the point count location) during the first June survey, but not detected during the second survey. Bobolink was detected approximately 250 m north of the PDA centerline where the proposed road intersects with the existing TCH, east of Strathgartney. Only 30 m or less of field edge will be lost to the Project at this location. The Killdeer was recorded calling more than 100 m east of point count number L12, near a residential property in New Haven. There is little potential for nesting of Killdeer near the right-of-way at this location, however, there is ample potential nesting habitat in the area, such as a large quarry and other disturbed areas in and around New Haven. Eastern Wood-Pewee, another SOCC recorded within the LAA during the MBBA, was located within the privately-owned natural area west of Strathgartney Provincial Park. The Project in this area is located north of the existing TCH in edge and field habitats, and therefore, with the shifting of traffic away from this forest, will result in less disturbance to forest birds in this area, following construction.

Potential environmental effect mechanisms resulting in a loss of wetland area and the resultant loss of wetland function, including hydrological function, involve the activities and equipment used to carry out construction activities. Replacement of permeable surfaces (including wetlands) with impermeable surfaces (asphalt) has the potential for downstream environmental effects on other wetlands and receiving environments (*i.e.*, West River). A total of 0.7 ha of wetland habitat, between five wetlands, will be lost as a result of Project activities. The resulting loss of wetland function will be minimal. This loss of wetland function will be compensated for and will therefore result in no net loss of wetland function. Additionally, standard mitigation will be applied during construction, as outlined in the Project Specific EPP and Sedimentation and Erosion Control Plan (*e.g.*, silt fencing, sediment collection ponds) to limit further impacts to wetlands in and around the PDA.

Construction activities within the PDA will result in the permanent loss of habitat, and potentially direct mortality for migratory bird species found within the area of activities. Project activities associated with Construction have the potential to cause direct and indirect mortality of migratory bird species. Direct mortality of migratory birds, their eggs or young may occur during vegetation clearing, grubbing, or excavating activities. Indirect mortality may occur through the same mechanisms as for wildlife SAR and SOCC such as increased predation, habitat fragmentation, and edge effects.

Components of Construction contributing to these mechanisms include Site Preparation, Roadbed Preparation, Installation of Structures, and Temporary Ancillary Elements.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.4.4.2 Mitigation of Project Environmental Effects**

The mitigation measures that will be implemented during the Project are listed in Table 5.16. The key mitigation measures to reduce environmental effects of the Project on the Terrestrial Environment are as follows. These mitigation measures will be implemented wherever technically and economically feasible to minimize potential environmental effects of the Construction of the Project on the Terrestrial Environment.

- avoid known locations of plant and wildlife SAR and SOCC, and established nest sites of migratory birds
- limit Project-related activity outside of the PDA
- limit the extent of clearing to the outside toe of slope in important habitats, such as old hemlock stands and wetlands, when feasible
- employ standard erosion and sediment control measures, including:
 - erosion control fencing
 - check dams
 - sedimentation control ponds where appropriate
 - construction sequencing to minimize soil exposure
 - retaining existing vegetation as long as possible
 - re-vegetating and mulching of denuded areas
 - diverting runoff away from denuded areas
 - optimizing length and steepness of slope
 - keeping surface water runoff velocities low
 - proper sizing and protecting of drainage ways and outlets
 - intercepting of sediments on site
 - inspecting and maintaining the above-mentioned control measures
- design culverts to accommodate water level equalization to allow peak and low flows in wetland areas
- minimize channeling near wetlands
- use clean, coarse fill materials within and near wetland areas
- clean construction machinery prior to entering and leaving wetlands to reduce the spread of potential invasive species from one wetland to another
- flag off environmentally sensitive areas prior to Construction
- conduct clearing activities in fall and/or winter, outside the breeding season of migratory birds (March 31 to August 31). Clearing outside of the breeding season for migratory birds will also protect bat species that might be roosting in the area during this time. If any clearing during migratory bird breeding season is required, surveys will be conducted to determine if migratory bird nesting activity is taking place. If nesting activity is taking place that clearing will be delayed until bird young of the year have fledged and left the nest. Bat surveys will also be conducted at this time. If bat roosts are found, roosting trees will be flagged and clearing of roost trees will be delayed until bats have left any colonies.
- establish buffers and protect active migratory bird nests until fledging, upon their discovery in work areas

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

- the mitigation sequence of avoidance, minimization, and compensation, as applied to the Project, are presented here in the form of mitigation to avoid wetlands where possible, minimize the loss and potential environmental effects, and ultimately compensate for any residual losses
- include any SAR or SOCC found within or adjacent to the PDA in post-construction monitoring and follow-up plans
- flag any vascular plant SAR or SOCC found within 30 m of the PDA, and minimize Construction adjacent to the plants whenever feasible
- keep litter and garbage contained
- use designated roadways and access roads
- follow conditions of any Project environmental permits
- follow the project specific EPP and sedimentation and erosion control plan

Changes in the project design have been largely associated with avoidance of terrestrial habitats (including the Strathgartney Park), wetlands, and reducing the loss of the old mature hemlock forest stand along Crawford's Stream. In addition, PEITIR intends to purchase the private properties encompassing the hemlock stand and mature forest, and will consider setting aside for conservation in a designation yet to be determined.

The minimization of direct impacts to wetland habitats has resulted in a limited amount of wetland area within the PDA. All loss of wetland function will be compensated for, resulting in no net loss of wetland function.

The current construction schedule indicates that the phases involving the construction of new road section within forest and agricultural land will occur in the fall (currently scheduled for October 1 to December 14, 2012), avoiding the nesting period of migratory bird species. Construction of phases near the existing TCH (Bonshaw Phases 3 and 4 and New Haven Phases 3 and 4) that are scheduled for spring and early summer will occur along the existing TCH, in areas that will largely already be disturbed, and have a lower potential to directly affect wildlife and wildlife habitat.

5.4.4.3 Characterization of Residual Project Environmental Effects

If not carefully carried out or suitably mitigated, the Project could affect the Terrestrial Environment due to a change in terrestrial populations. The loss of individuals of SOCC (e.g., staghorn sumac) constitutes a residual environmental effect. It is anticipated that the individuals of each species outside of the PDA will ensure that the local populations persist. Effective Project planning, design, avoidance, and the application of known and proven mitigation measures will reduce the environmental effects of the Project on changes to Terrestrial Populations so that they are not significant. The application of the same standard mitigation to avoid or reduce potential environmental effects on migratory birds (discussed above) will be implemented. This includes clearing outside the breeding season when nests and/or nestlings are not present. Loss of important habitats such as the old mature hemlock stand has been

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

minimized through Project redesign. The project impacts to the hemlock stand represent an estimated 0.002% of the hemlock forest area in PEI.

Effective Project planning, design, avoidance, and the application of known and proven mitigation measures will reduce the environmental effects of the Project on changes to wetlands so that they are not significant. Where avoidance is not possible, mitigation measures that will be established for work with regard to wetlands will include implementation of well-established and proven erosion and sedimentation control measures. With mitigation, potentially including compensation, the Project will result in no net loss of wetland function and area.

With the proposed mitigation (e.g., no loss of protected or rare species, mitigation for protection of migratory birds) the residual environmental effects of a change in terrestrial populations during all phases of the Project are rated not significant. This conclusion has been determined with a high level of confidence as a result of the planned implementation of proposed proven mitigation measures described above.

Based on the available data and wetland evaluations, the proposed mitigation (e.g., avoidance, and limiting area of disturbance, no loss of wetland function that is not compensated for, and applicable sections of the EPP), and the residual environmental effects significance ratings criteria, the environmental effects during all phases of the Project on a change in wetlands are rated not significant.

5.4.5 Assessment of Cumulative Environmental Effects

In association with the Project environmental effects discussed above, an assessment of the potential cumulative environmental effects was conducted for other projects and activities that have potential to interact with the Project. Table 3.2 identifies the potential for overlap between the Project activities and cumulative environmental effects of other projects and activities conducted or to be conducted in the RAA. Table 5.18 below presents the potential cumulative environmental effects on terrestrial populations and ranks each interaction with other projects as 0, 1, or 2 with respect to the nature and degree to which important Project-related environmental effects overlap with those of other projects and activities.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.18 Potential Cumulative Environmental Effects on Terrestrial Populations

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects	
	Change in Terrestrial Populations	Change in Wetlands
Land Use	1	1
Future Highway Projects	1	1
KEY 0 = Project environmental effects do not act cumulatively with those of other projects and activities. 1 = Project environmental effects act cumulatively with those of other projects and activities, but the resulting cumulative effects are unlikely to exceed acceptable levels with the application of best management or codified practices. 2 = Project environmental effects act cumulatively with those of other projects and activities and the resulting cumulative effects may exceed acceptable levels without implementation of project-specific or regional mitigation.		

Potential Project-related effects on terrestrial populations and wetlands could overlap with similar effects within the RAA and therefore result in a cumulative change in terrestrial populations and change in wetlands. Historical and current use of land for recreational purposes, including recreational hunting, fishing, trail development, and use of land for hiking, all-terrain vehicles, or snowmobiling as well as agricultural and forest resource harvesting activities in the area. Past and present terrestrial population effects and change in wetlands associated with land use in the RAA have potential to interact cumulatively with the Project to adversely affect terrestrial populations and wetlands.

Existing residential and recreational land use in the RAA, including housing and cottage development have potential to encroach on lands and waters that support terrestrial populations, and result in changes in wetland area and function. These potential effects could be amplified due to overlap with similar effects associated with Project-related activities and infrastructure. The total area to be disturbed as a result of existing residential and recreational land use, in combination with Project activities and infrastructure, will still be minimal relative to the proportion of habitat available for terrestrial populations, and the amount of wetlands in the RAA. Trails intended for recreational land use support ATV and other traffic that can also disturb wetlands, and other wildlife habitat important to terrestrial populations and can overlap cumulatively with similar use of roadway corridors, where permitted.

Resource land use in the RAA, including forestry, agriculture, and small-scale quarries, has potential to interact cumulatively with the Project to affect terrestrial populations and wetlands through removal, destruction, or disturbance of SOCC individuals and habitats, including wetlands. Potential forestry-related cumulative effects on SOCC will be mitigated by the compliance with provincial forestry guidelines, where applicable and by the natural regeneration of forestry resources.

Overall, the landscape has been largely altered by other project activities in the past and present. Despite a heavy change in the landscape, many species of wildlife and vegetation

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

persist. The contribution of the project to those cumulative environmental effects is not substantive except in the LAA, and certainly not in the RAA.

5.4.6 Determination of Significance**5.4.6.1 Residual Project Environmental Effects**

Construction activities for the Project will result in adverse environmental effects which could result in a change in terrestrial populations and/or change in wetlands which could persist over the life of the Project. The potential change in terrestrial populations is attributable to direct and indirect disturbance/loss of habitat and loss of individuals of SAR or SOCC, and/or migratory birds. The potential change in wetlands can be due to a change in area and/or a change in wetland function. With the implementation of proposed mitigation (e.g., clearing vegetation outside of nesting season, no loss of wetland function that is not compensated for, following procedures illustrated in the EPP) and environmental protection measures, the environmental effects of a change in terrestrial populations and a change in wetlands are predicted to be not significant. Ongoing consultation with local stakeholders and PEIDELJ representatives will provide feedback on the effectiveness of this mitigation and confirm this effects prediction.

Overall, given the nature of the Project and the proposed mitigation, the potential environmental effects of all Project-related activities (ranked as 0, 1, or 2 in Table) on the Terrestrial Environment during all phases of the Project are rated not significant with a high level of confidence.

5.4.6.2 Residual Cumulative Environmental Effects

The potential environmental effects of the Project on a Change in Terrestrial Populations and Change in Wetlands are not significant, but will overlap with the environmental effects of other projects and activities that have been or will be carried out. The principal activities of concern are agricultural, forest resource harvesting, residential and recreational land use resulting in the loss of terrestrial habitat, including wetlands. The residual cumulative environmental effects of a Change in Terrestrial Populations and Change in Wetlands, as a result of past, present, and reasonably foreseeable projects or activities that have been or will be carried out, in combination with the environmental effects of the Project, during all phases is rated not significant. This determination has been made with a high level of confidence.

5.4.7 Follow-up and Monitoring

Wetland monitoring is recommended for any wetlands (mapped or unmapped) within the PDA or a 15 m buffer, in order to assess potential change in function. A wetland monitoring plan will be developed prior to construction. No monitoring (as per Section 79 of the SARA) is warranted as no SAR are likely to be affected by the Project. No other follow-up or monitoring is required to verify the predictions of the environmental effects assessment on the Terrestrial Environment, or to verify the effectiveness of mitigation.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

5.5 Land Use

In this section, the environmental effects of Project activities on Land Use resulting from Construction and Operation and Maintenance are assessed. Project activities are not anticipated to have significant residual adverse environmental effects on Land Use due to planned mitigation and compensation. The basis for this conclusion is provided in the following sections.

5.5.1 Scope of Assessment

The scope of the environmental assessment of Land Use in consideration of the regulatory setting, potential Project-VEC interactions, and existing knowledge, is defined in the sections that follow.

5.5.1.1 Rationale for Selection of Valued Environmental Component and Regulatory Setting

Land Use was selected as a VEC in consideration of potential Project-related interactions with current land use in the vicinity of the Project.

5.5.1.2 Selection of Environmental Effect and Measurable Parameter

The environmental assessment of Land Use is focused on the following environmental effect:

- change in Land Use

The Project has the potential to affect Land Use through changes to existing residential, commercial, agricultural, and institutional land use. In this section, the environmental effects of Project activities, including cumulative environmental effects, resulting from all phases of the Project, will be assessed.

Table 5.19 provides the measurable parameters used for the assessment of the selected environmental effect, and the rationale for selection.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.19 Measurable Parameters for Land Use

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in land use	Loss of land for other land uses (ha)	The Project will result in the loss of land.
	Loss of access (road access to property)	The Project will result in temporary loss of access to property.
	Increased sound (dB _A), air emissions(TSP, PM ₁₀ , PM _{2.5} , VOCs, SO ₂ , NO _x , CO, PAHs, CO ₂ , N ₂ O, CH ₄)	Increased noise, dust, and emissions of air contaminants resulting from the Project may affect the ability to use affected properties for their current land use activities.

The selection of the measurable parameters in Table 5.19 was based on the professional judgment of the Study Team and discussions with regulatory agencies for similar projects.

5.5.1.3 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on Land Use include the periods of Construction and Operation and Maintenance of the Project in perpetuity.

5.5.1.4 Spatial Boundaries

The spatial boundaries for the environmental effects assessment of Land Use include the Project Development Area (PDA), Local Assessment Area (LAA) and Regional Assessment Area (RAA).

Project Development Area (PDA): The PDA is located between St. Catherines Road in Bonshaw to east of West River Road (Route 9) in New Haven, Queens County, PEI (Figure 1, Appendix A).

Local Assessment Area (LAA): The LAA is defined as the PDA plus an additional 100 m radius around that area. With respect to Land Use, the LAA represents the area where indirect or secondary environmental effects of Construction and Operation and Maintenance of the highway realignment on Land Use are likely to be most pronounced or discernible (e.g., sound, dust).

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Regional Assessment Area (RAA): The RAA is defined as the LAA, the old TCH, plus an additional 100 m radius around that area.

5.5.1.5 Administrative and Technical Boundaries

The administrative boundaries for the assessment of Land Use pertain to the *Planning Act* and *Lands Protection Act* (and their associated regulations) administered by the Municipal Affairs and Provincial Planning Branch of the PEI Department of Finance, Energy, and Municipal Affairs.

The technical boundaries for the assessment of Land Use were based on a review of available information for the study area, including public and stakeholder consultations, mapping and property identification data, and a reconnaissance survey of the PDA.

5.5.1.6 Residual Environmental Effects Rating Criteria

The EA methodology for Land Use is based on the determination of whether significant adverse residual environmental effects are likely to occur from the Project.

A significant residual adverse environmental effect on Land Use is one where Project activities will result in environmental effects on the land such that existing activities cannot continue at current levels for extended periods of time (*i.e.*, beyond the Construction phase) and cannot be compensated.

5.5.2 Existing Conditions

The existing conditions of Land Use were discussed in Section 4.3.3.1.

5.5.3 Potential Project-VEC Interactions

Table 5.20 lists each Project activity and physical work for the Project, and ranks each interaction as 0, 1, or 2 based on the level of interaction each activity or physical work will have with Land Use.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.20 Potential Project Environmental Effects to Land Use

Project Activities and Physical Works	Potential Environmental Effect
	Change in Land Use
Construction	
Site Preparation	2
Roadbed Preparation	2
Installation of Structures	2
Surfacing and Finishing	2
Temporary Ancillary Elements	2
Material and Equipment	2
Operation and Maintenance	
Project Presence	2
Infrastructure Maintenance	1
Winter Maintenance	1
Vegetation Management	1
KEY	
<u>Project-Related Environmental Effects were ranked as follows:</u>	
0 No interaction. The environmental effects are not significant and not considered further in this report.	
1 Interaction will occur. However, based on past experience and professional judgment, the interaction would not result in a significant environmental effect, even without mitigation, or the interaction would clearly not be significant due to application of codified practices. The environmental effects are not significant and not considered further in this report.	
2 Interaction may, even with codified mitigation, result in a potentially significant environmental effect and/or is important to regulatory and/or public interest. Potential environmental effects are considered further and in more detail in the EA.	

Interactions between Infrastructure Maintenance, Winter Maintenance, and Vegetation Management activities and Land Use have been ranked as 1 in Table 5.20. During these activities, adjacent properties may experience noise, dust, and air emissions. The PEITIR EPP includes guidelines for reducing noise, dust, and air emissions.

Given the nature of the Project and the proposed mitigation, the potential environmental effects of all Project-related activities that were ranked as 0 or 1 in Table 5.20, are rated not significant with a high level of confidence, and are not considered further in this EA.

5.5.4 Assessment of Project-Related Environmental Effects

All other interactions that were previously ranked as 0 or 1 were determined to be not significant due to no interaction or no substantive adverse interaction with Land Use or because of planned implementation of mitigation of well-established and proven effectiveness that would result in the environmental effects being rated as not significant.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

A summary of the environmental effects assessment and prediction of residual environmental effects resulting from interactions with Land Use that were ranked as 2 in Table 5.20 is provided in Table 5.21. Only the interactions ranked as 2 in Table 5.20 were considered further in the environmental effects assessment. Activities with the potential to result in substantive residual environmental effects are Site Preparation, Roadbed Preparation, Installation of Structures, Temporary Ancillary Elements, Materials and Equipment, and Project Presence.

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 5.21 Summary of Residual Project-Related Environmental Effects on Land Use

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
Change in land use	Construction: <ul style="list-style-type: none"> • Site Preparation • Roadbed Preparation • Installation of Structures • Surfacing and Finishing • Temporary Ancillary Elements • Materials and Equipment 	<ul style="list-style-type: none"> • Fair market value will be offered for land acquisition • Access to lands will be maintained where possible • Temporary detours will be provided, if necessary • The project specific EPP will be followed and will include guidelines for reduction of noise, dust, and air emissions • PEITIR Project Specific Sediment and Erosion Control Plan will be in place during all phases of the Project 	A	L	L	ST/C	I	D	N	H	H	N	<ul style="list-style-type: none"> • Compliance monitoring to confirm that mitigation measures are carried out correctly during Construction.

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
		<ul style="list-style-type: none"> Apply dust suppressants as required Minimize activities that generate large quantities of dust during high winds Work will be limited to the daytime hours Use well maintained equipment with quality 											•
	Operation and Maintenance: <ul style="list-style-type: none"> Project Presence 	<ul style="list-style-type: none"> Access to lands will be maintained as per the PEI <i>Planning Act</i> 	A/P	H	L	P/C	I	D	N	H	H	N	• None

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up and Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socio-economic Context					
<p>KEY</p> <p>Direction: P Positive A Adverse</p> <p>Magnitude L Low: e.g., specific group, residence or neighbourhood affected such that adjacent land use activities will not be disrupted such that current activities cannot continue even after short periods of time. M Medium: e.g., part of a community affected such that adjacent land use activities will be disrupted such that current activities cannot continue for extended period of time longer than two years. H High: e.g., community affected such that adjacent land use activities will be disrupted such that current activities cannot continue for extended periods of time longer than two years and are not compensated for.</p>													
<p>Geographic Extent: S Site-specific: Within the PDA. L Local: Within the LAA.</p> <p>Duration: ST Short term MT Medium Term LT Long Term P Permanent – will not change back to original condition</p> <p>Frequency: O Occasionally, once per month or less S Sporadic, once per week R Regular, more than once per week intervals C Continuous</p>													
<p>Reversibility: R Reversible I Irreversible</p> <p>Ecological/Socio-economic Context: U Undisturbed: Area relatively or not adversely affected by human activity D Developed: Area has been substantially previously disturbed by human development or human development is still present N/A Not Applicable</p> <p>Significance: S Significant N Not Significant</p>													
<p>Prediction Confidence: Based on scientific information and statistical analysis, professional judgment and effectiveness of mitigation L Low level of confidence M Moderate level of confidence H High level of confidence</p> <p>Likelihood: Based on professional judgment L Low probability of occurrence M Medium probability of occurrence H High probability of occurrence</p> <p>Cumulative Environmental Effects? Y Potential for environmental effect to interact with other past, present or foreseeable projects or activities in the area of the Project N Environmental effect will not or is not likely to interact with other past, present or foreseeable projects or activities in the area of the Project</p>													

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.5.4.1 Project Environmental Effects Mechanisms**

During Construction, changes in Land Use could occur as a result of interactions with Site Preparation, Roadbed Preparation, Installation of Structures, Surfacing and Finishing, Temporary Ancillary Elements, and Materials and Equipment activities.

Site Preparation (*e.g.*, surveying and geotechnical investigations, clearing and grubbing) and Roadbed preparation activities (*e.g.*, excavation, placement of fill, cutting and grading, ditching) will result in the loss of land and changes to, or loss of, access to property. One commercial and nine residential buildings will be removed or demolished during Site Preparation.

The Installation of Structures (*i.e.*, the widening of Bonshaw Bridge and installation of four watercourse crossings on tributaries of the West River) may result in temporary interruptions to recreational activities such as fishing in the immediate vicinity of the Project.

Surfacing and Finishing activities could cause interruption to surrounding land use activities (including recreational activities) due to increased noise and decreased air quality (*e.g.*, increased dust and emissions).

Temporary Ancillary Elements associated with the Project (*i.e.*, temporary access roads, borrow areas, petroleum storage areas) will result in temporary loss of land and changes to, or loss of, access.

The Transportation of Materials and Equipment will result in increased truck traffic and associated noise. Storage of materials will result in a temporary loss of land and changes to, or loss of, access.

Potential environmental effects during Construction include a loss of use of property as a result of noise, dust, and air emissions. Increased sedimentation in waterbodies has the potential to adversely affect fishing in the PDA.

During Operation and Maintenance of the Project, the presence of the Project and its associated traffic may result in a loss of use of property and land use activities as a result of noise, dust, and air emissions. The Project will result in loss of land within the PDA and changes to, or loss of, access to properties within the LAA.

Positive environmental effects of the Project presence on Land Use include improvement of the safety and efficiency of the TCH on PEI and the ability for landowners along the old alignment to subdivide their properties where access restrictions are removed. Opportunities for development along the existing highway will be permitted once the new alignment is in operation. According to the *Roads Act* (Highway Access Regulations), the existing TCH will become a class 3 highway, and will no longer be subject to the same access restrictions as the arterial highway.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.5.4.2 Mitigation of Project Environmental Effects**

As a result of public feedback, redesign of the Project during the planning stages realigned the highway to preserve Strathgartney Provincial Park; access to the Park will be improved by realigning the entranceway to form a four-way intersection with Riverdale Road.

Landowners will be compensated at fair market value for loss of land and/or buildings. In the unlikely event that expropriation of property becomes necessary, lands will be expropriated as per the PEI *Expropriation Act*, at fair market value.

Access to lands will be maintained where possible and temporary detours will be provided, if necessary. Temporary access roads will be constructed in accordance with landowner agreements. Access to property will be maintained in the long term in compliance with Section 24 of the PEI *Planning Act*.

To minimize the effects of dust, noise, and air emissions during all Project activities, the project specific EPP, containing guidelines for managing dust, noise, and air emissions and mitigation outlined in this EA will be adhered to. Based on the evaluation of environmental effects on the Atmospheric Environment, there will be no significant environmental effects due to planned mitigation (*e.g.*, dust suppression, limiting work hours to daylight hours only, muffling equipment, maintaining equipment). Noise modeling using sound pressure levels collected adjacent to the existing highway and also in areas off the existing highway determined that noise is not expected to increase noticeably in the vicinity of the new highway alignment. The duration and magnitude of atmospheric emissions are such that adjacent land use should not be affected at levels where the current land use cannot continue.

Erosion control structures (*i.e.*, silt fencing), mulching, hydroseeding and/or the use of rip-rap (as outlined in the Project Specific Sediment and Erosion Control Plan) will be used to control erosion that could affect adjacent properties so that it does not result in damage or loss of use.

Overall, in view of the planned mitigation, loss of land and its use will be mitigated and in the case of direct loss, compensated. Therefore, the residual environmental effects of the Project on Land Use are rated not significant.

5.5.5 Assessment of Cumulative Environmental Effects

In association with the Project environmental effects discussed above, an assessment of the potential cumulative environmental effects was conducted for other projects or activities that have potential to interact with the Project. Table 3.2 identified the potential for overlap between Project activities and cumulative environmental effects of other projects or activities conducted or to be conducted in the LAA. Table 5.22 presents the potential cumulative environmental effects to Land Use, and ranks each interaction with other projects or activities as 0, 1, or 2 with

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

respect to the nature and degree to which important Project-related environmental effects overlap with those of other projects or activities.

Table 5.22 Potential Cumulative Environmental Effects to Land Use

Other Projects and Activities With Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects
	Change in Land Use
Existing Infrastructure	1
Future Highway Projects	0
Historical and Current Land Use	1
<p>Key: Cumulative environmental effects were ranked as follows: 0 Project environmental effects do not act cumulatively with those of other Projects and Activities. 1 Project environmental effects act cumulatively with those of other Project and Activities, but are unlikely to result in significant cumulative environmental effects or Project environmental effects act cumulatively with existing significant levels of cumulative environmental effects but will not measurably change the state of the VEC. 2 Project environmental effects act cumulatively with those of other project and activities, and may result in significant cumulative environmental effects or Project environmental effects act cumulatively with existing significant levels of cumulative environmental effects and may measurably change the state of the VEC.</p>	

Interactions between the Project and future highway projects, in particular, the future highway realignment between Crapaud and Tryon, were ranked as a 0 in Table 5.22. The Crapaud to Tryon realignment is located outside of the RAA and therefore would have no cumulative environment effects on land use. Any other future highway projects at other locations along the Trans-Canada Highway will only serve to further improve safety and traffic efficiency and result in further positive cumulative environmental effects.

Historical and current land use activities were ranked 1, as the Project will result in changes to existing land use in the PDA, LAA, and RAA, resulting in cumulative environmental effect on land use. The Project RAA is a highly developed landscape with agriculture, forest resource harvesting, residential, and other land uses occupying a majority of the RAA. The Project will change land use indefinitely in the PDA and will have some changes to access and adjacent land use. The planned mitigation for these Project-related contributions to cumulative environmental effects will be effective in ensuring that the cumulative environmental effects are not significant.

Interactions between the Project and existing infrastructure were ranked as 1 in Table 5.22 because the Project improves the existing road transportation network. The Project improves safety by reducing grades, improving vertical curves and sight distances, and improving access. Consequently, the Project results in a positive cumulative environmental effect to Land Use.

Therefore, the potential cumulative environmental effects of the Project in combination with all other projects or activities that have been or will be carried out are rated not significant.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.5.5.1 Characterization of Residual Project Environmental Effects**

Effective Project planning, design, application of the project specific EPP, and fair market value compensation for land acquisition will reduce the environmental effects of the Project on Land Use so that they are not significant as they will not result in non-compensated changes that prevent the continuation of current land uses.

With the proposed mitigation and compensation, the residual environmental effects of a Change in Land Use during all phases of the Project are rated not significant. This conclusion has been determined with a high level of confidence as a result of Project planning, design, and mitigation measures.

5.5.6 Determination of Significance**5.5.6.1 Residual Project Environmental Effects**

The residual environmental effects for the Project are characterized by the following descriptors: Direction; Magnitude; Geographic Extent; Duration and Frequency; Reversibility; Ecological/Socio-economic Context, Significance, and Prediction Confidence. These descriptors are further explained in Table 5.21.

The residual environmental effects of Construction (Site Preparation, Roadbed Preparation, Installation of Structures, Temporary Ancillary Elements, Materials and Equipment) on a Change in Land Use are expected to be adverse, of low magnitude, located within the LAA, of short term duration, continuous frequency, and irreversible. The Project is occurring in a predominantly developed area. The environmental effects are not significant and there is a high level of confidence in the prediction of these ratings, high level of likelihood, and no anticipated adverse cumulative environmental effects.

The residual environmental effects of Operation and Maintenance (Project Presence) on a Change in Land Use are expected to be adverse and positive, of high magnitude, located within the LAA, permanent, of continuous frequency, and irreversible. The Project is located in a predominantly developed area and will improve safety and efficiency of the TCH system on PEI. The environmental effects are not significant and there is a high level of confidence in the prediction of these ratings, high level of likelihood, and no anticipated adverse cumulative environmental effects.

With the proposed mitigation, the residual environmental effects of a Change in Land Use during all phases of the Project are rated not significant. There is a high level of confidence in the assessment of environmental effects and significance prediction because of the nature of mitigation outlined in this assessment and the collective professional judgment of the Study Team, which has local knowledge based on involvement with other projects within the region.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.5.6.2 Residual Cumulative Environmental Effects**

The potential environmental effects of the Project on Land Use will not overlap with those of other projects and activities that have been or will be carried out in any substantive adverse way. Therefore, the residual cumulative environmental effect of a Change in Land Use as a result of past, present, and reasonably foreseeable projects and activities, in combination with the environmental effects of the Project during all phases, is rated not significant. This determination has been made with a high level of confidence because of the limited nature and extent of the Project and the lack of substantive overlapping environmental effects with other projects or activities that have been or will be carried out.

5.5.7 Follow-up and Monitoring

Follow-up and monitoring programs for Land Use will consist of compliance monitoring of the EPP during Construction.

5.6 Effects of the Environment on the Project**5.6.1 Scope of Assessment**

This section defines the scope of the assessment of Effects of the Environment on the Project in consideration of the regulatory setting, potential Project-VEC interactions, and existing knowledge.

5.6.1.1 Rationale for Selection and Regulatory Setting

Effects of the Environment on the Project refer to the forces of nature that could affect the Project physically or hamper the ability to carry out the Project activities in their normal, planned manner.

Typically, potential effects of the environment on any project are a function of project or infrastructure design and the risks of natural hazards and influences of nature. These effects may result from physical conditions, land forms, and general site characteristics that may act on the Project such that Project components, schedule and/or costs could be substantively and adversely changed.

While environmental forces (*e.g.*, severe weather, climate change) have the potential to adversely affect the Project, good engineering design considers and accounts for these effects and the associated loadings or stresses on the Project that may be caused by these environmental forces. The methodologies used for mitigating potential effects of the environment on the Project are inherent in the planning, engineering design, construction, and planned operation of a well-designed Project expected to be in service for several decades or longer. The Canadian Environmental Assessment Agency requires the Effects of the Environment on the Project be considered as part of the environmental screening reports.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

5.6.1.2 Environmental Attributes

A variety of environmental attributes have the potential to have an effect on the Project. These were determined based on a review of known past and existing conditions and knowledge gained through projections of potential future conditions, such as the potential effects of climate change. The environmental attributes selected for consideration in this EA include the following:

- severe weather events
- climate change
- change in microclimates

These environmental attributes are considered to be those of highest likelihood or of highest consequence if they were to occur; other lesser events such as storm surges, soil erosion, or other environmental stressors are less likely to occur and as such their effects on the Project are inherently assessed by addressing those higher likelihood or higher consequence events.

5.6.1.3 Selection of Effects

For the purpose of this EA, the effects assessment of potential Effects of the Environment on the Project is focused on the following effects:

- delays in Construction and/or Operation and Maintenance
- damage to Infrastructure
- reduced visibility impacting public health and safety

5.6.1.4 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on the Effects of the Environment on the Project include the periods of Construction (approximately one year beginning September 2012) and Operation and Maintenance (until the end of its useful life).

5.6.1.5 Spatial Boundaries

The spatial boundaries for the assessment of effects of the environment on the Project are limited to the PDA as described below.

Project Development Area (PDA): The PDA is located from St. Catherines Road in Bonshaw to east of West River Road (Route 9) in New Haven, Queens County, PEI (Figure 1.1, Appendix A).

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.6.1.6 Residual Effects Rating Criteria**

A significant adverse residual effect of the environment on the Project would be one that directly results in:

- a substantial loss of the Project schedule (e.g., delay resulting the in construction period being extended by greater than six months)
- a substantive interruption in service to motorists
- a decrease in safety to motorists
- damage to infrastructure resulting in repairs that could not be technically or economically implemented

5.6.2 Effects Analysis

The Effects of the Environment on the Project considers any change to the Project that may be caused by the environment. The Project will be designed, constructed, and operated in compliance with various codes, standards, best practices, acts, and regulations that govern the required structural integrity, safety, reliability, and environmental and operating performance of the Project to minimize the potential for adverse effects of the environment on the Project.

There are no environmental factors that are expected to interact substantially with the Construction of the Project. While some weather related delays are possible, they are not likely to adversely affect the Project construction, schedule, or cost.

During Operation and Maintenance the highway may be exposed to extreme weather conditions, and the bridge may also be subject to sea level rise. The bridge has been designed to withstand a one in 100 year storm event and is not expected to be affected by sea level rise in the near term. Proper design, construction, and operation of the highway will minimize the potential for effects of extreme weather conditions (e.g., severe rainstorm) to affect the use of the highway.

In areas where large cuts have occurred there is the possibility of a change in microclimates to affect the safety of the highway. Wind patterns may be subject to change in these areas, potentially leading to accumulation of snow or white out conditions on sections of the new alignment. De-icing of the highway (sanding and salting) in combination with snow removal are expected to keep safety conditions in these areas consistent with other sections of the highway.

5.6.3 Potential Effects of Climate Change on the Project

Over the next 100 years, Atlantic Canada will likely experience warmer temperatures, a greater frequency of storm events, increasing storm intensity, rising sea level, storm surges, coastal erosion and flooding (Vasseur and Catto 2008). Potential effects of climate change on Operation and Maintenance of the Project would be related to increases in the frequency of severe weather events, changes in temperature, changes in precipitation, as well as storm

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

surges (at Bonshaw Bridge). It is expected that increases in extreme weather events would potentially affect Operation and Maintenance of the Project by increasing unexpected maintenance due to storm damage, while increased precipitation could potentially affect the amount of runoff associated with highway drainage. Changes in temperature could affect the freeze/thaw cycle which will result in decreased roadbed quality and potentially increase maintenance. As the Project includes the widening of Bonshaw Bridge, sea level rise has the potential to affect the structure. The discussion in this section will thus focus on the potential climate change scenarios based on recent modeling results. The Project will be designed, constructed, and operated in compliance with various codes, standards, best practices, acts, and regulations that govern the required structural integrity, safety, reliability, and environmental and operating performance of the Project.

5.6.3.1 Limitations to Climate Model Results

The effects of climate change are becoming better understood. Since it is not possible to conduct experiments on the climate or to reproduce its intricacies in the laboratory, climate models facilitate increased understanding of climate change (Natural Environment Research Council 2011). Climate models are based on the laws of physics to describe how temperature, pressure, winds, currents and other variables interact and change over time (Natural Environment Research Council 2011). Climate models are the only scientifically-credible tools for making detailed predictions about climate at the scale of geographical regions. Nonetheless, because climate models are mathematical approximations of the climate system and not the real system itself, their results must be treated with due scientific caution (Natural Environment Research Council 2011).

Numerous climate change-related effects have been observed globally. Many of these effects are anticipated to intensify over the next century, including increased temperatures, receding glaciers, melting of permafrost, rising sea levels, coastal flooding, and changing of precipitation patterns and temperatures.

Predicting future environmental effects of climate change for a specific area using global data sets can be problematic due to generic data that does not take into account local climate forcing (climate forcing represents natural mechanisms, such as variations in ocean circulation and changes in the atmospheric composition, and others, which “force” the climate to change by upsetting the energy balance). Accurate regional and local projections require the development of specific regional and local climate variables and climate change scenarios (Lines *et al.* 2005). As a result, downscaling techniques have emerged over the last decade as an important advancement in climate modeling. Downscaling techniques are particularly important for Atlantic Canada due to the inherent variability associated with this predominantly coastal climate. Statistical downscaling uses global climate model (GCM) predictions as well as historical data from weather stations across the region, and studies the relationship between these stations.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

There is some variation in the predictions of the Statistical Downscaling Model (SDSMs) and the Global Climate Models (GCMs). According to Lines *et al.* (2005), monthly, seasonal, and annual results for SDSM values differed from, and were typically higher than, those of the Canadian coupled global climate model. For the sake of conservatism, results from the SDSM are used to predict future climate trends in this analysis of the Effects of the Environment (specifically climate change) on the Project.

There is variability and there are inconsistencies in predictions from climate models. However, there is a consensus in the climatological community concerning the overall anticipated environmental effects of climate change.

5.6.3.2 Model Results for Prince Edward Island

Based on SDSM modeling as presented in Lines *et al.* (2008), the changes to seasonal precipitation amounts in Charlottetown, PEI for the 2020s, 2050s, and 2080s are provided in Table 5.23.

Table 5.23 Seasonal Precipitation % Change Projections for SDSM and HadCM3 Models for Charlottetown, PEI

Return Period	Range of Percent Change (%)		
	20	50	80
Charlottetown	13 to 12	16 to 11	18 to 10

Lines *et al.* (2008) also presented data for 10, 50, and 100 year return periods with respect to extreme 24 hour precipitation amounts. These results are presented below in Table 5.24.

Table 5.24 Projected Extreme 24 hour Precipitation Amounts for Charlottetown, PEI

Return Period	Precipitation Amounts (mm)											
	10 Years				50 Years				100 Years			
	Decade	Historic	2020s	2050s	2080s	Historic	2020s	2050s	2080s	Historic	2020s	2050s
Charlottetown CGCM2	74	120.7 to 86.4	107.7 to 93.7	99.8 to 79.1	94.2	168.4 to 110.3	144.8 to 121.1	128.6 to 97.2	102.7	188.6 to 120.4	160.6 to 132.7	140.7 to 104.7

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Changes in precipitation amount and intensity could affect Operation and Maintenance of the highway. Increased amounts of precipitation could result in increased water pooling on the highway and, if the increased precipitation is the result of a severe weather event, washed out sections of the highway. Based on the modeled data, the predicted changes to precipitation are moderate for Charlottetown. The increase in precipitation is not expected to be an issue as the appropriate drainage systems being put in place during construction have been designed to accommodate a one in 100 year storm event.

The modeled mean annual changes in temperature for the 2020s, 2050s, and 2080s are presented by *Lines et al. (2008)*. A range for the downscaled models of both the CGCM2 and HadCM3 models is illustrated in Table 5.25, below.

Table 5.25 Projected Annual Temperature Change for Charlottetown, PEI

Decade	T max (°C)			T min (°C)		
	2020s	2050s	2080s	2020s	2050s	2080s
Charlottetown	1.70 to 1.66	2.46 to 2.30	3.51 to 4.04	1.69 to 1.05	2.33 to 1.39	3.34 to 2.57

In terms of seasonal temperature changes, the temperature in Charlottetown is projected to increase moderately on an annual basis (*Lines et al. 2008*).

The warmer winter temperatures could lead to a later freeze up; wetter, heavier snow; more liquid precipitation occurring later into the fall; and possibly more freezing precipitation during both seasons. There is less agreement among the global circulation and regional downscaling models regarding changes in precipitation.

Atlantic Canada is the largest region of high sensitivity to sea level rise in Canada (*Shaw et al. 1998*). A sea level rise of 0.5 m is expected in the region by the year 2100 (*Climate Change and Climate Variability in Atlantic Canada 1996*). In PEI this has the potential to increase erosion due to the predominance of sandstone. Rip-rap protection surrounding the bridge piles at the Bonshaw Bridge are intended to provide protection against such erosion.

5.6.4 Determination of Significance

Mitigation measures include, applying best engineering practices and scheduling of activities to account for possible weather disruptions. Based on the above, the Effects of the Environment on the Project during all phases of the Project are rated not significant. This prediction is made with a moderate level of confidence, because of the uncertainty in the potential changes to local, regional, and global climate that could occur over the life of the Project.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI****5.6.5 Follow-up and Monitoring**

No specific follow-up or monitoring measures are required or recommended.

5.7 Accidents, Malfunctions, and Unplanned Events

Accidents, Malfunctions, and Unplanned Events are accidents or upset events or conditions that are not planned as a part of routine Project activities during any Project phase. Even with the best planning and application of mitigation, Accidents, Malfunctions, and Unplanned Events could occur during any phase of the Project. These could occur as a result of abnormal operating conditions, wear and tear, human error, equipment failure, and other possible causes. Many accidents, malfunctions, and unplanned events are preventable and can be readily addressed or prevented by good planning, design, equipment selection, hazards analysis and corrective action, emergency response planning, and mitigation.

5.7.1 Methodology

In this section, the potential Accidents, Malfunctions, and Unplanned Events that could occur during any phase of the Project and potentially result in significant adverse environmental effects are described, discussed, and assessed. The focus is on credible accidents that have a reasonable probability of occurrence, and for which the resulting environmental effects could be significant in relation to the identified thresholds of significance for each VEC (previously identified, as applicable).

It is noted that Accidents, Malfunctions and Unplanned Events are evaluated individually, in isolation of each other, as the probability of a series of accidental events occurring in combination with each other is not likely to occur. It is not credible to assess the occurrence of a series of accidental events occurring in parallel or as a result of each other, nor would it be possible to predict or prevent such occurrences, even with the best of planning. These possible events, on their own, generally have a very low probability of occurrence and thus their environmental effects are of low likelihood. They have an even lower probability or likelihood of occurring together - thus their combination is not considered credible, nor of any measurable likelihood of occurrence.

Various credible accidents, malfunctions, and unplanned events have been selected by the Study Team to complete the assessment. Since it is impossible to review and assess all possible accidents, malfunctions, and upset conditions, the Study Team has conservatively selected scenarios that represent higher consequence events that would more than adequately address the consequences of less likely or lower consequence scenarios.

5.7.2 Identification of Accidents, Malfunctions, and Unplanned Events

The Accidents, Malfunctions, and Unplanned Events that have been selected by the Study Team, based on its experience and professional judgment, are as follows:

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

- **Worker Accident:** Worker accidents may occur during either Construction or Operation, and may result in harm, injury, or death to one or more Project workers.
- **Erosion and Sediment Control Failure:** The temporary failure or loss of effectiveness of erosion and sedimentation control measures that may release sediment into the freshwater environment, marine environment, or result in soil erosion.
- **Fire:** Consists of a fire in a Project component. The focus is on the consequence, and not the mechanism by which it occurs.
- **Hazardous Materials Spill:** Spills of fuel, petroleum products, and/or other chemicals used on site or in Project components.
- **Vehicle Accident:** Project-related vehicle accidents that could occur on the road transportation network.
- **Discovery of Heritage Resource:** The discovery of a previously undiscovered heritage or archaeological resource that could occur during Construction, and to a lesser extent during Operation and Maintenance.

5.7.3 Environmental Effects Assessment

The potential interactions between the selected Accidents, Malfunctions, and Unplanned Events that could occur during the Construction, Operation, or Decommissioning and Abandonment of the Project and each relevant VEC are identified in Table 5.26 below.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Table 5.26 Potential Interactions between Selected Accidents, Malfunctions and Unplanned Events

Accident, Malfunction, or Unplanned Event	Atmospheric Environment	Groundwater Resources	Freshwater Environment	Terrestrial Environment	Marine Environment	Land Use	Archaeology and Heritage Resources	Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons	Transportation	Public Health and Safety
Worker Accident	0	0	0	0	0	0	0		0	1
Erosion and Sediment Control Failure	0	0	1	1	1	0	0		0	0
Fire	1	0	1	1	1	1	0		0	1
Hazardous Material Spill	0	1	1	1	1	0	0		0	0
Vehicle Accident	1	0	0	0	0	0	0		1	1
Discovery of Heritage Resource	0	0	0	0	0	0	1		0	0

5.7.3.1 Interactions Ranked as 0

None of the Identified Project-related Accidents, Malfunctions, or Unplanned Events will interact with the various VECs ranked as 0 in Table 5.26 during any phase.

5.7.3.2 Interactions Ranked as 1

5.7.3.2.1 Worker Accident

A Worker Accident has the potential to interact with Public Health and Safety as it may result in harm, injury, or death to workers. A Worker Accident will not interact with any other VEC and thus its effects on these other VECs for which the interactions were ranked as 0 in Table 5.26 are rated not significant, and are not discussed further.

All workers will be properly trained in practices to prevent workplace accidents including WHMIS, first aid, and other applicable training programs. These procedures are designed to prevent serious injury to staff and the general public as well as to minimize the occurrence of unplanned events and minimize any potential damage to the environment.

Interactions between a Worker Accident and Public Health and Safety will be mitigated by compliance with health and safety legislation, safety by design, and implementation of environmental management measures aimed at protecting human health. Safety risks to

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

workers will be reduced by complying with the requirements of various governing standards including the federal Canada Labour Code, the federal *Transportation of Dangerous Goods Act*, the Prince Edward Island *Occupational Health and Safety Act*, and the Prince Edward Island *Workers Compensation Act* and all associated regulations. Adherence to public safety codes and regulations will help ensure that the Project is carried out in a safe manner to protect workers and the public.

With the application of, and compliance with, these Acts, regulations, and standards, including the application of safety and security measures that are known to effectively mitigate the potential environmental effects, the potential environmental effects of a Worker Accident on Public Health and Safety during Construction and Operation and Maintenance of the Project are rated not significant.

5.7.3.3 Failure of Erosion or Sedimentation Control Measures

A Failure of Erosion or Sedimentation Control Measures has the potential to interact with the Marine Environment, Terrestrial Environment, and Freshwater Environment as indicated by their ranking of 1 in Table 5.26. A Failure of Erosion or Sedimentation Control Measures would not interact with any other VEC and thus their environmental effects on these other VECs for which the interactions were ranked as 0 in Table 5.26 are rated not significant, and are not discussed further.

A failure of erosion or sedimentation control structures could occur as a result of human error or heavy precipitation events, particularly during construction activities. Such failures could result in the release of sediment-laden runoff to the surrounding environment, with potential adverse environmental effects on marine and freshwater fish and fish habitat. Terrestrial habitats could be adversely affected by such a failure.

Temporary erosion and sediment control measures will be installed prior to initial disturbance in areas susceptible to erosion, and will be properly maintained throughout Construction until restoration is completed. Temporary measures may include, but are not limited to, the following:

- installing sediment traps to contain sediment eroded from slopes such as at the base of lower slopes
- seeding with non-invasive native species
- grading exposed faces to a slope which minimizes the potential for erosion
- mulching exposed slopes to minimize erosion/runoff

When necessary, work will be scheduled or suspended to avoid periods of heavy precipitation or prolonged periods of saturated ground conditions. Erosion and sediment control measures will be monitored during Construction by personnel, particularly after a heavy precipitation event that results in the visible overland flow of water. Remedial action will be taken as necessary.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

With these mitigation measures and emergency response procedures implemented, and because of the low likelihood of such events, the potential environmental effects of Failures of Erosion or Sedimentation Control Measures on the Marine Environment, Freshwater Environment, and Terrestrial Environment during all phases of the Project are rated not significant.

5.7.3.3.1 Fire

A Fire at the Project location could interact with the Atmospheric Environment (emissions of smoke), Public Health and Safety (potential safety risks to workers), Land Use (potential for substantive loss or damage to property of resources), and the Terrestrial, Freshwater and Marine Environments (potential contamination with sediment-laden water used in extinguishing the fire). A Fire will not interact with any other VEC and thus its environmental effects on these other VECs for which the interactions were ranked as 0 in Table 5.26 are rated not significant, and are not discussed further.

A Fire may arise from Project heavy equipment or from natural causes such as a lightning strike. In the unlikely event that a Fire occurred, the immediate concern for a Fire would be for human health and safety. Local air quality conditions may deteriorate through the duration of the fire.

Personnel will take the necessary precautions to prevent fire hazards when at the work site and will keep the site free of all flammable waste. The Proponent will ensure that all personnel are trained in the use of fire-extinguishing equipment. In the unlikely event of a fire, local emergency response will be able to reduce the severity and extent of damage.

The emissions from a fire would likely consist mainly of smoke (particulate matter) and CO₂ but could also include CO, NO₂, SO₂, and other products of incomplete combustion. A large fire could create particulate matter levels greater than the ambient air quality standard over distances of several kilometers, but such situations would be of short duration, infrequent, and are not expected to occur because of the limited nature of the Project, planned mitigation, and prevention measures.

The potential environmental effects of a Fire on Atmospheric Environment, Public Health and Safety, Terrestrial Environment, Land Use, and Marine Environment during Construction, and Operation and Maintenance of the Project are rated not significant.

5.7.3.3.2 Hazardous Material Spill

A Hazardous Material Spill may interact with Groundwater Resources, Marine Environment, Freshwater Environment, and Terrestrial Environment. A Hazardous Material Spill will not interact with any other VEC and thus its environmental effects on these other VECs for which

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

the interactions were ranked as 0 in Table 5.26 are rated not significant, and are not discussed further.

A spill of fuel, oil, lubricants, or other hazardous materials may occur during Construction or Operation and Maintenance activities, through damage to vehicles, leaks from Project components. Any spill is usually highly localized and easily cleaned up by on-site crews using standard equipment. Large quantities of hazardous materials will not be used by or stored as part of the Project, therefore a large spill is not considered to be a possibility.

The contractor will be required to provide environmental training, as well as training in spill prevention and response to Construction personnel. Prior to the commencement of Construction activities, the Proponent will ensure that spill response equipment is readily available. All spills will immediately be contained, cleaned, and reported to applicable authorities as per the following guidelines:

- all contaminated material or potentially hazardous material will be contained
- proper safety precautions (e.g., protective clothing and footwear) will be taken
- the Proponent will follow their Spill Response Policy and will ensure that PEIDELJ or the Canadian Coast Guard Maritimes Regional Office's Environmental Emergencies 24-hour Report Line at 1-800-563-9089 is notified
- contaminated wastes, such as used cleaning cloths, absorbents, and pads, will be stored in proper waste containers
- waste material will be disposed of at approved disposal facilities

Construction equipment will be cleaned and maintained in good working condition, with visual inspections of equipment performed on a regular basis. Petroleum products such as gasoline, diesel fuel, and oil will be properly labeled in accordance with the appropriate legislation and regulations. Refuelling, oiling, and maintenance of equipment, as well as storage of hazardous materials, will be conducted in a designated and contained area. Servicing of equipment (e.g., oil changes and hydraulic repairs) will be completed off site when possible. When required at the site, work will be completed over an impervious tarp or a tray. Vehicles will be equipped with spill containment and clean-up materials.

Personnel handling fuels and hazardous wastes will have WHMIS training and will be qualified to handle these materials in accordance with the manufacturer's instructions and applicable regulations. Hazardous waste and storage area(s) will be clearly marked and secured. Industrial waste will be reused or recycled on a priority basis. Where reuse or recycling opportunities are not available, industrial waste will be collected and disposed of at an approved facility. Garbage receptacles for solid non-hazardous wastes will be available. These wastes will be collected on a regular basis or as they are generated and will be disposed of at approved locations.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

With these mitigation measures and emergency response procedures implemented, and because of the low likelihood of such events, the potential environmental effects of a Hazardous Material Spill on Groundwater Resources, Marine Environment, and Terrestrial Environment during Construction and Operation and Maintenance of the Project are rated not significant.

5.7.3.3.3 Vehicle Accident

A Vehicle Accident arising from Project-related activities may interact with Atmospheric Environment, Transportation, and Public Health and Safety. A Vehicle Accident will not interact with any other VEC and thus its environmental effects on these other VECs for which the interactions were ranked as 0 in Table 5.26 are rated not significant, and are not discussed further. Note that the potential for a fire or hazardous material spill which could be associated with a vehicle accident or other means has been addressed above.

The potential for a Vehicle Accident to occur exists during Construction and Operation and Maintenance of the Project. Worker traffic and truck traffic to and from the site, and the operation of heavy equipment on-site during Construction have the potential to result in a vehicle accident during Construction. The Project-related vehicles will observe all traffic rules and provincial and federal highway regulations. Trucking activity will take place on designated truck routes, and observe speed limits and weight restrictions.

A pedestrian strike resulting in severe injury could occur during Construction. Standard construction practices will be adhered to including use of temporary highway markings, dividers and the use of proper signage, flagging and lighting, within construction zones will reduce the probability of a pedestrian-strike. A pedestrian strike during Operation and Maintenance is less likely to occur due to the nature of the area (*i.e.*, rural).

Because the Project will comply with all applicable traffic rules and regulations, the nominal increase in traffic volumes as a result of the Project, and because safety measures will be implemented during Construction, the potential environmental effects of a Vehicle Accident on Transportation and Public Health and Safety during Construction and Operation and Maintenance of the Project are rated not significant.

5.7.3.4 Discovery of a Heritage Resource

The Discovery of a Heritage Resource has the potential to interact only with Heritage Resources and was assigned a ranking of 1 in Table 5.26, reflecting the low probability that a previously undiscovered heritage resource (archaeological or paleontological) may be uncovered as a result of the Project. Such a discovery would be most likely to occur from earthworks and excavation activities during Construction. Discovery of a Heritage Resource will not interact with any other VEC and thus its environmental effects on these other VECs for which the interactions were ranked as 0 in Table 5.26 are rated not significant, and are not discussed further.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

A significant 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 significant. The disturbance of an individual artifact is not normally considered significant.

In the unlikely event that a heritage resource is discovered, the Contractor will notify PEITIR; all work will cease in the immediate area of the discovery, and the provincial Archaeologist will be contacted immediately at (902) 368-5378. Work in the area will only continue if approval is received from the authorities having jurisdiction to resume these activities, and the Project will continue in compliance with mitigation strategies required by the provincial regulators or other regulatory bodies having an interest in heritage resource protection.

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 emergency and contingency response procedures that would be used in the unlikely event of such a discovery, the potential environmental effects of a Discovery of a Heritage Resource on Heritage Resources during Construction and Operation and Maintenance of the Project are rated not significant.

5.7.3.5 Interactions Ranked as 2

There were no interactions ranked as 2 in Table 5.26. Accordingly, by definition, the potential environmental effects of all Accidents, Malfunctions, and Unplanned Events are rated not significant.

5.7.4 Determination of Significance

The Project is being designed, and will be constructed and operated with the utmost regard for health, safety, and environmental protection to minimize its potential environmental effects that could result during the normal course of Construction and Operation and Maintenance as well as those that could result from Accidents, Malfunctions, and Unplanned Events.

The careful planning of the Project and the implementation of proven and effective mitigation will minimize the potential for Accidents, Malfunctions, and Unplanned events to occur. There are no potential environmental effects that could occur as a result of Accidents, Malfunctions, or Unplanned Events that would cause a significant adverse environmental effect to any VEC, during any phase of the Project. In the very unlikely and improbable event that an Accident, Malfunction, or Unplanned Event of any considerable magnitude were to occur, it would be of a short duration, low frequency, or limited geographic extent such that significant adverse environmental effects to any VEC would be very unlikely to occur.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Overall, given the nature of the Project and credible Accidents, Malfunctions, and Unplanned Events considered, and in light of the nature of the Project and proposed mitigation, the potential environmental effects of all Project-related Accidents, Malfunctions, and Unplanned Events on all VECs during all phases of the Project, are rated not significant.

6.0 CONCLUSION

In this EA, Stantec conducted an assessment of the proposed new and upgraded Trans-Canada Highway realignment from the St. Catherines Road in Bonshaw west of the West River crossing (*i.e.*, Bonshaw Bridge) heading east to just east of West River Road (Route 9) in New Haven, Queens County, PEI proposed by the PEI Department of Transportation and Infrastructure Renewal.

6.1 Scope of the Environmental Assessment

An EA of the Project is required under Section 9(1) of the PEI *EPA* and section 5 of *CEAA*. This EA follows Stantec EA Methodology that has been developed to meet the requirements of the PEI *EPA* and *CEAA*.

The EA 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. Environmental effects were assessed for each phase of the Project (*i.e.*, Construction and Operation and Maintenance), where relevant, as well as for credible accidents, malfunctions, and unplanned events. The assessment was conducted within defined boundaries (spatial, temporal, administrative, and technical) for the assessment and in consideration of defined residual environmental effects rating criteria aimed at determining the significance of the environmental effects. The EA considered measures that are technically and economically feasible that would mitigate any significant adverse environmental effects of the Project.

6.2 Environmental Effects Assessment

Of the VECs identified for further evaluation, a considerably more substantive environmental effects assessment was conducted for Atmospheric Environment, Freshwater Environment, Terrestrial Environment, Land Use, Effects of the Environment on the Project, as well as Accidents, Malfunctions, and Unplanned Events. These VECs were identified by the Study Team (based on experience and professional judgment) as being the key components for which substantive interactions with the Project were anticipated or could occur. Table 6.1 summarizes the results of environmental effects analysis for the proposed highway realignment.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI**

Table 6.1 Potential Environmental Effects Analysis Summary

Environmental Components	Project Phase/ or Component	Description of Potential Environmental Effects	Significance of the Effect*	Recommended Mitigation Measures / or Best Management Practices (BMPs)	Residual Effect (If yes, provide a description)	Significance of Residual Effect*	Monitoring	Follow-up
Atmospheric Environment (Change in Air Quality)	Construction	There is potential for Project activities to release contaminants in to the air during Construction activities.	NS	<ul style="list-style-type: none"> • Apply dust suppressants as required • Follow equipment maintenance schedules • Environmental awareness training with Key Contract Personnel will include vehicle idling • Minimize activities that generate large quantities of dust during high winds 	Overall, given the nature of the Project and the proposed mitigation, the potential environmental effects of the Construction activities on Air Quality are rated not significant, with a high level of confidence.	NS	NA	NA

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 6.1 Potential Environmental Effects Analysis Summary

Environmental Components	Project Phase/ or Component	Description of Potential Environmental Effects	Significance of the Effect*	Recommended Mitigation Measures / or Best Management Practices (BMPs)	Residual Effect (If yes, provide a description)	Significance of Residual Effect*	Monitoring	Follow-up
Atmospheric Environment (Change in Sound Quality)	Construction	There is potential for Project activities to produce sound emissions in the form of unwanted noise during Construction activities.	NS	<ul style="list-style-type: none"> Work will be limited to the daytime hours 	Overall, given the nature of the Project and the proposed mitigation, the potential environmental effects of the Construction activities on Sound Quality are rated not significant, with a moderate level of confidence.	NS	NA	NA
Atmospheric Environment (Change in Sound Quality)	Construction	There is potential for Project activities to produce sound emissions in the form of unwanted noise during Construction activities.	S	<ul style="list-style-type: none"> Use well maintained equipment with quality mufflers Notify residents within 500 m of major Construction activities and update on progress Compliant follow-up and response procedures 	Overall, given the nature of the Project and the proposed mitigation, the potential environmental effects of the Construction activities on Sound Quality are rated not significant, with a moderate level of confidence.	NS	NA	NA

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI**

Table 6.1 Potential Environmental Effects Analysis Summary

Environmental Components	Project Phase/ or Component	Description of Potential Environmental Effects	Significance of the Effect*	Recommended Mitigation Measures / or Best Management Practices (BMPs)	Residual Effect (If yes, provide a description)	Significance of Residual Effect*	Monitoring	Follow-up
Atmospheric Environment (Change in Sound Quality)	Operation and Maintenance	There is potential for the Project to produce sound emissions in the form of unwanted noise during Operation and Maintenance activities.	NS	<ul style="list-style-type: none"> None needed (negligible change predicted) 	Overall, given the nature of the Project and the small magnitude of the expected change in sound quality during Operation and Maintenance, Sound Quality is rated not significant, with a moderate level of confidence.	NS	NA	NA

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 6.1 Potential Environmental Effects Analysis Summary

Environmental Components	Project Phase/ or Component	Description of Potential Environmental Effects	Significance of the Effect*	Recommended Mitigation Measures / or Best Management Practices (BMPs)	Residual Effect (If yes, provide a description)	Significance of Residual Effect*	Monitoring	Follow-up
Freshwater Environment	Construction	There is potential for the Project to affect the Freshwater Environment through changes in fish populations, fish habitat, and water quality.	NS	<ul style="list-style-type: none"> Erosion and sediment control measures will be implemented (as per PEITIR Project Specific Sediment and Erosion Control Plan). All barren soil will be stabilized for over-wintering. Measures will include placing flexible growth medium (e.g., Flexterra® or similar product) within 30 m of water courses/ wetlands as well as hydroseeding and hay mulching the remaining areas. Rip-rap lined ditches leading to sediment traps may be installed in the steepest areas. Instream sediment traps may be also installed in these areas. Hazardous materials will be properly stored at least 30 m away from all wetlands/watercourses. 	The residual environmental effects of Construction on a Change in Freshwater Environment have been rated not significant with a high level of confidence in the prediction of this rating.	NS	Compliance monitoring of the EPP	NA

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 6.1 Potential Environmental Effects Analysis Summary

Environmental Components	Project Phase/ or Component	Description of Potential Environmental Effects	Significance of the Effect*	Recommended Mitigation Measures / or Best Management Practices (BMPs)	Residual Effect (If yes, provide a description)	Significance of Residual Effect*	Monitoring	Follow-up
Freshwater Environment (Cont'd.)				<ul style="list-style-type: none"> • Visual monitoring in the vicinity of the project to ensure the turbidity is limited; if an excessive change occurs due to construction activities, work will stop and sediment control measures will be re-evaluated. • Any construction debris or other material (e.g., plastic, food scraps, etc.) that enters the freshwater environment must be removed immediately and disposed in a provincially approved manner. • If required, authorization under Section 35(2) of the Fisheries Act will be acquired prior to construction. • Project Specific EPP has been prepared for the construction project. • Construction Contractor is required to have an Environmental Control Manager on site at all times during Construction. • A water quality monitoring program for total suspended solids (TSS) will be conducted during construction to ensure sedimentation and erosion controls are working. 				

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 6.1 Potential Environmental Effects Analysis Summary

Environmental Components	Project Phase/ or Component	Description of Potential Environmental Effects	Significance of the Effect*	Recommended Mitigation Measures / or Best Management Practices (BMPs)	Residual Effect (If yes, provide a description)	Significance of Residual Effect*	Monitoring	Follow-up
Terrestrial Environment	Construction	There is potential for the Project to affect the Terrestrial Environment through changes in terrestrial populations and changes in wetlands.	NS	<ul style="list-style-type: none"> • Avoid known locations of plant and wildlife SAR and SOCC, where feasible • Conduct clearing activities in fall and/or winter, outside the breeding season of migratory birds, also when bats are no longer roosting • Establish buffers and protect active migratory bird nests until fledging, upon their discovery in work areas • Include any SAR or SOCC found within or adjacent to the PDA in post-construction monitoring and follow-up plans • Flag any vascular plant SAR or SOCC found within 30 m of the PDA, and minimize Construction adjacent to the plants whenever feasible • Keep litter and garbage contained. Use designated roadways and access roads • Limit the extent of clearing to the outside toe of slope in important habitats, such as old hemlock stands and wetlands, when feasible • Flag off environmentally sensitive areas prior to site clearing and construction 	The residual environmental effects of Construction on a Change in Terrestrial Populations and a Change in Wetlands have been rated not significant with a high level of confidence in the prediction of this rating.	NS	Compliance monitoring of the EPP	NA

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI**

Table 6.1 Potential Environmental Effects Analysis Summary

Environmental Components	Project Phase/ or Component	Description of Potential Environmental Effects	Significance of the Effect*	Recommended Mitigation Measures / or Best Management Practices (BMPs)	Residual Effect (If yes, provide a description)	Significance of Residual Effect*	Monitoring	Follow-up
<p>Terrestrial Environment (Cont'd.)</p>				<ul style="list-style-type: none"> • Limit Project-related activity outside of the PDA • Use the designated roadways and access roads • Follow the project specific EPP • Follow conditions of any environmental permits. • Follow the mitigation sequence of avoidance, minimization, and compensation • Employ standard erosion and sediment control measures outlined in the PEITIR Project Specific Sediment and Erosion Control Plan • Design culverts to accommodate water level equalization to allow peak and low flows in wetland areas • Minimize channeling near wetlands. • Use clean, coarse fill materials within and near wetland areas • Clean construction machinery prior to entering and leaving wetlands to reduce the spread of potential invasive species • Construction Contractor is required to have an Environmental Control Manager on site at all times during Construction 				

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 6.1 Potential Environmental Effects Analysis Summary

Environmental Components	Project Phase/ or Component	Description of Potential Environmental Effects	Significance of the Effect*	Recommended Mitigation Measures / or Best Management Practices (BMPs)	Residual Effect (If yes, provide a description)	Significance of Residual Effect*	Monitoring	Follow-up
Marine Environment	Construction/ Operation and Maintenance	No anticipated environmental effects.	NS	<ul style="list-style-type: none"> A silt curtain will be installed around the perimeter of the armourstone prior to pile driving during bridge widening activities. The construction manager will monitor the stability of the structure on a daily basis to ensure the silt curtain is functioning properly. 	NA	NS	NA	NA
Groundwater Resources	Construction/ Operation and Maintenance	Vibration from heavy equipment and excavation could temporarily affect water quality in the immediate area of construction.	NS	<ul style="list-style-type: none"> Well surveys will be done within 100 m of areas where major cuts will be conducted. 	NA	NS	NA	NA
Land Use	Construction	The Project has the potential to affect Land Use through changes in residential, commercial, agricultural, and institutional land use.	S	<ul style="list-style-type: none"> Fair market value will be offered for land acquisition Access to lands will be maintained where possible Temporary detours will be provided, if necessary The project specific EPP will be followed and will include guidelines for reduction of noise, dust, and air emissions Erosion and sedimentation control will be in place during all phases of the Project 	The residual environmental effects of Construction on a Change in Land Use have been rated not significant with a high level of confidence in the prediction of this rating.	NS	Compliance monitoring of the EPP	NA

DRAFT ENVIRONMENTAL ASSESSMENT (EA):
 TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI

Table 6.1 Potential Environmental Effects Analysis Summary

Environmental Components	Project Phase/ or Component	Description of Potential Environmental Effects	Significance of the Effect*	Recommended Mitigation Measures / or Best Management Practices (BMPs)	Residual Effect (If yes, provide a description)	Significance of Residual Effect*	Monitoring	Follow-up
Land Use	Operation and Maintenance	The Project has the potential to affect Land Use through changes in residential, commercial, agricultural, and institutional land use.	S	<ul style="list-style-type: none"> Access to lands will be maintained where possible 	The residual environmental effects of Operation and Maintenance on a Change in Land Use have been rated not significant with a high level of confidence in the prediction of this rating.	NS	Compliance monitoring of the EPP	NA
Archaeology and Heritage Resources	Construction/ Operation and Maintenance	No anticipated environmental effects.	NS	NA	NA	NS	Periodic site inspection by a qualified archaeologist	NA
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons	Construction/ Operation and Maintenance	No anticipated environmental effects.	NS	NA	NA	NA	NA	NA
Transportation	Construction/ Operation and Maintenance	No anticipated environmental effects.	NS/ ME	NA	NA	NS	NA	NA

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS COUNTY, PEI**

Table 6.1 Potential Environmental Effects Analysis Summary

Environmental Components	Project Phase/ or Component	Description of Potential Environmental Effects	Significance of the Effect*	Recommended Mitigation Measures / or Best Management Practices (BMPs)	Residual Effect (If yes, provide a description)	Significance of Residual Effect*	Monitoring	Follow-up
Public Health and Safety	Construction/ Operation and Maintenance	No anticipated environmental effects.	NS	NA	NA	NS	NA	NA
Effects of Environment on the Project	Construction/ Operation and Maintenance	Severe weather events and climate change have the potential to delay construction and/or operation and maintenance by causing damage infrastructure.	S	The Project will be designed in compliance with various codes, standards, best practices, acts, and regulations that govern the required structural integrity, safety, reliability, and environmental and operating performance of the Project to minimize the potential for adverse effects of the environment on the Project.	Overall, in consideration of the nature of the environmental forces and planned mitigation, a significant adverse residual effect on the environment is not expected.	NS	NA	NA

* Different methods/criteria can be used to define the Significance of the effect (or the significance of residual effect).

S: Significant adverse environmental effect
 ME: Minor Adverse Effect/ Mitigable Effect (Not Significant)
 NS: Not significant adverse environmental effect

M: Monitoring required
 F: Follow-up required
 NA: Not required or not applicable

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

The EA concluded that the potential environmental effects of the Project for all VECs would be not significant during all phases of the Project and for all activities to be conducted as part of the Project. These conclusions were reached in consideration of the nature of the Project itself, the nature and extent of its environmental effects, and the planned implementation of proven and effective mitigation as part of the Project throughout its design, construction, commissioning, and operation and maintenance. 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. The environmental effects and significance predictions were made with a high level of confidence by the Study Team.

6.3 Follow-Up and Monitoring

Where appropriate and/or required, follow-up and monitoring measures aimed at verifying the environmental effects predictions or the effectiveness of mitigation were identified. Other than for routine compliance monitoring during Construction, no specific follow-up and monitoring measures were required as a result of this EA.

6.4 Overall Conclusion

Based on the results of this EA, it is concluded that, with planned mitigation, the residual environmental effects of the Project during all phases, including cumulative environmental effects, are rated not significant and the Project should proceed as is described within this EA.

7.0 CLOSING

This report has been prepared by Stantec Consulting Ltd. (Stantec) for the sole benefit of the PEI Department of Transportation and Infrastructure Renewal (PEITIR). 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 PEITIR.

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 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 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 the 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.

STANTEC CONSULTING LTD.

(digital not signed)

Dale Conroy, M.Sc.
Associate, Project Manager
Environmental Management

(digital not signed)

Michael C. Murphy, PhD, P.Eng.
Senior Reviewer
Environmental Management

8.0 REFERENCES

- ACCDC. 2012. Species Location Data. Ordered online through <http://www.accdc.com/products/dataproducts.html>
- Bruel & Kjaer. 1984. Measuring Sound, Revision September 1984, Printed in Denmark by K. Larsen & Sons, 1984.
- British Columbia Water Land and Air Protection (BCWLAP). 1995. Final Air Quality Objectives for Formaldehyde and the Interim Air Quality Objective for Fine Particulate: PM₁₀. January 1995.
- Canadian Endangered Species Conservation Council (CESCC). 2012. Wild Species – General Status Ranks. Available at: <http://www.wildspecies.ca/ranks.cfm?lang=e>. Last updated March 20, 2012.
- Canada's Historic Places. No date (nd). Strathgartney Homestead National Historic Site of Canada. Accessed online May 17, 2012 at: <http://www.historicplaces.ca/>.
- Canadian Council of Ministers of the Environment (CCME). 1999. National Ambient Air Quality Objectives. Accessed online January 12, 2011 at: <http://documents.ccme.ca/download/en/133/>.
- Canadian Council of Ministers of the Environment (CCME). 2000. Canada Wide Standards for Particulate Matter and Ozone, Quebec City, PQ, June 2000. Accessed online January 12, 2011 at: http://www.ccme.ca/assets/pdf/pmozone_standard_e.pdf.
- Canadian Council of Ministers of the Environment (CCME). 1987. Canadian Water Quality Guidelines for the Protection of Aquatic Life. pH guideline.
- Canadian Endangered Species Conservation Council. 2011. Wild Species 2010 : The General Status of Species in Canada. National General Status Working Group.
- Canadian Environmental Assessment Agency (CEA Agency). 2003. Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners. Accessed online December 12, 2010 at: http://www.ceaa.gc.ca/012/014/index_e.htm.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Canadian Environmental Assessment Registry (CEAR). 2012. Canadian Environmental Assessment Agency, Project Registry Database. Accessed online April 26, 2012 at: http://www.ceaa-acee.gc.ca/050/index_e.cfm.

Canadian Council of Ministers of the Environment (CCME). 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Updated 2001, 2002, 2003, 2005, 2006 and 2007.

City of Charlottetown. 1989. Nuisance Bylaw. Amended October 23, 2007.

Climate Change and Climate Variability in Atlantic Canada. 1997. Volume VI of the Canada Country Study: Climate Impacts and Adaptation.

Comprehensive Air Management Steering Committee. 2010. Comprehensive Air Management System – a Proposed Framework to Improve Air Quality Management, April 2010.

Cornell Lab of Ornithology. 2011a. Olive-sided Flycatcher. Accessed online May 1, 2012 at: <http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011b. Barn Swallow. Accessed online May 1, 2012 at: <http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011c. White Breasted Nuthatch. Accessed online May 1, 2012 at: <http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011d. Eastern Bluebird. Accessed online May 1, 2012 at: <http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011e. Evening Grosbeak. Accessed online May 1, 2012 at: <http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011f. Pine Siskin. Accessed online May 1, 2012 at: <http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011g. Rose-breasted Grosbeak. Accessed online May 1, 2012 at: <http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011h. Bay-breasted Warbler. Accessed online May 1, 2012 at: <http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011i. Tennessee Warbler. Accessed online May 1, 2012 at: <http://www.allaboutbirds.org/guide/search>

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Cornell Lab of Ornithology. 2011j. Eastern Kingbird. Accessed online May 1, 2012 at:
<http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011k. Killdeer. Accessed online May 1, 2012 at:
<http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011l. Eastern Wood-Pewee. Accessed online August 1, 2012 at:
<http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011m. Belted Kingfisher. Accessed online August 1, 2012 at:
<http://www.allaboutbirds.org/guide/search>

Cornell Lab of Ornithology. 2011n. Bank Swallow. Accessed online August 1, 2012 at:
<http://www.allaboutbirds.org/guide/search>

Delphi Systems Inc. 2000. Review of TCH Improvement Options: Borden – Cornwall.
Prepared by Delphi Systems Inc for Prince Edward Island Department of Transportation
and Public Works. January 2000.

Environment Canada. 2004. Code of Practice for the Environmental Management of Road
Salts. Accessed online June 25, 2010 at:
<http://canadagazette.gc.ca/part1/2004/20040403/html/notice-e.html#i1>.

Environment Canada. 2011. Charlottetown. National Climate Data and Information Archive.
Accessed online May 9, 2012 at:
http://www.climate.weatheroffice.gc.ca/climate_normals/index_e.html

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

Federal Highway Administration (FHWA). 2006. US Department of Transportation FHWA
Roadway Construction Noise Model User's Guide. Final Report, January 2006. Report
no. FHWA-HEP-05-054. Prepared by the US DOT, Research and Innovative Technology
Administration.

Fisheries and Oceans Canada (DFO). 1986. The Department of Fisheries and Oceans, Policy
for the Management of Fish Habitat. Communications Directorate, Department of
Fisheries and Oceans, Ottawa, Ontario. ISBN 0-662-15033-3. Available online at:
<http://www.dfo-mpo.gc.ca/Library/23654.pdf>. Last accessed on November 8, 2010.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

- Fisheries and Oceans Canada (DFO). 1998. Guidelines for the Protection of Fish and Fish Habitat: The Replacement and Design of Large Culverts. Fisheries and Oceans Canada, Maritimes Region.
- Galloway, Gloria. 2010. Tory senators kill climate bill passed by House. The Globe and Mail, November 17, 2010. Accessed January 12, 2010. Available online at <http://www.theglobeandmail.com/news/politics/ottawa-notebook/tory-senators-kill-climate-bill-passed-by-house/article1802519/>.
- Government of Canada. 2008. Regulatory Framework for Industrial Greenhouse Gas Emissions. Published March, 2008. Accessed online May 11, 2012 at: <http://www.ec.gc.ca/Publications/C16DAFD9-E250-46DC-8B26-3F0DF2E7A75%5CTurning-The-Corner-Regulatory-Framework-for-Industrial-Greenhouse-Gas-Emissions.pdf>
- Government of Canada. 1999. National Ambient Air Quality Objectives, Maximum Acceptable Levels.
- Government of PEI. 2004. Chapter E-9, Environmental Protection Act, Air Quality Regulations. Accessed online December 17, 2010 at: <http://www.gov.pe.ca/law/regulations/pdf/E&09-02.pdf>
- Government of PEI. 2008. Prince Edward Island and Climate Change : A Strategy for Reducing the Impacts of Global Warming. Published November, 20, 2008. Accessed online December 13, 2008 at: <http://www.gov.pe.ca/publications/getpublication.php3?number=1463>.
- Government of PEI. 2011a. McArthur Family Cemetery. Accessed online May 7, 2012 at: http://maps.gov.pe.ca/mapserver2012/PEI_Maps/Historic_Places/tool.php
- Government of PEI. 2011b. Strathgertney Homestead Cemetery. Accessed online May 7, 2012 at: http://maps.gov.pe.ca/mapserver2012/PEI_Maps/Historic_Places/tool.php
- Government of PEI. 2011c. Bonshaw Pioneer Cemetery. Accessed online May 7, 2012 at: http://maps.gov.pe.ca/mapserver2012/PEI_Maps/Historic_Places/tool.php
- Hajek J., C. Blaney, and D. Hein. 2006. Mitigation of Highway Traffic-Induced Vibration. Session on Quiet Pavements: Reducing Noise and Vibration. Paper presented at the 2006 Annual Conference of the Transportation Association of Canada, Charlottetown, Prince Edward Island.
- Health Canada. 2010. Guidelines for Canadian Drinking Water Quality Summary Table. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal- Provincial-Territorial Committee on Health and the Environment.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Health Canada . 2008b. Michaud, D. S.; S.H.P, Bly; S.E.Keith; Using a Change in Percent Highly Annoyed with Noise as a Potential Health Effect Measure for Projects Under the Canadian Environmental Assessment Act. Canadian Acoustics. Volume 36. No. 2. 2008.

Hinds, H.R. 2000. Flora of New Brunswick, 2nd ed. University of New Brunswick Press, Fredericton, New Brunswick.

Historic Places of Prince Edward Island. No date (nd). Accessed online May 17, 2012 at: <http://www.gov.pe.ca/hpo/index.php3?number=1017977&lang=E>

Kollmorgen Instruments Company. 1990. Munsell Soil Color Charts. Kollmorgen Corporation. Baltimore, Maryland.

Lines, G.S.; M. Pancura; C.Lander. 2005. Building Climate Change Scenarios of Temperature and Precipitation in Atlantic Canada Using the Statistical Downscaling Model (SDSM). Meteorological Service of Canada. Atlantic Region. Science Report Series 2005-9 October 2006 revision.

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. Meteorological Service of Canada. Atlantic Region. Science Report Series 2009-01.

MacDougall, J., C. Veer, and F. Wilson. 1988. Soils of Prince Edward Island. Land Resource Research Centre Contribution No. 83-54.

MBBA. 2010. Maritimes Breeding Bird Atlas. Accessed online December 5, 2010 at: <http://www.mba-aom.ca>

New Brunswick Department of Environment (NBENV) 2009. Wetland Delineation Minimum Requirements: Large Scale Linear Projects. Watercourse and Wetland Alteration Program. Fredericton, New Brunswick.

New Democrat Party (NDP). 2010. New democrat climate change bill passes House of Commons. Accessed online January 12, 2011 at: <http://www.ndp.ca/C311-adopted>.

Nova Scotia Department of Environment. 1989. Guideline for Environmental Noise Measurement and Assessment.

PEI DEEF. 2006. Prince Edward Island Watercourse and Wetland Alteration Guidelines. Published April 2006. Accessed online May 1, 2012 at: http://www.gov.pe.ca/photos/original/eef_wet_alter_1.pdf

PEIDELJ. 2012. Projects under Environmental Review (Undertakings). Accessed online April 13 2012 at: <http://www.gov.pe.ca/envengfor/index.php3?number=1005874&lang=E>.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Prince Edward Island. 2010. Environmental Impact Assessment Guidelines, Revised January 2010. Prince Edward Island Department of Environment, Energy and Forestry. Accessed online November 3, 2010 at: http://www.gov.pe.ca/photos/original/eia_guidelines.pdf.

Prest, V.K. 1973. Surficial Deposits of Prince Edward Island. Geological Survey of Canada.

Reid, J., MSc. Personal communication, March 22, 2012. Biologist, Miramichi Salmon Association (trout densities in the Miramichi and tributaries).

Reitsma, Len, Marissa Goodnow, Michael T. Hallworth and Courtney J. Conway. 2010. Canada Warbler (*Cardellina canadensis*), The Birds of North America Online (A. Poole, Ed.).

Seattle Audubon Society. 2008. Accessed online December 5, 2010 at: <http://www.birdweb.org/birdweb/>

Shaw, J., R.B. Taylor, S. Solomon, H.A. Christian, and D. Forbes. 1998. Potential Impacts of Sea-level Rise on Canadian Coasts. *The Canadian Geographer*: 42 (no. 4) pgs 365-379.

Species at Risk Public Registry. 2011. A to Z Species Index. Accessed online at : http://www.sararegistry.gc.ca/sar/index/default_e.cfm

Transportation Association of Canada (TAC). 1999. Geometric Design Guide for Canadian Roads. Ottawa, Ontario.

Transport Canada. 2012. CEAA Environmental Assessment Draft Scoping Document Trans-Canada Realignment Through New Haven – Churchill, Queens County, Prince Edward Island. Issued April 16, 2012.

Transportation Research Board. 1991. Special Report 235 Highway Deicing Comparing Salt and Calcium Magnesium Acetate. Section 4: Road Salt Impacts on the Environment. Prepared by Committee on the Comparative Costs of Rock Salt and Calcium Magnesium Acetate (CMA) for Highway Deicing. Prepared for the Transportation Research Board, National Research Council. Washington, D.C.

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Field Indicators of the Hydric Soils in the United States, Version 6.0. G.W. Hurt and L.M. Vasilas (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

U.S. Army Corps of Engineers. 2008. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Draft), ed. J. S.

**DRAFT ENVIRONMENTAL ASSESSMENT (EA):
TRANS-CANADA HIGHWAY REALIGNMENT THROUGH NEW HAVEN-BONSHAW, QUEENS
COUNTY, PEI**

Wakeley, R. W. Lichvar, and C. V. Noble. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Vasseure, L and Catto, N. 2008. Atlantic Canada; in From Impacts to Adaptation: Canada in a Changing Climate 2007, Government of Canada, Ottawa, ON, P.119-170.

World Health Organization (WHO). 1999. Guidelines for Community Noise, edited by: Berglund, B, Lindvall, T., and D.H. Schwela, World Health Organization, Geneva, April, 1999. Accessed online May 4, 2010 at: <http://whqlibdoc.who.int/hq/1999/a68672.pdf>.