Dominion Street Schedule C Municipal Class Environmental Assessment

Environmental Study Report

Prepared for the Corporation of the Town of Caledon

GHD | 65 Sunray Street Whitby Ontario L1N 8Y3 Canada

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Executive Summary

Introduction

GHD Limited (GHD) was retained by the Corporation of the Town of Caledon to undertake a Municipal Class Environmental Assessment[1] (MCEA) to investigate feasible bank stabilization and bridge rehabilitation activities in order to improve safety and access based on the current and future utilization of Dominion Street and the Dominion Street Bridge.

The intent of the Dominion Street Class EA is three-fold:

1. To identify and evaluate the levels of risk associated with the riverbank and road embankment along Dominion Street
2. To identify a preferred long-term treatment strategy for existing Dominion Street and the bridge
3. To identify and evaluate the potential for additional access/service roads connecting to Dominion Street

The proposed undertaking will respect the natural habitat and species within the Credit River, such as Redside Dace, as well as the cultural heritage component of the existing Dominion Street Bridge.

Consultation

Public consultation is an integral component of the Class EA processes. The Dominion Street Class EA ensured that the interests and/or concerns of the public, affected groups and applicable government agencies were identified, documented, assessed, and appropriately considered. The Dominion Street Class EA fulfilled the consultation objectives of the Class EA process through the completion of the following consultation activities:

- Online posting on the Town's website (https://www.caledon.ca/en/news/index.aspx?newsId=d5215132-6273-4e01-b685-c930de407dc4), advertisement placements and direct distributions, including Notices of Study Commencement, information and report availability (project status update), public information centres, survey work, geotechnical investigation and road closure, and Study Completion
- Facilitation of agency meetings with the Credit Valley Conservation Authority (CVC), Ministry of Natural Resources and Forestry (MNRF), the Niagara Escarpment Commission (NEC), Ontario Parks, the Regional Municipality of Peel (Peel Region), and the Mississaugas of the New Credit First Nation (MNCFN)
- Publication of newspaper/newsletter notifications in the Caledon Citizen and Caledon Enterprise

[1] Undertaken through the Municipal Engineers Association Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 and 2015) process.

- Direct mailings (hardcopy letters and email, where applicable) to applicable stakeholders (i.e., public, agencies, interested groups)
- On-going direct correspondence with individual stakeholders, as required based on comments and input received by the public, government agencies, and interest groups
- Facilitation of two (2) public information centres (PICs)
- Placement of the Dominion Street Class EA Environmental Study Report (ESR) on the public record
- Direct distribution of the Notice of Study Completion to all applicable stakeholders consistent with the Dominion Street Class EA study distribution/contact list

Existing Conditions

Dominion Street is currently a predominantly two-lane rural roadway and the connecting bridge acts as a single lane egress. Due to current roadway conditions from slope instability and erosion, the road width of Dominion Street is limited to single vehicle operation in some sections. Dominion Street is connected via an existing bridge to a low capacity arterial (Forks of the Credit Road). Dominion Street provides direct access to private residences located toward the north end of the street. Dominion Street is a vital component of the Bruce Trial, providing an active transportation linkage to the Forks of the Credit Provincial Park.

Within the study area, Dominion Street services 17 individual private residences. The study area is subject to the Town of Caledon Official Plan, the Regional Municipality of Peel Official Plan, and is regulated under the Niagara Escarpment Plan, designated as Escarpment Natural Area.

The Study Area overlaps the Niagara Escarpment and Oak Ridges Moraine Physiographic Regions as well as the Credit River valley, and is located in a relatively complex geological and hydrogeological setting.

Problem and Opportunity Statement

The primary high-level potential issues and site constraints used in the development of the problem/opportunity statement as it relates to the existing infrastructure of Dominion Street are as follows:

- Access
- Structural integrity of the bridge
- Road instability
- Topography and terrain
- Embankment protection
- Species at risk
- Cultural heritage
- The Forks of the Credit Provincial Park and Credit River

Based on the identified potential issues and site constraints, the Problem and Opportunity Statement of the Dominion Street Class EA is as follows:

> *Maintaining the structural integrity of Dominion Street and the bridge is essential to providing access to private residential dwellings located on Dominion Street. The bridge also provides access for emergency and town services. The current condition of Dominion Street and the bridge warrants either significant rehabilitation or replacement. Erosion is evident around the bridge abutments and must be addressed as part of the study. Traditional erosion measures have the potential to threaten existing mature vegetation residing on the embankment. Due to erosion and slope instability, the slumping of Dominion Street has resulted in the reduction of road width, which has proven problematic for vehicular and pedestrian movements. Dominion Street and the bridge are key linkages of the Bruce Trail and should be conserved in order to sustain pedestrian passage in addition to vehicle access while respecting cultural heritage value. The solution to this problem must be financially viable given the number of local residents serviced by Dominion Street and the bridge.*
>
> *Accordingly, an opportunity exists to remediate the identified issues surrounding the deficiencies associated with existing Dominion Street and the bridge. Access will be improved upon the completion of identified works. The potential rehabilitation provides an opportunity for the enhancement of the Bruce Trail located within the study area along Dominion Street. Cultural heritage resources have the potential to be maintained and rehabilitated for future long-term use.*

Alternative Solutions

Various alternatives solutions were considered, identified, and assessed in order to accommodate for the identified problems, opportunities, and site constraints. The following alternative solutions were developed and evaluated utilizing a qualitative evaluation methodology:

Alternative Solution 1: Do Nothing

The Do Nothing alternative is used as a benchmark for the evaluation of additional alternative solutions.

Alternative Solution 2: Re-alignment of Dominion Street

- Alternative Solution 2A: Re-alignment via Puckering Lane (**Figure 7.1**)
- Alternative Solution 2B: Re-alignment via Forks of the Credit Road (**Figure 7.2**)
- Alternative Solution 2C: Re-alignment via Forks of the Credit Provincial Park Parking Lot Facility (**Figure 7.3**)

Alternative Solution 3: Rehabilitate Existing Dominion Street and Bridge

- Alternative Solution 3A: Existing Bridge and Road Rehabilitation
- Alternative Solution 3B: New Bridge and Road Rehabilitation

Alternative Solution Evaluation

Preliminary evaluation criteria consisting of specific environmental criteria and indicators, was derived from the problem/opportunity statement, existing environmental conditions and the range of alternative solutions considered. The preliminary evaluation criteria are linked to each aspect of the environment as defined in the Ontario *Environmental Assessment Act* (*OEAA).* The following environmental components of the alternative solution evaluation criteria were considered for assessment:

- Technical assessment (*Group 1*)
- Natural environment *(Group 2)*
- Built, social, and cultural environment *(Group 3)*
- Land use and Niagara Escarpment Plan compliance *(Group 4)*
- Financial assessment *(Group 5)*

Preferred Alternative Solution

The recommended preferred alternative solution was determined based on its relative advantages and disadvantages compared to other alternatives considered. With this in mind, the three (3) Alternative Solutions were ranked according to their relative advantages and disadvantages, as identified in the Alternatives Solution Evaluation. After completion of the alternatives solution evaluation, Alternative Solution 3A has been identified as the technically preferred alternative solution to present to the public. Alternative Solution 3A was confirmed as the preferred alternative solution after completion of the PIC #1, based on public input received during this event and correspondence received shortly thereafter.

Alternative Design Concepts

The alternative design concepts for the Dominion Street Class EA consist of options for roadway configuration, various geotechnical methods for the road rehabilitation options, and structure rehabilitation or replacement alternatives pursuant to the preferred alternative solution.

Roadway Configuration Options

- Option 1: Original Road Reconfiguration
- Option 2: Two-lane ‘Local Road’ Configuration

Geotechnical Methods for Road Rehabilitation

- Method 1: Soldier Pile and Lagging System
- Method 2: Sheet Pile Walls
- Method 3: Reinforced Soil Slopes (RSS) Systems
- Method 4: Mechanically Stabilized Earth (MSE) Retaining Walls
- Method 5: Soil Nails/Micro-piles and Shotcrete Facing

- Method 6: Soil Mixed Walls
- Method 7: Tangent/Secant Pile Walls

Dominion Street Structure Alternatives

- Alternative 1: Structure Rehabilitation
- Alternative 2: Structure Replacement (Precast Concrete Box Girders)
- Alternative 3: Structure Replacement (Precast Concrete NU Girders)
- Alternative 4: Structure Replacement (Precast Concrete CPCI Girders)

Alternative Design Concept Evaluation

The following environmental components of the alternatives evaluation criteria were considered for qualitative assessment:

- Technical assessment (Transportation, Design and Operations) *(Group 1)*
- Natural environment *(Group 2)*
- Built environment, social environment, cultural environment *(Group 3)*
- Economic and Financial Assessment *(Group 4)*

The alternative design evaluation criterion consists of revised environmental criteria and indicators from the evaluation of alternative solutions. The alternative design evaluation criterion also builds on the alternative solutions evaluation framework, incorporating economic and financial feasibility in consideration of environmental net effects.

Preferred Alternative Design Concept

Based on the evaluation of the alternative design concepts, a combination of Road Option 1 (Original Road Reconfiguration), Geotechnical Method 1 (Soldier Pile and Lagging System), and Structure Alternative 1 (Structure Rehabilitation) is preferred, as these designs most appropriately address future needs and maintenance requirements, and best address the issues and site constraints as illustrated in the Problem and Opportunity Statement.

Recommended Plan

Rehabilitation of Dominion Street will consist of full road rehabilitation to the original road configuration of Dominion Street. Failed sections of the existing road will be reconstructed with a various road (single lane) width from 4.90 m to 6.20 m, consisting of unpaved shoulders and other roadside safety elements. A soldier pile and lagging system will be considered for implementation at the identified failed slope sections within the existing Dominion Street right-of-way. There is no requirement for permanent disposal of provincial park property (i.e. no permanent infrastructure or grading will be located on land that is currently regulated as Forks of the Credit Provincial Park) and all works (i.e. temporary staging areas/ lay down areas) will be located within the existing municipal road allowance.

A single lane of traffic will be maintained on the existing bridge during construction, as no other means of safe access/egress exist. Traffic staging for the rehabilitation of the existing bridge is constrained by the narrow deck width of the existing bridge. Minor widening of the bridge will facilitate maintenance of the crossing during construction with a minimum 3.0m lane width. The potential for temporary road closures will be identified during the detail design phase of this undertaking.

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1. Introduction

The Corporation of the Town of Caledon (Town) originally initiated Class Environmental Assessments (EA) in accordance with both the Municipal Engineers Association (MEA) Class EA (MCEA) and the Ministry of Natural Resources and Forestry (MNRF) Provincial Parks and Conservation Reserves (PPCR) Class EA guidelines, for the rehabilitation of Dominion Street. Based on the original defined study and the proposed rehabilitation works, there was a potential to trigger both a Schedule C undertaking via the MCEA and a Category C under the MNRF Class EA. As such, it was determined at the outset that the study be conducted in accordance with the planning and design process for Schedule C projects as outlined in the MEA's "Municipal Class Environmental Assessment" (October 2000, as amended in 2015). The preliminary study area includes a portion of the Forks of the Credit Provincial Park, potentially triggering a Category C assessment as outlined in the MNRF's Class EA for Provincial Parks and Conservation Reserves (September 2004, as amended in 2015), as approved under the *Ontario Environmental Assessment Act (EA Act)*.

Currently, Dominion Street provides access to private residences located toward the north end of the street. Dominion Street is currently a predominantly two-lane rural roadway and the bridge is a single lane egress. The bridge is the only egress point for residents on Dominion Street, serving as an overpass to the Credit River. Therefore, any alternatives that involve significant construction works on Dominion Street and/or the bridge will have to allow passage of vehicles at all times, or alternative measures for full road closures during the construction period will be further investigated during detail design. There is evidence that Dominion Street is currently experiencing road surface slippage in areas where the road is closest to the Credit River.

Unique features for further consideration within the study area include the Forks of the Credit Provincial Park; the Credit River; the bridge connecting Dominion Street; and a segment of a Canadian Pacific Railway (CPR). The river banks of the Credit River are covered with mature vegetation, which could potentially experience significant impacts, given the potential implementation of traditional erosion protection measures. Built in 1935, the existing bridge connecting Dominion Street is on scenic road within the Belfountain and the Credit Gorge Cultural Heritage Landscape. Therefore, any bridge rehabilitation work must be sensitive to the heritage characteristics of the bridge.

The intent of this study is to investigate alternatives that address feasible bank stabilization and bridge rehabilitation activities, while minimizing potential environmental impacts, in order to improve safety and access based on the current and future utilization of Dominion Street and the bridge. Alternative roadway re-alignments are considered as part of this study, but are limited given the study area's topographic deviation. In order to protect Dominion Street from further movement, techniques to improve embankment stability were investigated through this study.

2. Environmental Assessment Process

2.1 Municipal Class Environmental Assessment Process

2.1.1 Overview of the Municipal Class Environmental Assessment Process

As required under the Ontario Environmental Assessment Act (OEAA), this study will follow the MCEA planning process, as prescribed by the MEA Class EA document (October 2000 as amended in 2007, 2011, and 2015). The MCEA process allows the Municipality to satisfy the requirements of the OEAA for municipal infrastructure without having to either undertake an Individual EA or request a specific exemption for the project. Municipal projects addressed by the MCEA may be implemented without further approval under the OEAA, if the approved MCEA planning process is carried out.

The stated purpose of the OEAA is to provide for the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation, and wise management in Ontario of the environment, where the broad environment includes the natural, social, cultural, built, and economic environments.

The provisions of the OEAA require municipalities to carry out an EA for public works projects, including those undertaken for municipal roads, water and wastewater systems, and transit ventures that are subject to the MCEA. As described in the MCEA document, this process is a five-phased decision-making framework for the planning and design of municipal infrastructure.

The key principles of the MCEA process include:

- Consultation with affected parties upon commencement, and throughout the process, of the project
- Consideration of a reasonable range of alternatives, including both the functionally different “alternative solutions” and the “alternative design concepts” of implementing the preferred solution
- Identification and consideration of the effects of each alternative solution and/or method on all aspects of the environment (i.e., natural, cultural, social, economic, etc.)
- Systematic evaluation of all alternative solutions and/or methods in terms of the advantages and disadvantages associated with each to determine the net environmental effects
- Provision of clear and complete documentation of the planning process followed, to ensure transparency and traceability of the decision-making process followed for the project

2.1.2 Project Classifications

The MCEA document classifies projects into four separate categories depending on the potential environmental effects and significance: Schedule A, A+, B, and C undertakings. The level of review associated with each category to satisfy the MCEA requirements, and thereby achieve compliance with the EA Act, is described below.

Schedule A/A+ This category includes projects that are limited in scale, have minimal environmental impacts, and include a number of municipal maintenance and operational activities. These undertakings are approved and may proceed directly to Phase 5 for implementation without completing the other phases. As part of the 2007 amendments to the MCEA process, the Schedule A+ classification was introduced to supplement the requirements of Schedule A undertakings, which includes projects that are pre-approved; however, the public must be notified prior to project implementation (i.e., Phase 5).

Schedule B These projects have the potential for some adverse environmental effects and, therefore, the municipality is required to undertake a screening process (i.e., Phases 1 and 2) involving mandatory contact with the public that are directly affected and relevant agencies to ensure that they are aware of the project and that their concerns are addressed. In addition, it is required that a document must be prepared and submitted for review by the public and review agencies for these undertakings. If there are no outstanding concerns, the municipality may proceed to Phase 5 for implementation.

Schedule C Projects included under this classification have the potential for significant environmental effects and must proceed under the full planning and documentation procedures specified in the MCEA document (i.e., Phases 1 to 4). An Environmental Study Report must be prepared and submitted for review by the public and relevant agencies for these undertakings. If there are no outstanding concerns, the municipality may proceed to Phase 5 for implementation.

2.1.3 Schedule C Municipal Class Environmental Assessment Process

Based on review of the MCEA document, we have determined that the proposed undertaking is most appropriately classified as a Schedule C activity. Therefore, Phases 1 to 4 of the MCEA process will be undertaken and documented as follows:

Phase 1: Identify the Problem/Opportunity

This phase involves not only identifying the problem/opportunity, but also describing it in sufficient detail to lead to a clear problem/opportunity statement. As part of describing the problem/opportunity, input from review agencies and the public can be solicited.

Phase 2: Identify and Evaluate Alternative Solutions to the Problem/Opportunity

This phase involves the following six steps:

- Prepare a general inventory of the existing natural, social, and economic environments in which the project is to occur
- Identify all reasonable alternative solutions to the problem/opportunity
- Identify the net positive and negative effects of each alternative solution including mitigation measures

- Evaluate the alternative solutions
- Consult with review agencies and the public to solicit comment and input
- Select or confirm the recommended solution(s)

Phase 3: Alternative Design Concepts for the Preferred Solution

Phase 3 involves the following seven steps:

- Identification of the alternative designs for the preferred solution, including a detailed description of all reasonable design concepts
- Preparation of a detailed inventory of the natural, social, and economic environments, where components of the environment are identified and evaluated in detail
- Identification of the potential impact of the alternative designs based on the established environmental inventory
- Evaluation of the alternative designs and identification of recommended design based on identified environmental impacts and mitigation measures
- Consult with review agencies and the public regarding conclusion of studies and investigations, including preliminary recommended design detail
- Selection of the preferred design and determine mitigation measures for confirmed environmental impacts
- Preliminary finalization of the preferred design

Phase 4: Environmental Study Report

Phase 4 involves the following three steps:

- Environmental Study Report to be completed in accordance with the general requirements outlined in the MCEA
- Consult with review agencies and public regarding the completion and review period of the ESR
- Provide notification of the provision to request a Part II Order

Following the Completion of Phase 4, documentation of the ESR will be placed on public record for a period of at least 30-calendar days to provide review agencies and the public with an opportunity to review these materials.

During this review period, concerned individuals have an opportunity to request a Part II Order under the *OEAA* before the project may proceed to implementation. A successful Part II Order requires that an Individual EA be carried out, documented, and submitted to the Minister of the Environment, Conservation and Parks for review and approval. The decision on whether the project should be subject to a Part II Order rests with the Minister of Environment, Conservation and Parks. Once the public review period has expired and there are no outstanding Part II Order requests, the municipality may proceed to the final phase of the planning and design process.

Phase 5: Implementation of the Preferred Design

Phase 5 involves completing contract drawings and tender documents, incorporating the recommended solution and mitigating measures identified during the previous phases of the process. Once contracts are awarded, construction and project implementation can take place. Any monitoring programs identified during the MCEA process shall be undertaken to ensure that the environmental provisions and commitments made during the process are fulfilled and effective.

Figure 2.1 provides an overview of the five phases of the MCEA process and indicates the Class EA process followed for this project.

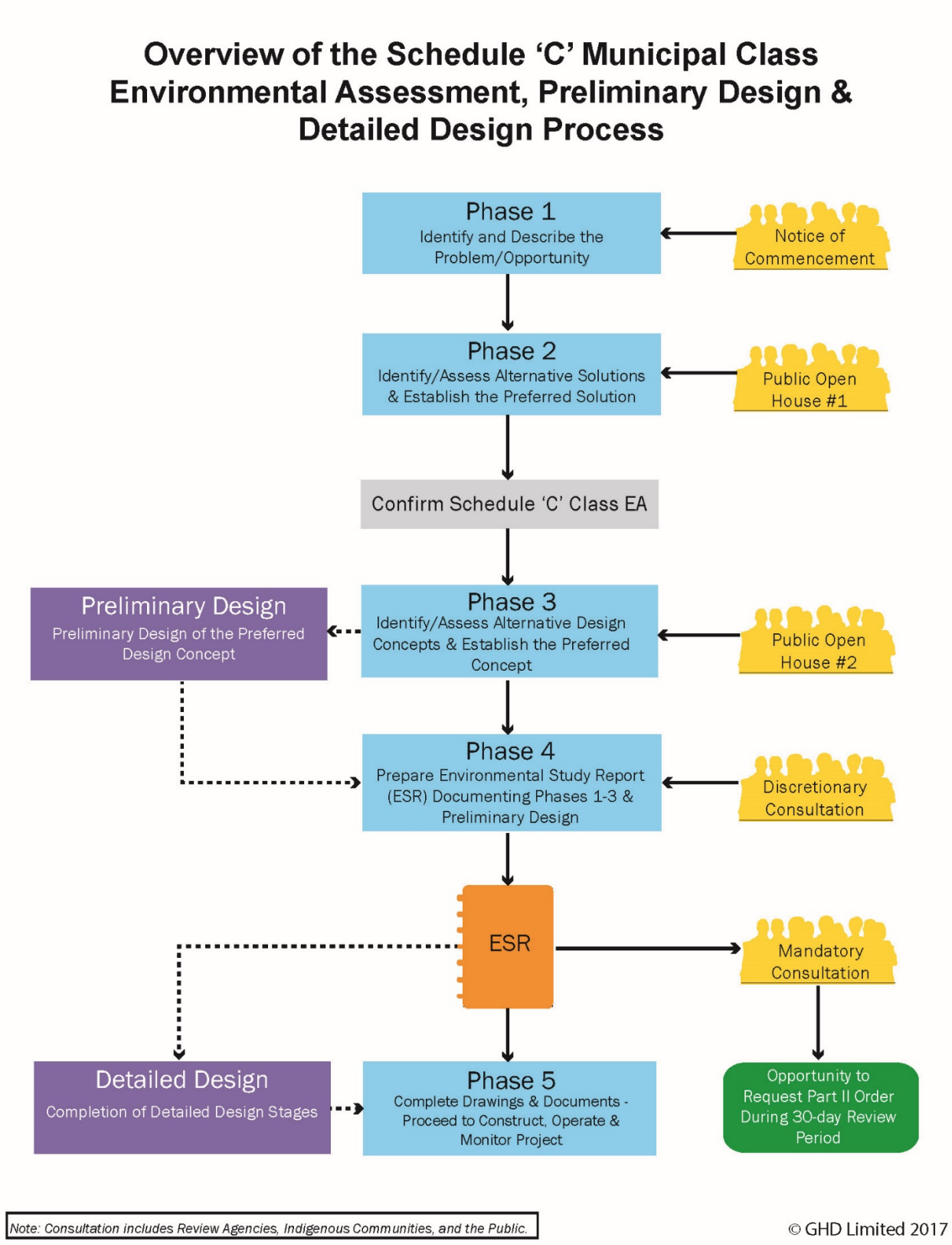

Figure 2.1 Municipal Class EA Process

2.2 Ministry of Natural Resources and Forestry Public Parks and Conservation Reserves Class Environmental Assessment Process

2.2.1 Overview of the MNRF PPCR Class Environmental Assessment Process

Based on the proximity to the Forks of the Credit Provincial Park and the potential for property within the Provincial Park, initially this Class EA incorporated elements of the MNRF PPCR Class EA processes. The MNRF PPCR Class EA applies to the potential alternatives to be addressed and considered, which evaluate the potential for an alternate solution that may include land within the Forks of Credit Provincial Park.

2.2.2 Project Classifications and Screening

The MNRF PPCR Class EA classifies undertakings into three separate categories in order to address concerns and mitigation for undertakings with the potential for net negative environmental effects and concerns of the public, government agencies, and aboriginal communities. The level of review associated with each category to satisfy the requirements of the MNRF PPCR Class EA, and thereby achieve compliance with the EA Act, is described below.

Category A Projects are minor in routine and of low intensity. These undertaking have the potential for low net negative environmental effects and are of low concern to the public, review agencies, and aboriginal communities.

Category B Potential for moderate net environmental effects and concerns of interested parties. These undertakings proceed with appropriate mitigation.

Category C Potential for high net negative effects and concerns of interested parties. Requires detailed information and analysis, and a comprehensive external review process. Project classified as a Category C undertaking require the completion of an ESR.

The first step in the MNRF Class EA for PPCR is to carry out an initial screening process to determine the appropriate project Category. Screening is a common method used to identify potential negative and positive environmental effects associated with projects. Screening is a way to confirm an understanding of potential effects and the need for remedial effort, and to ensure that all aspects have been or will be considered.

As part of the Screening Process undertaken prior to commencing the Class EA, a table identifying the range of potential effects that might be caused by the proposed undertaking as well as those areas requiring further study in order to determine whether or not potential effects might be experienced will be completed.

2.3 Harmonized Class Environmental Assessment Process

The Dominion Street Class EA study was initially pursued through a harmonized Class EA process, which included the process requirements of both the MEA Class EA and the MNRF PPCR Class EA processes. The MNRF PPCR Class EA applies to the potential alternatives to be addressed and considered, which evaluate the potential for alternative solutions that may require lands within the Forks of Credit Provincial Park.

A detailed description of the method used to harmonize the MEA Class EA and the MNRF PPCR Class EA processes may be found in **Appendix B**. The harmonized process table outlines the similarities between the two Class EA processes and describes the method for which the harmonized process will be followed. The harmonized Class EA process consists of the following five milestones, which incorporate various phases and steps of both the MEA Class EA and MNRF PPCR Class EA processes. A flowchart of the combined Schedule C and Category C Class EA processes is depicted in **Figure 2.2**.

Milestone 1 Municipal Class EA Phase 1 + MNRF PPCR Steps 1 and 2

Milestone 2 Municipal Class EA Phase 2 + MNRF PPCR Step 3

Milestone 3 Municipal Class EA Phase 3 + MNRF PPCR Step 4

Milestone 4 Municipal Class EA Phase 4 + MNRF PPCR Steps 5 and 6

Milestone 5 Municipal Class EA Phase 5 + MNRF PPCR Step 7

It should be noted to the reader that after evaluating the alternative solutions and alternative design concepts, the MNRF PPCR Class EA was no longer required and the project would only be subject to the MEA Class EA. For the readers benefit, we have included information on the MNRF PPCR Class EA process as the initial correspondence (i.e. Notifications of Commencement and Open House events) included discussion on a harmonized Class EA process.

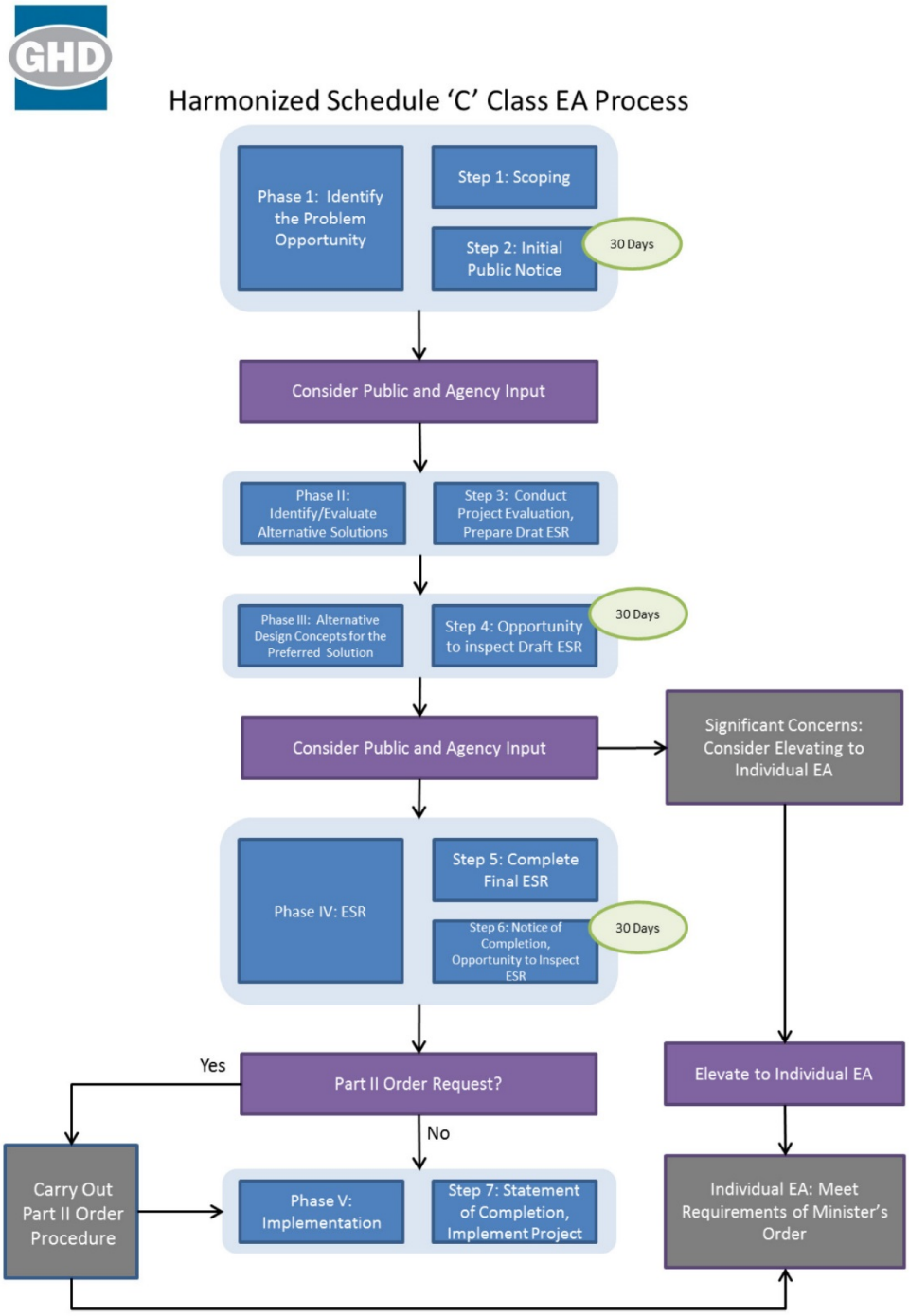

Figure 2.2 Harmonized Class EA Process Flowchart

3. Consultation

3.1 Study Commencement

3.1.1 Study Website

A project-specific webpage was created on the Town's website, where information, notices and available reports regarding this undertaking are available for public viewing: https://www.caledon.ca/en/news/index.aspx?newsId=d5215132-6273-4e01-b685-c930de407dc4.

3.1.2 Study Contact List

Table 3.1, below, identifies applicable stakeholders and public agencies consulted as part of this Class EA.

Table 3.1 Applicable Stakeholders and Public Agencies

Stakeholders and Public Agencies, Applicable to the Proposed Undertaking	
Ministry of the Environment Conservation and Parks (MECP)	Hydro One Networks Inc.
Ministry of Indigenous Relations and Reconciliation (MIRR)	CN Rail
Ministry of Tourism, Culture and Sport (MTCS)	Fisheries and Oceans Canada (DFO)
Infrastructure Ontario (IO)	Ontario Provincial Police (OPP)
Ministry of Municipal Affairs and Housing (MMAH)	Métis Nation of Ontario (MNO)
Ministry of Natural Resources and Forestry (MNRF) - Aurora District	Mississaugas of the New Credit First Nation (MNCFN)
Ministry of Transportation (MTO)	Regional Municipality of Peel (ROP)
Ontario Parks	Town of Caledon
Niagara Escarpment Commission	Town of Caledon Fire and Emergency
Credit Valley Conservation Authority (CVC)	Peel District School Board
Bell Canada	Dufferin-Peel Catholic District School Board
Bruce Trail Conservancy	TransCanada Trail Ontario
Enbridge Gas Distribution Incorporated	Student Transportation of Peel Region
Hydro One Networks Inc.	

The detailed study contact list and project correspondence may be found in **Appendix C**.

3.1.3 Notice of Study Commencement

The Notice of Study Commencement for the Dominion Street Class EA was provided through newspaper publications and direct mailing residents within the Study Area on August 4, 2016. In addition, the notice was posted on the Town's website and social media pages. Notification emails announcing the Notice of Study Commencement were sent to the identified agencies, Aboriginal communities and various stakeholder groups on August 4, 2016.

Copies of the *Notice of Study Commencement* may be found in **Appendix C**.

3.1.4 Public Information Centres

Public Information Centre #1

The *Notice of Public Information Centre (PIC) #1* was published on November 17, 2016 and was distributed via newspaper publications in the Caledon Citizen and Caledon Enterprise, the Town's website, social media webpages, and direct mailings. The *PIC #1 Summary Report* may be found in **Appendix D**.

PIC #1 was held on November 30, 2016 at the Inglewood Community Centre (15825 McLaughlin, Inglewood, ON). Of the total number of individuals in attendance, 27 participants signed-in and attended the PIC on November 30, 2016. Those in attendance included local residents and landowners, members and representatives of the Bruce Trail, Councilor Doug Beffort, Councilor Barb Shaughnessy and Mayor Allan Thompson. The information presented at this PIC focused on the Existing Conditions within the preliminary study area, including baseline information on the condition of the roadway, as well as the surrounding environment, a description and evaluation of the alternative solutions, and proposed next steps in the process. The PIC followed a drop-in format, with the information illustrated on a set of display panels arranged around the perimeter of the presentation room. Project Team members from the Town and GHD were available to answer questions and solicit comments from attendees, as well as record attendance for the event.

Public Information Centre #2

The *Notice of PIC #2* was published on November 30, 2017 and December 7, 2017, and was distributed via newspaper publications in the Caledon Citizen and Caledon Enterprise, the Town's website, social media webpages, and direct mailings. The *PIC #2 Summary Report* may be found in **Appendix E**.

PIC #2 was held on December 13, 2017 from 6:30 p.m. to 8:00 p.m. (EST) at the Inglewood Community Centre (15825 McLaughlin, Inglewood, ON).

PIC #2 was structured as a drop-in format, with the information illustrated on a set of display panels arranged around the perimeter of the presentation room. The information presented at this PIC focused on the additional data collected in the field, a description and evaluation of the alternative design concepts, and proposed next steps in the process. Project Team members from the Town and GHD were available to answer questions and solicit comments from attendees.

3.2 Agency Meetings

September 29, 2016

An agency meeting was held on September 29, 2016 at the Town of Caledon Town Hall to discuss the findings and analysis from Phases 1 and 2 of the Class EA. In addition to GHD and Town of Caledon staff, agencies in attendance included MNRF, Ontario Parks, the Niagara Escarpment Commission (NEC) and CVC. The following is a list of individuals in attendance for this agency meeting:

- Town of Caledon (proponent): Ian Todhunter, Ryan Grodecki, Tim Danyliw
- MNRF: Mark Heaton
- Ontario Parks: Alex Meilutis, on behalf of Tim Marchand
- NEC: Nancy Mott
- CVC: Liam Marray, Kaitlyn McGlade
- GHD (consultant): Brian Ruck, Blair Shoniker, Alex Pereira

The intent of this meeting was to provide the agencies in attendance with a brief project understanding and to identify potential issues and/or constraints that may arise as the study progresses. Preliminary alternatives were also discussed with the agencies in attendance.

September 14, 2017

An agency meeting was held on September 14, 2017 at the Town of Caledon Town Hall to discuss the findings and analysis from Phase 3 of the Class EA. In addition to GHD and Town of Caledon staff, agencies in attendance included Ontario Parks and the CVC. The following is a list of individuals in attendance for this agency meeting:

- Town of Caledon (proponent): Ian Todhunter
- Ontario Parks: Tim Marchand, Chelsea Smith, Sean Callaghan
- CVC: Liam Marray, Rizwan Haq
- GHD (consultant): Brian Ruck, Alex Pereira, Jeff Doucette

The intent of this meeting was to provide the agencies in attendance with an update on the preferred alternative solution and alternative design concepts considered for evaluation.

3.3 Project Status Update (Phase 1 and Phase 2 Summary Report)

Following PIC #1, stakeholders were provided with the opportunity to review findings and initial assessment of alternatives completed during Phases 1 and 2 of the MEA Class EA process for this study. As this was an optional point of contact with the public, direct feedback was not requested by the Town, rather the information was provided as a courtesy to adjacent landowners with the study area and agencies requesting involvement in the Class EA study. The Phase 1 and 2 Summary Report and supplementary discipline-specific reporting were placed on the Town's website

(https://www.caledon.ca/en/news/index.aspx?newsId=d5215132-6273-4e01-b685-c930de407dc4) with an email informing stakeholders of its availability distributed on February 8, 2017.

3.4 Consultation with Indigenous Communities

Applicable Indigenous communities were notified during the Class EA process, including the Mississaugas of the New Credit First Nation and Métis Nation of Ontario. As per the request of the Mississaugas of the New Credit First Nation, a meeting to discuss the Dominion Street Class EA was held on March 13, 2018 to present recommendations relative to the technically preferred alternative solution and alternative design concepts. Existing conditions of the environment within the study area were discussed, relative to archaeological and cultural heritage features, as well as the natural environment. It was determined that the Dominion Street Class EA study was a low-level concern to the Mississaugas of the New Credit First Nation.

4. Planning Framework

4.1 Provincial Planning Context

Specific details concerning provincial policies relevant to the Dominion Street Class EA are summarized in the following sections.

4.1.1 Ontario Planning Act

The *Planning Act* (2006) describes the fundamentals of land use planning in Ontario, including how land uses may be controlled and who may control them. The *Planning Act* enables the Province to delegate authority to upper-tier municipalities (e.g., regional municipalities) while retaining control through the approval process. The *Planning Act* ensures conformity among council directed land use planning decisions with provincial plans and the provincial policy statement (PPS). The Town of Caledon is subject to the following four provincial plans: Niagara Escarpment Plan (NEP) (2012), the Greenbelt Plan (2005), the Growth Plan (2006), and the Oak Ridges Moraine Conservation Plan (ORMCP) (2002). However, the study area does not fall within regulated areas of the aforementioned provincial plans.

4.1.2 Provincial Policy Statement, 2014

The Provincial Policy Statement (PPS) (2014) sets the framework for the provincial government's long-term land use vision for how Ontario lands and resources are managed. Land use planning in the Town of Caledon is subject to the PPS (2014). In consolidation with the Planning Act and provincial plans, the PPS diverts development from environmentally sensitive areas. The PPS ensures the development of safe and efficient transportation systems, able to facilitate the movement of people and goods. For this reason, the proposed improvements to Dominion Street conforms to the PPS, by providing active and vehicular transportation infrastructure, which will improve the safe movement of people/residents while satisfying current and future needs of the Study Area.

4.1.3 Greenbelt Plan, 2017

The Greenbelt Act, 2005 and Greenbelt Plan (2005 and updated in 2017) protect and control the use of additional land outside the ORMCP area designated as Protected Countryside.

4.1.4 Niagara Escarpment Plan, 2012

The Study Area is located within the Niagara Escarpment Plan Area, subject to regulations under the Niagara Development Control Area. Niagara Escarpment Plan (NEP) designations within the Study Area include “Escarpment Natural Area” and “Escarpment Protection Area”. The purpose of the NEP is to *“…provide for the maintenance of the Niagara Escarpment and land in its vicinity substantially as a continuous natural environment, and to ensure only such development occurs as is compatible with that natural environment.”* Objectives of the NEP are as follows:

1. *To protect unique ecologic and historic areas;*
2. *To maintain and enhance the quality and character of natural streams and water supplies;*

3. *To provide adequate opportunities for outdoor recreation;*
4. *To maintain and enhance the open landscape character of the Niagara Escarpment in so far as possible, by such means as compatible farming or forestry and by preserving the natural scenery;*
5. *To ensure that all new development is compatible with the purpose of the Plan;*
6. *To provide for adequate public access to the Niagara Escarpment; and*
7. *To support municipalities within the Niagara Escarpment Plan Area in their exercise of the planning functions conferred upon them by the Planning Act.*

The proposed undertaking will be considered with respect to each of the above NEP objectives. A preferred solution to the alternative solutions considered will be evaluated favorably based on minimal potential impacts against the need for infrastructure improvements at Dominion Street.

4.2 Regional and Municipal Planning Context

Dominion Street is a municipal roadway operated and maintained by the Town of Caledon. The Region of Peel (Region) has a two-tier planning system whereby planning responsibilities are divided between the Region and its three (3) area municipalities. Given that both the Region and the Town are responsible for regulating land use and establishing policies for physical, economic, and social development within their respective jurisdictions, a review of relevant Regional policy was undertaken, and is provided below.

4.2.1 Region of Peel Official Plan, October 2014, Office Consolidation

The Peel Regional Official Plan represents regional council's long-term policy framework for decision-making. It sets the Regional context for detailed planning by protecting the environment, managing resources, directing growth, and setting the basis for providing regional services in an efficient and effective manner. The Official Plan provides direction for future planning activities and for public and private initiatives aimed at improving the existing physical environment. The four primary goals of the Regional Official Plan are to:

1. Create a healthy community
2. Recognize the importance of the environment
3. Recognize the importance of a vibrant economy
4. Support balanced growth and development

4.2.2 Ontario Regulation 160/06

CVC administers Ontario Regulation 160/06: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses. Ontario Regulation 160/06 establishes Regulated Areas where development could be subject to flooding, erosion or dynamic beaches, or where interference with wetlands and alterations to shorelines and watercourses might have an adverse effect on those environmental features. Under the regulation, any proposed development, interference, or alteration within a Regulated Area requires a permit from CVC.

4.2.3 Town of Caledon Official Plan

The Town of Caledon Official Plan guides the future land use, physical development and change, and the effects on the social, economic, and natural environment, within the Town. The Official Plan came into effect in 1979 and since that time the Plan has been reviewed and amended in order to keep it current, reflect changing community needs and dynamics, address external influences, and to respond to new Regional and Provincial planning polices and guidelines. The current Official Plan came into effect in November 2015 and includes all approved Official Plan Amendments to date. The proposed improvements to Dominion Street with the transportation objectives (**Section 5.9.3**) of the Town's Official Plan with respect to the safe and efficient movement of people and goods, integration, and use of existing transportation infrastructure.

5. MCEA Phase 1: Problem and Opportunity

5.1 Location and Description of Key Infrastructure

The area under consideration for this study encompasses a square block, including the Forks of the Credit Road as well as the entirety of Puckering Lane, Dominion Street and the bridge. The study area includes segments of both the Credit River and the Forks of the Credit Provincial Park. Dominion Street extends north westerly from Forks of the Credit Road.

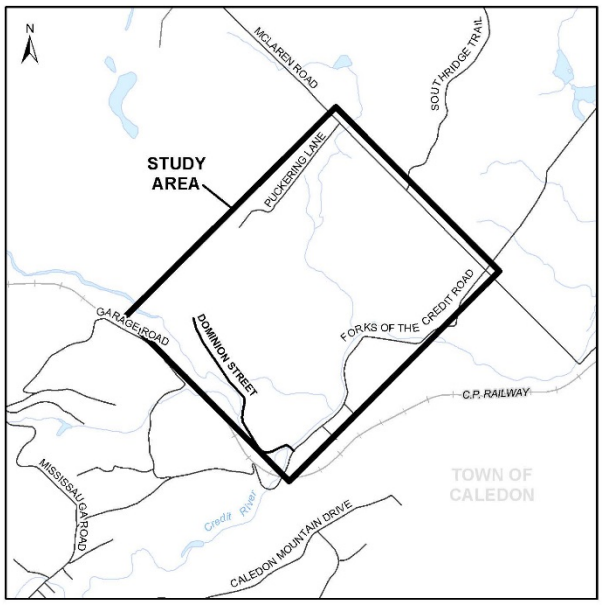

Figure 5.1 Study Area

5.2 Identification of Issues and Site Constraints

The main high-level problems and constraints used in the development of the problem/opportunity statement as it relates to the existing infrastructure of Dominion Street are as follows:

Access

Dominion Street and the bridge is a point-source egress and provide access to private residential dwellings. During potential construction/rehabilitation works of Dominion Street and the bridge, or in the event of a road or bridge closure, local residents would be landlocked. Hence, ensuring the reliability of road access will be a focal point of the study.

Structural Integrity of the Bridge

Since the bridge does not fully span the Credit River valley, the flow of the river is constricted resulting in an increase in flow velocity and scour potential at the bridge abutments and road embankment. Current guidelines would require a bridge in this location to be longer, such that it would span the width of the river, allowing for dry passage on both sides for animal movements. Maintaining the structural integrity of the bridge crossing is a key component of this EA study.

Road Instability

Dominion Street is currently experiencing road slippage in areas where the road embankment is closest to the river. Based on initial site visits cracking appears to be limited to the western half of the road.

Topography and Terrain

Significant deviations in the topography and terrain of the Study Area present significant technical constraints and limitations in the consideration of new alternative alignments for Dominion Street. Mature vegetation removal and excessive cuts to the existing Escarpment may be required to facilitate a maximum grade of 11 percent for a new two-lane rural road.

Embankment Protection

Measures to reduce embankment toe erosion may prevent further movement of existing Dominion Street. The river banks of the Credit River are lined with mature vegetation, considered valuable for environmental, and aesthetic purposes. Since traditional erosion protection measures could involve extensive impacts to this vegetation, alternative methods will be considered. Potential impacts to this vegetation along the embankment are of potential concern to CVC, MNRF and DFO.

Species at Risk

DFO recognizes the segment of the Credit River within the Study Area as having potential for the presence of Redside Dace, a species currently listed as “Endangered” under the *Species at Risk* Act and the Endangered Species Act.

Cultural Heritage

Built in 1935, the bridge has been identified by the Town as being of “heritage interest”. The bridge is located on a scenic road within the Belfountain and the Credit Gorge Cultural Heritage Landscape, and is a vital component of the Bruce Trail. Any required rehabilitation work must be sensitive to the bridge’s heritage characteristics.

Forks of the Credit Provincial Park and the Credit River

Unique features within the study area, (and considered obstacles in preparing alternative solutions for this EA) include the Forks of the Credit Provincial Park and segment of the Credit River. There is potential for the development of alternative solution, which would call for additional access to Dominion Street through the Forks of the Credit Provincial Park.

5.3 Problem and Opportunity Statement

Based on the previously identified problems and constraints, the following Problem/Opportunity Statement (as per Phase 1 of the MCEA process) was developed, and is as follows:

> *Maintaining the structural integrity of Dominion Street and the bridge is essential to providing access to private residential dwellings located on Dominion Street. The bridge also provides access for emergency and town services. The current condition of Dominion Street and the bridge warrants either significant rehabilitation*

or replacement. Erosion is evident around the bridge abutments and must be addressed as part of the study. Traditional erosion measures have the potential to threaten existing mature vegetation residing on the embankment. Due to erosion and slope instability, the slumping of Dominion Street has resulted in the reduction of road width, which has proven problematic for vehicular and pedestrian movements. Dominion Street and the bridge are key linkages of the Bruce Trail and should be conserved in order to sustain pedestrian passage in addition to vehicle access while respecting cultural heritage value. The solution to this problem must be financially viable given the number of local residents serviced by Dominion Street and the bridge.

Accordingly, an opportunity exists to remediate the identified issues surrounding the deficiencies associated with existing Dominion Street and the bridge. Access will be improved upon the completion of identified works. The potential rehabilitation provides an opportunity for the enhancement of the Bruce Trail located within the study area along Dominion Street. Cultural heritage resources have the potential to be maintained and rehabilitated for future long-term use.

5.4 Intent of Class EA Study

Given consideration for the identified problem/opportunity, the purpose of this Class EA is three-fold:

1. To identify and evaluate the levels of risk associated with the riverbank and road embankment along Dominion Street
2. To identify a preferred long-term treatment strategy for existing Dominion Street and the bridge
3. To identify and evaluate the potential for additional access/service roads connecting to Dominion Street

The proposed undertaking will respect the natural habitat and species within the Credit River, such as Redside Dace, as well as the cultural heritage component of the existing Dominion Street Bridge.

6. Description of the Existing Environment

As part of the initial phase of the Class EA, a larger study area was established to ensure a reasonable range of alternative solutions could be developed. The Project Team established a Preliminary Study Area (see **Figure 5.1**) through a review of secondary information sources, field investigations, an assessment of geomorphic conditions, and detailed hydrologic and hydraulic review. A summary of results and findings of these activities is provided in the following subsections. These findings will form the comparative evaluation criteria of the three (3) alternatives that have been established for further investigation.

The potentially affected environment associated with the alternative solutions is described in further detail in the following subsections as defined in the *EA Act* based on existing information sources and field investigations:

- Natural Environment – includes air, land, water, plant, and animal life
- Built Environment and Social – includes any buildings or structures; social conditions that influence the life of residents or a community
- Cultural Environment – includes the cultural conditions that influence the life of residents or a community

The following existing conditions summaries have been developed through the utilization of desktop analysis, secondary source review and observations made through windshield surveys (site visits). Detailed existing condition reports may be found in **Appendix F** through **Appendix L** to this ESR.

Figure 6.1 provides an overview of the study area, with locations of the Dominion Street, the bridge, Forks of the Credit Provincial Park and the Credit River.

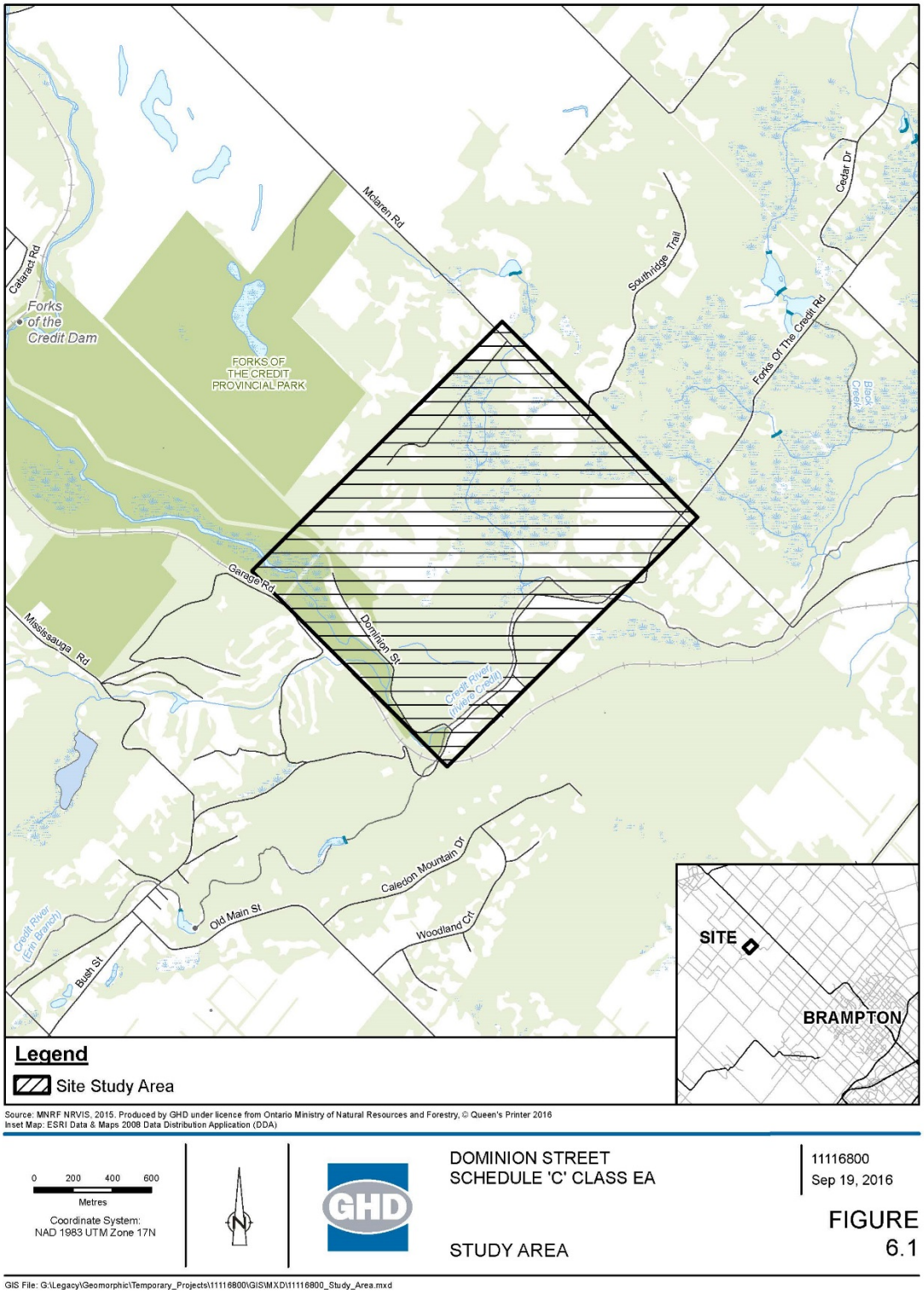

Figure 6.1 Dominion Street Preliminary Site Study Area

6.1 Natural and Physical Environment

The Study Area is a predominantly forested natural area with a small amount of residential and transportation land use throughout. There are several significant natural features including Areas of Natural or Scientific Interest (ANSIs) and Provincially Significant Wetlands (PSWs) within the Study Area. Terrestrial habitats present are diverse and generally intact, and likely provide habitat for interior forest breeding birds and other wildlife species. The primary aquatic feature in the Study Area, the Credit River, provides high quality cold-water habitat for a variety of fish species. MNRF and Natural Heritage Information Centre (NHIC) mapping have identified the potential for a variety of Species at Risk (SAR) within Study Area. Further investigation of potential habitat available within the Study Area will be needed in order to determine the likelihood of presence of SAR.

6.1.1 Significant Natural Features

There are several significant natural features within and adjacent to the Study Area. The Forks of the Credit Provincial Park extends to within the western portion of the Study Area along Dominion Street, and the preliminary Study Area is within part of the Niagara Escarpment Plan Area. Unevaluated wetlands are present in the northwestern portion and the southern portion of the Study Area, and a provincially significant wetland complex (Credit Forks Wetland Complex) is present to the east. Two ANSIs are located within the Study Area, with the Credit Forks ANSI in the southern portion and the Credit Forks Lowland ANSI in the eastern portion. No deer wintering areas were found to occur within several kilometers of the Study Area boundary.

6.1.2 Terrestrial Environment

Ecological communities represented within the Study Area include coniferous forest, coniferous plantation, mixed plantation, deciduous forest, mixed forest, mixed swamp, and cultural meadow (CVC, 2013). MNRF has identified that the woodlands within the preliminary Study Area are 'significant' according to the criteria established by MNRF. A SAR tree species, Butternut (*Juglans cinerea*), has been identified as having the potential to occur within the preliminary Study Area. The preliminary Study Area is composed of relatively undisturbed forest habitat, roadways, small agricultural farms, and single-family residential properties. The natural forest habitat across the preliminary Study Area is fairly homogenous and mature in age. The dominant forest types are Fresh-Moist White Cedar Sugar Maple Mixed Forest and Dry-Fresh Sugar Maple Deciduous forest. Tree species present include Eastern White Cedar (*Thuja occidentalis*), Sugar Maple (*Acer saccharum*), American Basswood (*Tilia americana*), American Beech (*Fagus grandifolia*), White Ash (*Fraxinus americana*), Eastern Hemlock (*Tsuga canadensis*), White Birch (*Betula papyrifera*), European Buckthorn (*Rhamnus cathartica*), Speckled Alder (*Alnus incana*), Red-Osier Dogwood (*Cornus stolonifera*), Black Cherry (*Prunus serotine*) and Eastern White Pine (*Pinus strobus*).

6.1.3 Aquatic Environment

The Credit River is the primary aquatic feature within the Study Area. The Credit River is almost 90 kilometers (km) long and meanders southeast from its headwaters in Orangeville, Erin and Mono, through nine municipalities, eventually draining into Lake Ontario at Port Credit, Mississauga (CVC, 2016). Within the Study Area, the Credit River runs north-south approximately parallel to Dominion Street, where it eventually encounters the Credit River Erin Branch to the west, after

which it continues in an eastward direction through the Study Area. Several small one to three order tributaries of the Credit River (CVC, 2013) also run roughly north-south within the Study Area east of Dominion Street. All watercourse features within and adjacent to the Study Area are shown to have a cold-water thermal regime. The Study Area encompasses two subwatersheds of the Credit River Watershed, with the divide running north-south in this area, and falling just east of Dominion Street.

6.1.4 Wildlife

Based on atlas results within the preliminary Study Area, 34 species of butterflies, 26 species of reptiles and amphibians and 114 species of breeding birds have been documented as occurring within the greater area surrounding the preliminary Study Area.

6.1.5 Species at Risk

There are several SAR which MNRF have identified as having a known presence within or adjacent to the Study Area. These species are described in detail below.

Butternut

Butternut is a provincially and federally endangered tree species, which has the potential to occur in the Study Area. It generally occurs on well-drained, rich soils in valleys or on slopes (MNRF, 2016a). MNRF have advised that records of Butternut exist near the Study Area.

Redside Dace

Redside Dace is a provincially and federally endangered fish species, which has been identified by MNRF and NHIC records as having the potential to occur near the Study Area. Furthermore, review of 2015 DFO Fish and Mussel SAR Mapping shows a portion of the Credit River within the southern portion of the Study Area to be an 'Occupied or Recovery Reach for Redside Dace'. Redside Dace are found in pools and slow-moving areas of small streams and headwaters with a gravel bottom, generally in areas with overhanging grasses and shrubs (MNRF, 2016b). Habitat observed within the Credit River up and downstream of the Dominion Street Bridge is not characteristic of Redside Dace habitat. Redside Dace prefer narrower, slower moving watercourses with deep pools; gravel riffles; and overhanging long grasses or shrubs, versus forested riparian areas. Habitat within smaller side tributaries should be assessed once access to private properties is obtained.

Jefferson Salamander

Jefferson salamander is a provincially endangered and federally threatened species, which MNRF has identified as having the potential to occur in the Study Area. They live in deciduous forest, and adults live in moist, loose soil, under logs or in leaf litter (MNRF, 2016c).

Chimney Swift

Chimney swift is a provincially and federally threatened species. They are mainly associated with urban and rural areas where there are chimneys available for nesting and resting (Rodewald, 2015). It is possible that there will be buildings with uncapped chimneys in the local Study Area that would provide nesting habitat, and the surrounding areas could be used a foraging habitat.

Canada Warbler

Canada warbler is a provincially special concern and federally threatened species. It breeds in a range of deciduous and coniferous forests, usually wet, with a well- developed, dense shrub layer (MNRF, 2016d).

Little Brown Myotis

The little brown myotis is a provincially and federally endangered species, which MNRF has identified as having the potential to occur within the Study Area. During the day, they roost in trees and buildings. They often select attics, abandoned buildings, and barns for summer colonies where they can raise their young. Little brown bats hibernate in caves or abandoned mines that are humid and remain above freezing (MNRF, 2016e).

Northern Myotis

The northern myotis is a provincially and federally endangered species, which MNRF has identified as having the potential to occur within the Study Area. These bats are associated with boreal forests, choosing to roost under loose bark and in the cavities of trees, and they hibernate in caves or abandoned mines (MNRF, 2016f).

Tri-coloured Bat

The tri-coloured bat is a provincially and federally endangered species, which MNRF has identified as having the potential to occur within the Study Area. During the summer, this bat is found in a variety of forested habitats. They form day roosts and maternity colonies in older forest and occasionally in barns or other structures, and overwinter in caves (MNRF, 2016g).

American Eel

The American Eel is a provincially and federally endangered species, which MNRF has identified as having the potential to occur within the Study Area. The American Eel can be found in both salt and fresh water, as far in land as Algonquin Park, returning to the Sargasso Sea to spawn (MNRF, 2016h).

6.1.6 Tree Inventory

GHD completed a Site visit to determine the presence of SAR trees within the Project Area. The Site visit was conducted by an International Society of Arboriculture (ISA) Certified Arborist and MNRF certified Butternut Health Assessor on January 24, 2018. The Site inspection did not include a full tree inventory or any assessment of tree health and condition. No butternut or other SAR tree species were observed during the Site visit. GHD does not anticipate any permitting concerns with SAR tree species because of the proposed work. Should any SAR trees be encountered through additional consultation and/or site surveys, or potential areas of impact change, considerations under the provincial Endangered Species Act may apply.

The limits of the areas of disturbance and the need for tree removals/protection will be identified during the detailed design stage. GHD recommends that a full tree inventory be completed to document the quantity, species composition, and condition of existing Site trees within the area of disturbance. As the detailed design progresses and a tree inventory is completed, opportunities for

tree preservation can be identified. The requirement for tree removal, tree preservation, and tree compensation will be discussed with the Town of Caledon at the time of detailed design. Further details of the SAR Tree Survey are included in **Appendix F**.

6.1.7 Soil Conditions

Local surficial geology in the project area is comprised of river deposits (sand and gravel), and glacial river deposits (gravel) typically found in glacial meltwater spillways (Sharpe et al., 1997). Extensive outwash sand and gravel is found along the main branch of the Credit River. Much of this is associated with the present Credit River Valley and the former Credit River Meltwater Channel within the bedrock valley found on the east flank of the Niagara Escarpment. The high relief throughout the reach and the permeable nature of most of the surficial geologic material within the valley indicates that water should easily discharge into much of the river valley (Credit Valley Conservation, 1998).

Soils in the area are made up of loamy tills and outwash deposits of fine sand and outwash gravel. Most of the soils in the spillways areas have high infiltrability and would be expected to produce overland runoff only rarely during very high intensity rain or during runoff episodes when soils are frozen or saturated.

6.1.8 Geomorphic Conditions

Characterization of the existing fluvial geomorphology of the channel was completed through desktop and field investigations. The Existing Geomorphology and Hydraulics Report (**Appendix G**) provides a summary of geomorphic studies within the study area; details on existing conditions and GHD field investigations; and a historical geomorphic assessment of the Credit River within the study area. A summary of the above report is provided herein. Specifically, the following tasks were completed:

- A desktop assessment of historical changes of the Credit River planform within the study area
- Rapid and detailed geomorphic field investigations to document existing channel conditions
- Preliminary hydraulic analyses

The results of the rapid visual assessments indicate that all three channel reaches are *in regime* and in good to excellent condition, and that the limiting features are channel stability and riparian habitat conditions.

Detailed geomorphic assessment included a topographic survey and field observations via examination of six cross-sections for bank material and bank angle, channel substrate, root density and depth, and channel substrate (pebble counts). An assessment of potential hazards to infrastructure was also completed, including photographing significant features such as areas of erosion, woody debris jams, unstable banks, storm sewer outfalls and erosion protection measures, and documenting them in the context of systematic channel adjustments.

The assessments summarized above indicate that the Credit River at Dominion Street is a significant watercourse with rich natural heritage features consisting of extensive terrestrial and

aquatic habitat. Any works near the River should have due regard for these features. The following recommendations are made with respect to potential rehabilitation works near the River:

- Significant portions of the watercourse banks adjacent to areas of road slippage appear to be stable due to the presence of bedrock and large stone at the toe of slope and mature vegetation on the banks. Proposed erosion rehabilitation works should avoid removal of mature riparian vegetation where possible. Geotechnical analysis determined that slope failures were due to slope processes and not undermining of the toe by the creek
- Instream bank stabilization works are not recommended at this site due to the sensitivity of the aquatic habitat. If possible, geotechnical stabilization techniques employed on the upper valley wall adjacent to Dominion Street should provide stability to the slope while minimizing disruption to aquatic habitat

6.1.9 Hydrology and Hydraulics

A hydrology and hydraulics analysis was undertaken to characterize the existing conditions of the Credit River at the Dominion St Bridge. The Existing Geomorphology and Hydraulics Report (**Appendix G**) provides details with respect to the preliminary analysis. A summary of the above report is provided herein.

The subwatershed of the Credit River upstream of the Dominion Street Bridge encompasses an area of 40 km^2. The main branch of the Credit River traversing the watershed is approximately 12 km long, with an average channel gradient of 4.2 m/km. The dominant characteristics of the watershed include limited municipal drainage, significant floodplain storage, high percentage of forest cover, the prevalence of high infiltration soils, and the presence of aggregate extraction activities. Forty percent of the subwatershed is considered a 'natural area' and roughly, 21 percent of the subwatershed is covered by forest. The high infiltrability associated with soil under forest cover restricts the amount of precipitation appearing as runoff for entry to the surface drainage network. In addition, snowmelt in heavily forested areas melts much later than agricultural areas. The delayed snowmelt reduces the potential for flooding and provides additional opportunities for groundwater recharge. The predominance of highly permeable soils results in high recharge rates to groundwater aquifers, and reduced surface water runoff to flow within the subwatershed (Credit Valley Conservation, 1998).

Based on existing HECRAS modelling provided by CVC, the existing Dominion Street Crossing has the ability to convey the 25-year design flow; however, the regulatory event exceeds the edge of travel line of Dominion Street by 1.5 meters. Based on the above, the Dominion Street Crossing is not compliant as per the MTO Drainage Design Standards.

It should be noted that the current model shows an addition to flow due to the confluence with the West Credit River downstream of the Dominion Street Bridge, when in reality the confluence occurs upstream of the bridge. The entirety of this flow is being directed through the current crossing and model values reflect artificially low flow conditions. For the purposes of this study and to model existing conditions accurately, the HECRAS model was revised to represent the addition of flows from the West Credit River upstream of the Dominion Street Bridge.

The following recommendations are made with respect to hydrology and hydraulics moving forward into detailed design:

- The CVC engineered hydraulic model and associated floodplain mapping is out of date and should be modified to include an addition of flows upstream of the Dominion Street Bridge due to the confluence with West Credit River. The discussion of bridge hydraulics above assumes that the confluence is upstream of the bridge
- Additional hydraulic assessment during the detailed design phase should be completed to ensure there is no increase in flooding on adjacent property due to any proposed works

6.1.10 Geotechnical

The Study Area overlaps the Niagara Escarpment and Oak Ridges Moraine Physiographic Regions as well as the Credit River valley, and is located in a relatively complex geological and hydrogeological setting. Regional studies (CVC Source Protection, 2012) indicate that both the main branch and the west branch of the Credit River flow through deep re-entrant valleys in the Niagara Escarpment, joining at the Forks of the Credit. A substantial thickness of overburden is interpreted near the Forks of the Credit, where two bedrock valleys converge.

Overburden in the area varies in thickness, ranging from less than 1 metre thick along the escarpment and within the stream valley up to more than 80 metres within the valley and on the adjacent upland moraine plateau.

Modern alluvial deposits and glaciofluvial deposits are found within the stream valley, and ice contact stratified drift, till, and moraine deposits are primarily encountered on the banks and upland plateaus. Clinton Cataract Group bedrock comprised of limestone, dolostone and sandstone, and Queenston Formation shale bedrock outcrop along the escarpment and locally within the stream valley.

Figure 6.2, below indicates the locations of boreholes undertaken, as well as road segments recommended for future improvements requiring rehabilitation. Road segments identified as ‘red’ are recommended for full rehabilitation due to existing slope failure. Road segments identified as ‘yellow’ are recommended for minor repairs due to existing edge cracking. Road segments identified in as ‘green’ are associated with no significant issues to the existing road, where rehabilitation of the road in these segments is not recommended as required, at this time.

The Geotechnical Report completed in support of the Class EA is located in **Appendix I**.

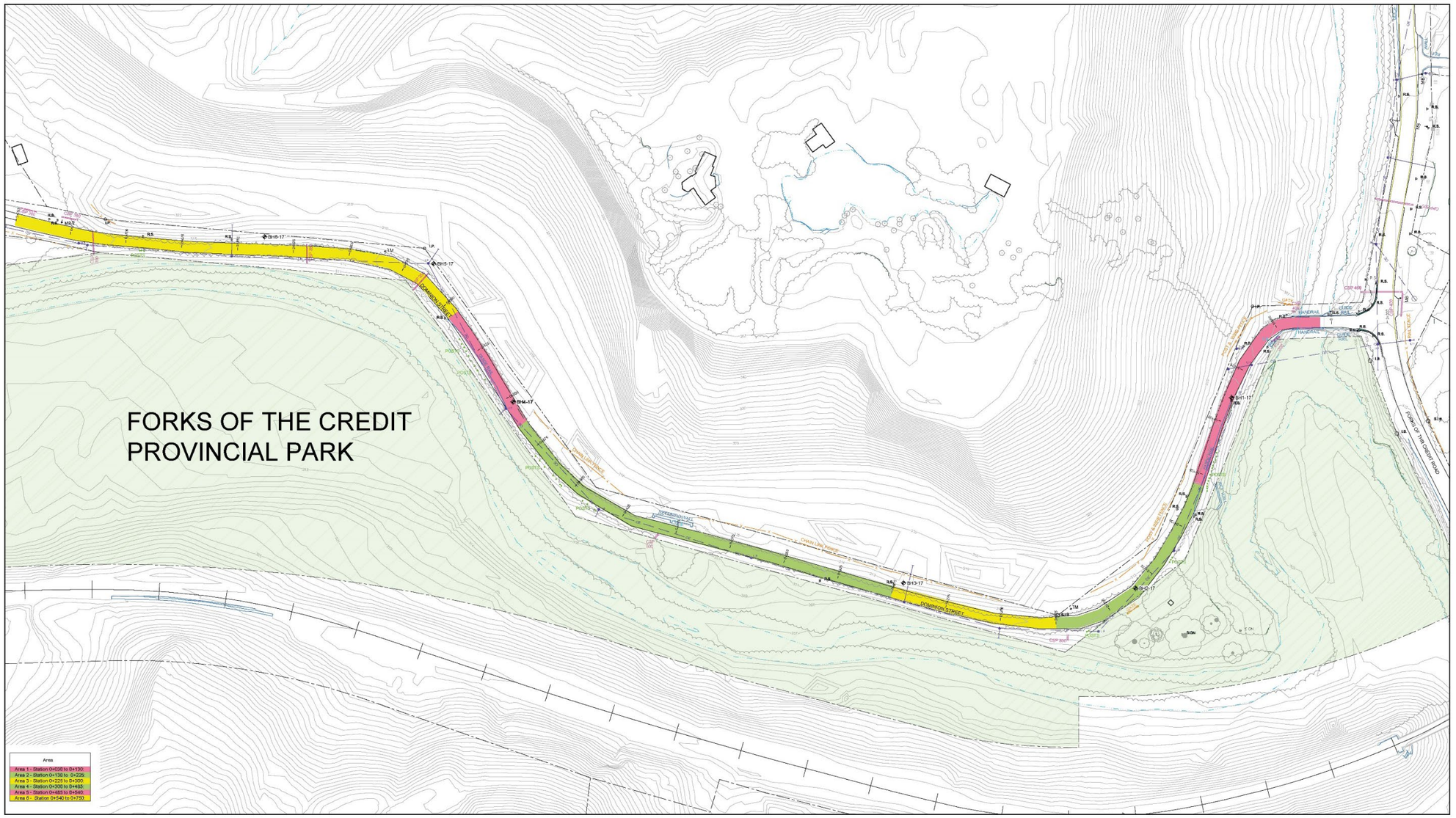

Figure 6.2 Areas of Proposed Dominion Street Improvements

6.1.11 Physiology and Topography

The Credit River valley within the Study Area is primarily within the Niagara Escarpment physiographic region (Chapman and Putnam 1984), which is characterized by a glacial spillway and the escarpment. The valley is situated at the base of the Escarpment and the majority of Dominion Street and the bridge are located in this region. The Credit River is incised into the escarpment at an elevation of approximately 310 mAMSL (Above Mean Sea Level). The escarpment rises approximately 100 metres to an elevation of 410 mAMSL, to the south, whereas to the north glacial overburden deposits generally mask the steep surficial expression of the Escarpment.

6.1.12 Geology and Hydrogeology

Regional surficial geology mapping of the area indicates that the Credit River valley is underlain by glaciofluvial deposits, sandy deposit, modern alluvial deposits and bedrock, (MNR NRVIS, 2011 - Ontario Geological Survey, 2003).

The surficial geology and general stratigraphic framework within the valley consists of the following deposits:

- Modern alluvial deposits – clay, silt, sand, gravel
- Glaciofluvial deposits; sand, gravel
- Queenston Formation (bedrock) – Shale

Review of the water well record information indicates that the majority of records in this area along Dominion Street and the Forks of the Credit Road near the bridge are for drilled wells (4 to 6-inch) which are completed in both the overburden and bedrock. Out of 30 selected well records, 10 wells are completed in the overburden and 20 are completed in shale bedrock. All of the wells are used for domestic purposes.

The hydrostratigraphic framework corresponds to the layered regional stratigraphy, and based on review of the well records these include the following units:

- Aquifer – sand, sand and gravel
- Aquifer/Aquitard – shale bedrock

In general, the hydrostratigraphy can be described as an unconfined sand, and sand and gravel aquifer overlying a shale bedrock aquifer/aquitard. Regional groundwater flow is anticipated to be toward the Credit River Valley and artesian conditions (upward gradients) and may be locally encountered.

The Hydrogeological Report may be found in **Appendix H** to this ESR.

6.1.13 Air Quality

The existing street serves as a direct access to 17 residential properties with no alternate egress or point of access. The undertaking was initiated with the intent of rehabilitating the existing street in order to provide reliable access for residents of Dominion Street. No increase in traffic volumes are anticipated as Dominion Street is not a through street and future development is strictly controlled.

Any potential for air quality effects are limited to construction operations relative to rehabilitation works. Best Management Practices for the Reduction of Air Emissions from Construction and Demolition Activities (Cheminfo Services Inc., March 2005) will be employed to minimize potential air quality effects during construction. No prolonged effects are anticipated. As such, a formal air quality assessment is not warranted.

6.1.14 Dominion Street Bridge

To date, no previous rehabilitation works have been undertaken on the Dominion Street Bridge. Detailed visual inspections were completed by EXP in 2015 and EMSI in 2013 and 2009. The inspection results of the Bridge are summarized as follows:

- The asphalt wearing surface is in good condition.
- The concrete curbs are in poor to fair condition with localized severe spalling along the exterior face, localized severe scaling along the curb face and localized narrow transverse cracks. Previous patching was noted along the curb face.
- The steel vertical bar handrails are in generally good condition with collision damage to one panel. The concrete handrail posts are in fair condition with spalling and cracking. The handrails do not meet current Canadian Highway Bridge Code vehicle collision load requirements.
- The concrete deck soffit is in fair to good condition with severe spalling, delamination and scaling along the exterior edges, adjacent to the abutments and along the centerline of the structure. Exposed reinforcing steel is corroded.
- Deck drainage is accommodated by four steel deck drains which outlet flush with the deck soffit.
- The north concrete abutment is in generally good condition with localized light cracking and efflorescence staining below the centerline deck construction joint and below deck drain outlets. The south concrete abutment is in fair condition with extensive light cracking, efflorescence staining, and scaling. A stained vertical crack was noted extending from the centerline joint in the bridge deck and inclined to the west to the base of the abutment.
- The northwest concrete retaining wall is in good condition. A gabion retaining wall is provided beyond the northwest concrete retaining wall and is in good condition. The northeast retaining wall consists of precast concrete blocks and boulders and is in generally good condition with minor movements. The southwest retaining wall is in fair condition with localized severe scaling and light cracking. The retaining wall also exhibits two horizontal cold joints. Efflorescence was noted along the joints. The southeast retaining wall is in fair condition with localized severe spalling and light cracking. The retaining wall also exhibits one horizontal cold joint. Efflorescence was noted along the joint.
- The asphalt paved approach roads have minor settlement adjacent to the structure.
- The roadway embankments adjacent to the structure are vegetated. No erosion was noted adjacent to the structure.
- The watercourse is in unobstructed with no evidence of scour. The watercourse is considered navigable.

6.2 Land Use and Social Environment

The Study Area is subject to the Town of Caledon Official Plan and further the Regional Municipality of Peel Official Plan. Zoning within the Town conforms to the Town of Caledon Zoning By-law 2006-50, as amended. However, lands incorporating the Study Area fall entirely within the Niagara Escarpment Plan. Therefore, Zoning By-law 2006-50 does not conform to lands within the Study Area that fall within the Niagara Escarpment Plan, except where site-specific zoning is present. The Oak Ridges Moraine within Peel Region also falls within 500 meters of the Study Area.

The Study Area is located within an Environmental Policy Area (EPA). *Section 5.7.3.5.1* of the Caledon Official Plan states, *"New public and private infrastructure will not be permitted in EPA, with the exception of essential infrastructure which may be permitted subject to approval requirements of the Town and other relevant agencies".*

Dominion Street is connected via bridge to a Low Capacity Arteria/(Forks of the Credit Road). In addition, a Canadian Pacific railway runs through (north-south) the Study Area, just west of the Dominion Street.

Surrounding land uses include Open Space Policy Area, Rural Lands, and the Settlement Area of Belfountain.

Dominion Street is a vital component of the Bruce Trail, providing an active transportation linkage to the Forks of the Credit Provincial Park. The Bruce Trail is also an essential component of the Niagara Escarpment Parks and Open Space System with a long-term goal to secure a permanent corridor for the Bruce Trail along its entire length.

The Caledon Ski Club, a commercial/recreational use within the Study Area, is located west of existing Dominion Street, on the west side of the Credit River. The Caledon Ski Club is not anticipated to experience potential impacts because of the undertaking based on the alternatives considered.

The Land Use and Social Environment Existing Conditions Report may be found in **Appendix J** to this ESR.

6.3 Cultural Environment

6.3.1 Archaeological Resources

A Stage 1 Archaeological Assessment (AA) was completed by ASI, and submitted to the Ministry of Culture, Tourism, and Sport (MTCS). The Stage 1 AA may be found in **Appendix K** to this ESR. Depending on the recommended alternative solution and the recommended alternative design concept, a Stage 2 AA may be required.

The *Standards and Guidelines for Consultant Archaeologists (S & G), Section 1.3.1*, lists criteria, which are indicative of archaeological potential. The study area meets the following criteria, which are indicative of archaeological potential:

- Proximity to Euro-Canadian settlements (farmsteads; early industry; villages of Belfountain; Cataract; Brimstone)

- Proximity to historic transportation routes (Credit Valley Railway; Dominion Street; Forks of the Credit Road, McLaren Road, Puckering Lane)
- Proximity to previously registered archaeological sites
- Proximity to water sources (Credit River)
- Well-drained sandy soils (Caledon and Pontypool sandy loams)
- Distinct land formations (Oak Ridges Moraine; Niagara Escarpment)

These criteria are indicative of the study area as having potential for the identification of Euro-Canadian and Indigenous archaeological sites, depending on the degree of disturbance and physical features of the study area.

The background study determined that one previously registered archaeological site is located within 1 km of the Study Area. The property inspection determined that parts of the Study Area possess archaeological potential and will require Stage 2 assessment. The requirement for the completion of a Stage 2 AA will be confirmed during detailed design, subsequent to potential impacts to areas of archaeological potential.

6.3.2 Cultural Heritage Resources

A Cultural Heritage Resource Assessment (CHRA) was completed by ASI, where the results were submitted to the MTCS. The CHRA may be found in **Appendix L** to this ESR. The results of background historic research and a review of secondary source material, including historic mapping, revealed a study area with Indigenous history dating back thousands of years, and rural/quarry land use history dating back to the nineteenth century. Since the early twentieth century, the area has become a popular recreational destination. The results of preliminary data collection indicate that there are 30 cultural heritage resources within or adjacent to the study area, 19 of which were previously identified as having heritage interest on the Town's Built Heritage Resource Inventory. The remaining 11 cultural heritage resources were identified through historic map and document reviews.

7. MCEA Phase 2: Alternative Solutions

7.1 Alternative Solutions to the Problem

As part of the Class EA process, it is necessary to consider alternative solutions to the identified problem, which can be evaluated using criteria developed to establish a preferred solution. The alternative solutions were developed relative to the preliminary study area. Alternative solutions of the project are functionally different ways of approaching and dealing with a problem or opportunity.

The following alternative solutions have been evaluated as part of the Dominion Street Class EA:

- Alternative Solution 1 – Do Nothing
- Alternative Solution 2 – Re-alignment of Dominion Street
- Alternative Solution 3 – Rehabilitate Existing Dominion Street and Bridge

7.1.1 Alternative Solution 1 – Do Nothing

The "Do Nothing" alternative is used as a benchmark for the evaluation of additional alternatives. Rehabilitation or replacement works will not be undertaken. No measures to improve the condition of the bridge and road will be considered; therefore, the bridge and road would remain in its present condition. Identified issues and problems will remain unresolved and current conditions of the bridge and road would continue to deteriorate. If no rehabilitation work is undertaken, the road and bridge will no longer be able to accommodate heavier vehicles, which would require load limit reduction and eventually need to be closed.

7.1.2 Alternative Solution 2 – Re-alignment of Dominion Street

Alternative 2 would involve moving the road farther from the river in the areas where instability exists. However, a large hill is located on the east side of the road, which makes this solution very difficult given the potential for significant environmental impacts. Re-alignment would require significant mature vegetation removal and significant cuts to the Escarpment. Expropriation of private property would be required in affected areas of the preliminary right-of-way configurations. No measures to improve the condition of the bridge will be considered; therefore, the bridge would remain in its present condition, allowed to deteriorate. As a result, vehicular traffic would not be permitted to access Dominion Street via the bridge. This would require alternative access to be provided. Three variations to Alternative 2 have been generated.

Alternative 2A – Re-alignment via Puckering Lane

Alternative 2A, as depicted in **Figure 7.1**, would require the connection of Dominion Street to Puckering Lane. The connection of west-end Puckering Lane and north-end Dominion Street would require an 11 percent grade given the significant change in elevation, the maximum for a low volume rural roadway.

The estimated surface area potentially impacted from the preliminary configuration of Alternative 2A is approximately 48,000 m^2. An approximate 750 m of additional road would be required to facilitate Alternative 2B. Estimated costs associated with the implementation of Alternative 2A may range

from $5,000,000 to $6,000,000. This cost estimate does not include potential expropriation/land acquisition costs associated with the preliminary configuration of Alternative 2A.

Alternative 2B – Re-alignment via Forks of the Credit Road

Alternative 2B, as depicted in **Figure 7.2**, would require a connection approximately 240 m east of the current Forks of the Credit/Dominion Street intersection to connect to the existing laneway located approximately 240 m north of the existing intersection. This new connection would not affect any of the lands of the Forks of the Credit Provincial Park. A road grade falling within the 11 percent maximum appears to be feasible. A new bridge would be required to cross the Credit River. An existing private access road would require to be purchased and reconstructed from Dominion Street to the proposed connection.

The estimated surface area potentially impacted from the preliminary configuration of Alternative 2B is approximately 18,700 m^2. An approximate 700 m of additional road would be required to facilitate Alternative 2B. Estimated costs associated with the implementation of Alternative 2B may range from $2,000,000 to $3,000,000. This cost estimate does not include potential expropriation/land acquisition costs associated with the preliminary configuration of Alternative 2B.

Alternative 2C – Re-alignment via Forks of the Credit Provincial Park Parking Lot

Alternative 2C, as depicted in **Figure 7.3**, would require the northern extension of Dominion Street following the alignment of the existing Bruce Trail, connecting to the Forks of the Credit Provincial Park parking lot. The connection would require significant cuts in excess of 20 m for a grade of 11 percent, maximum for a low volume rural roadway.

The estimated surface area potentially impacted from the preliminary configuration of Alternative 2C is approximately 59,000 m^2. An approximate 1,700 m of additional road would be required to facilitate Alternative 2C. Estimated costs associated with the implementation of Alternative 2C may range from $6,000,000 to $8,000,000. This cost estimate does not include potential expropriation/land acquisition costs associated with the preliminary configuration of Alternative 2C

7.1.3 Alternative Solution 3 – Rehabilitate Existing Dominion Street and Bridge

This alternative would undertake bank and embankment stabilization works required to safeguard against potential hazards to the public and Town assets. This would involve the rehabilitation of Dominion Street and the Dominion Street Bridge, where a single point access would remain. Two variations to Alternative 3 have been generated.

Alternative 3A – Existing Bridge and Road Rehabilitation

Alternative 3A would require bridge and road rehabilitation, which would address some of the scour issues at the existing crossing.

Estimated costs associated with bridge rehabilitation only range from $450,000 to $600,000. This estimate does not include the costs associated with the rehabilitation of the existing road (Dominion Street). Costs associated with existing road rehabilitation are verified through the alternative design concepts evaluated (**Section 9.4**).

Alternative 3B – New Bridge and Road Rehabilitation

Alternative 3B would require the construction of a new bridge, which would likely be located just east of the existing bridge at a more narrow point of the river. Building the bridge off-line would allow existing bridge to remain in service while the new one is built, thereby allowing full time access during construction.

Estimated costs associated with new bridge construction would range from $1,400,000 to $1,800,000. This estimate does not include the costs associated with the rehabilitation of the existing road. Estimated costs for the rehabilitation of the road are to be confirmed upon completion of geotechnical investigations, which will determine the extent of rehabilitation required.

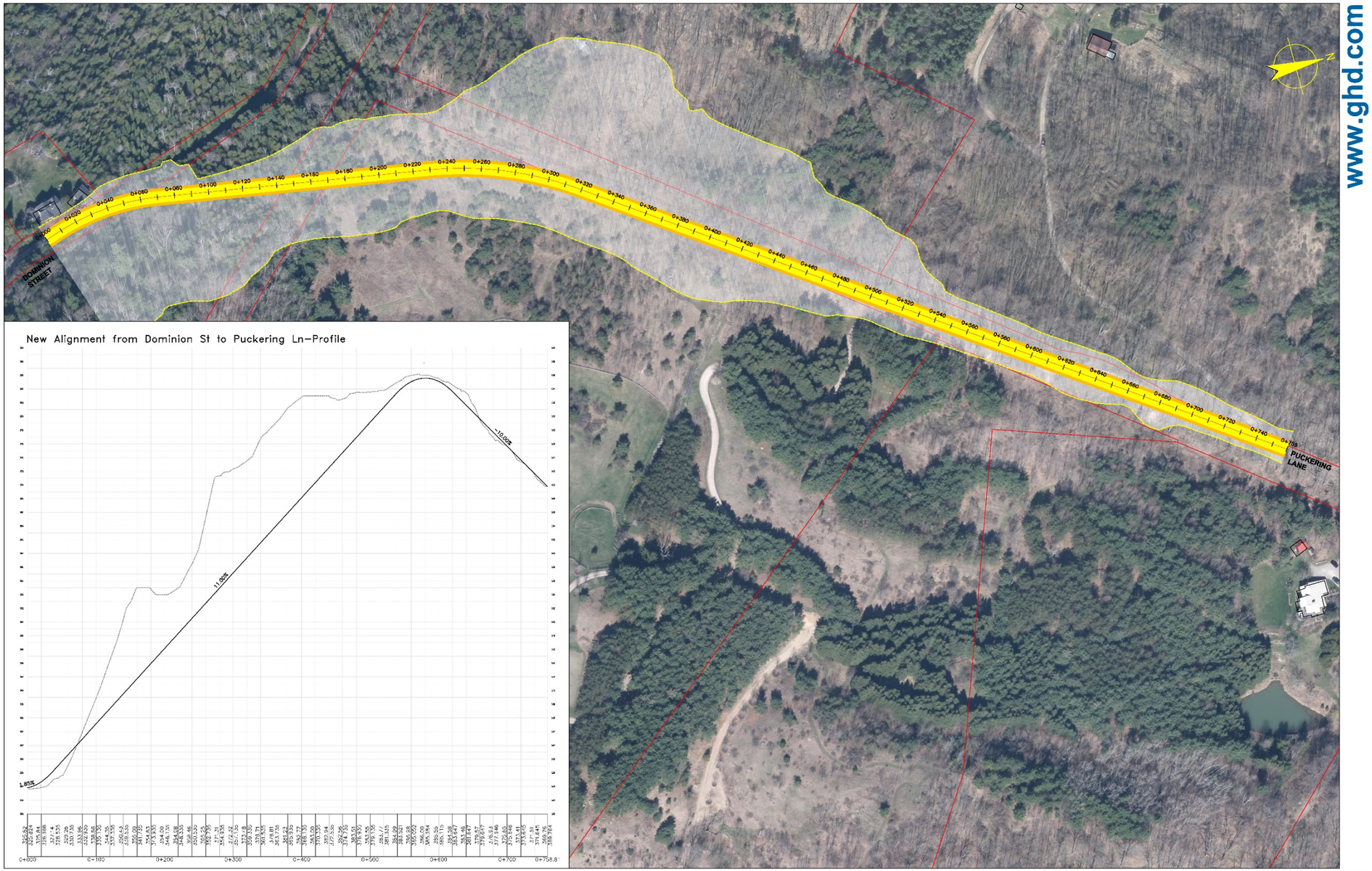

Figure 7.1 Alternative Solution 2A

Figure 7.2 Alternative Solution 2B

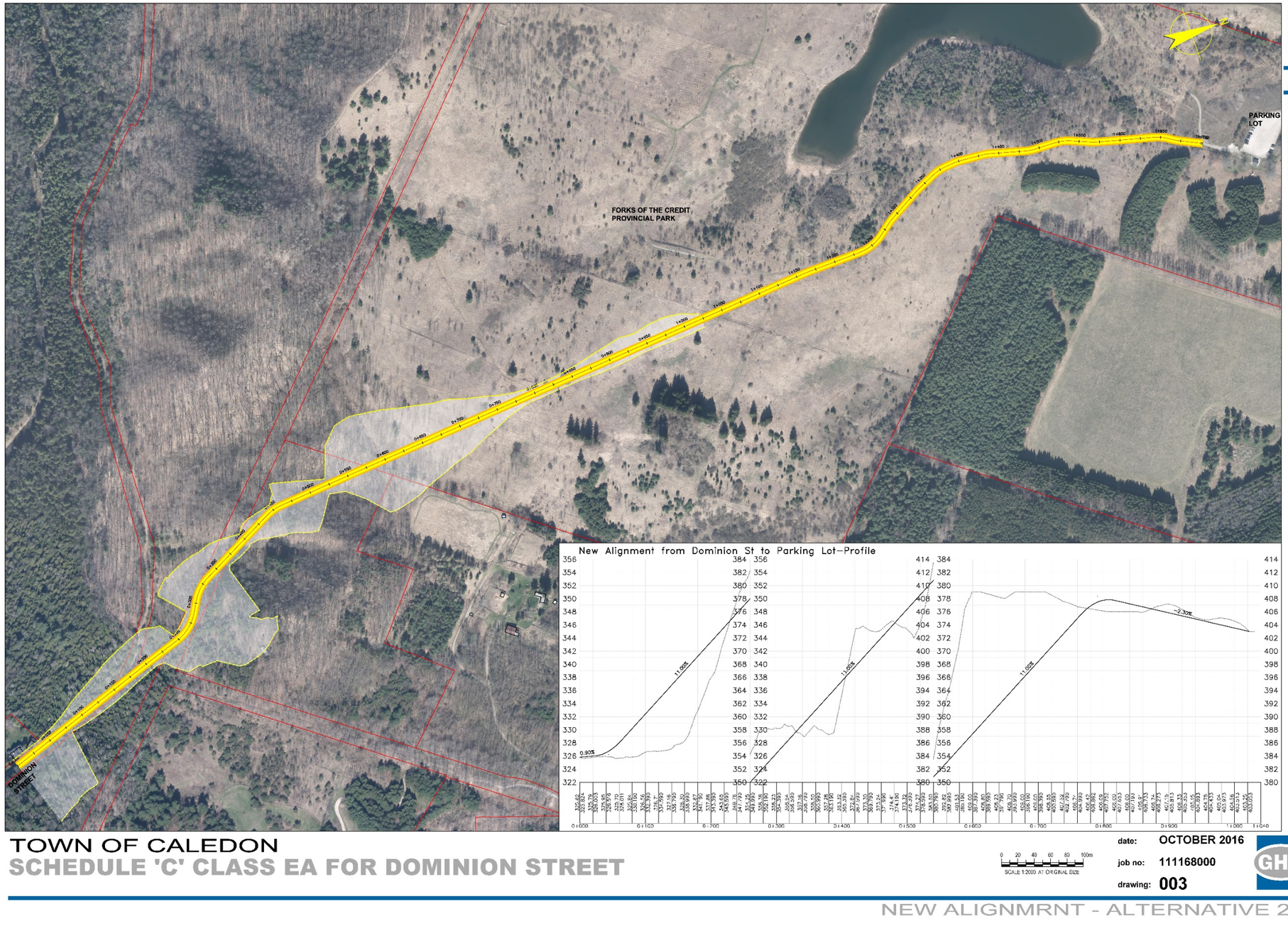

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Figure 7.3 Alternative Solution 2C

7.2 Evaluation Criteria for Alternative Solutions

Utilizing the existing conditions analysis, as identified in **Section 6** of this report, evaluation criterion was developed used to assess and compare each alternative solution based on the existing conditions explored at this stage of the Class EA process. At this stage in the Class EA process the alternative solutions evaluation is a high-level analysis that identifies potential impacts to the built, social, and natural environmental components of the study area through the following rating system:

> **Good** – limited to no potential for negative impacts or disturbance to the study area and/or some improvement to the study area is anticipated
>
> **Moderate** – potential for negative impacts or disturbance to a localized area within the study area
>
> **Poor** – high potential for negative impacts or disturbance to the broader study area

The detailed Alternative Solution Comparative Evaluation is located in **Section 7.3**.

7.2.1 Environmental Components, Criteria and Indicators

In order to identify the potential effects of the alternatives on the environment in a traceable, logical, understandable, and reproducible manner, a preliminary evaluation criterion was developed based on the problem/opportunity statement, existing environmental conditions and the range of alternatives being considered. The preliminary evaluation criteria is linked to each aspect of the environment (natural, built, social, economic, and cultural) as defined in the *EA Act* because the description of the effects of each alternative on the environment is required by the EA process. In addition, technical and financial criteria were included to account for these aspects associated with the alternatives. In total, the following five criterion categories are proposed:

- Technical Assessment *(Group 1)*
- Natural Environment *(Group 2)*
- Built, Social, and Cultural Environment *(Group 3)*
- Regulatory Compliance *(Group 4)*
- Financial Assessment *(Group 5)*

Table 7.1 Evaluation Criteria and Indicators for the Alternative Solutions

Group	Environmental Component	Criteria	Indicators
Group 1	Technical Assessment	Potential for improved public access	An assessment of the potential for the alignment and proposed works to accommodate and improve public access to Dominion Street and existing recreational features of the study area via vehicular and pedestrian travel.
		Constructability of proposed infrastructure	An assessment of the feasibility to construct the proposed infrastructure based on existing physical environmental conditions of the study area, including existing environmental constraints, such as the variant topography of the study area and the crossing of the Credit River.
		Future maintenance requirements	Potential for effects on future maintenance required. Is maintenance of the proposed infrastructure feasible given seasonal constraints and the potential extent of future maintenance required?
		Land or easement requirements	Potential for temporary or permanent disturbance to existing aquatic features. The extent that easements of land acquisition will be required based on the required right-of-way of the proposed infrastructure. Total area of land or properties required.
		Potential effect on general pedestrian, cyclist, and vehicle activity	An assessment of the potential effects to pedestrian, cyclist and vehicular transport modes based on the proposed infrastructure characteristics including required slope.
		Potential effect on property access	What is the effect on property access based on the proposed infrastructure under consideration?
Group 2	Natural Environment	Effect on the terrestrial environment	Potential for temporary or permanent disturbance to existing terrestrial features
		Effect on the aquatic environment	Potential for temporary or permanent disturbance to existing aquatic features
		Effect on known SAR and SAR habitat	Potential for effects associated with temporary or permanent disturbances to SAR and SAR habitat.
		Permits and Approvals requirements	Assessment of regulatory Federal, provincial and municipal approvals required.
		Effects on Areas of Natural Scientific Interest (ANSI), Environmentally Significant Areas (ESA), wetlands, or hazard lands	Potential for temporary or permanent disturbance to woodlots, Environmental Significant Areas, Areas of Natural or Scientific Interest, wetlands and hazard lands.

Table 7.1 Evaluation Criteria and Indicators for the Alternative Solutions

Group	Environmental Component	Criteria	Indicators
		Potential for effects on baseflow and/or groundwater resources	An assessment of the potential for disturbance to existing baseflow and groundwater resources.
		Potential for effects on surface water resources	An assessment of the potential for disturbance to existing surface water resources.
Group 3	Built, Social, and Cultural Environment	Potential for disturbing existing residences through temporary and/or permanent effects (i.e., construction noise, dust, traffic disruption, temporary property access disruption, etc.)	Number and type of residences and recreational facilities displaced and/or temporarily or permanently disrupted; or future planned land uses affected.
		Potential for disturbing existing recreational facilities/users through temporary and/or permanent effects (i.e., construction noise, dust, traffic disruption, temporary property access disruption, etc.)	Number and type of residences and recreational facilities displaced and/or temporarily or permanently disrupted; or future planned land uses affected.
		Potential effect on properties	An assessment of property potentially impacted from permanent or temporary easements and associated effects on property use.
		Potential for effects on archaeological resources	An assessment of archaeological resources and known sites potentially disturbed.
		Potential for effects on cultural/built heritage resources	Number and type of built heritage resources and cultural heritage landscapes displaced or disrupted.
Group 4	Regulatory Compliance	Potential to ensure that all new development is compatible with the purpose of the NEP	An assessment with the development objectives of the NEP with respect to applicable NEP designations and proposed infrastructure
		Potential to maintain and enhance the quality and character of natural streams and water supplies	An assessment of the potential impacts to natural streams and water supplies based the proposed infrastructure.
		Potential to provide adequate opportunities for outdoor recreation	Areas of permanent or temporary disruption of public access to the Niagara Escarpment, Bruce Trail and/or the Forks of the Credit Provincial Park.
		Potential to maintain and enhance the open landscape character of the Niagara Escarpment in so	Extent of required reformation of the Niagara Escarpment from proposed infrastructure development.

Table 7.1 Evaluation Criteria and Indicators for the Alternative Solutions

Group	Environmental Component	Criteria	Indicators
		far as possible, by such means as compatible farming or forestry and by preserving the natural scenery	
		Potential to provide adequate public access to the Niagara Escarpment	An assessment of potential alternate access to the Niagara Escarpment within the study area during and after construction.
		Compliance with Part One - Land Use Policies of the NEP - Escarpment Natural Area Designation	An assessment of compliance to Part One of the NEP, consistency with goals and policy provisions.
		Compliance with provisions of *Policy 2.15* of the NEP - Transportation and Utilities	An assessment of compliance with *Policy 2.15* of the NEP.
		Compliance with provisions of *Policy 2.16* of the NEP - The Bruce Trail	An assessment of compliance with *Policy 2.16* of the NEP.
		Potential to maintain and enhance the natural environment of the Niagara Escarpment	Areas of which may experience improvement or enhancement of the natural environment and integrity of the Niagara Escarpment.
Group 5	Economic and Financial Feasibility	Costs associated with property acquisition and/or temporary working easements	Relative difference in cost of property acquisition based on the total area of property required and the number and type of buildings on the properties to be acquired as compared to the other alignments.
		Costs for implementation (i.e., capital costs)	Relative difference in capital construction costs associated with the capital investment of the alignment as compared to the other alignments, not including the property acquisition costs.
		Operations and maintenance costs	Relative difference in costs associated with the maintenance and operation of the alignment as compared to the other alignments.

7.2.2 Niagara Escarpment Plan Policies and Consideration for Evaluation

The Study Area is located within the Niagara Escarpment Plan Area, subject to regulations under the Niagara Development Control Area. Niagara Escarpment Plan (NEP) designations within the Study Area include “Escarpment Natural Area” and “Escarpment Protection Area”. The purpose of the NEP is to *“…provide for the maintenance of the Niagara Escarpment and land in its vicinity substantially as a continuous natural environment, and to ensure only such development occurs as is compatible with that natural environment.”* Objectives of the NEP are as follows:

1. *To protect unique ecologic and historic areas;*

2. *To maintain and enhance the quality and character of natural streams and water supplies;*
3. *To provide adequate opportunities for outdoor recreation;*
4. *To maintain and enhance the open landscape character of the Niagara Escarpment in so far as possible, by such means as compatible farming or forestry and by preserving the natural scenery;*
5. *To ensure that all new development is compatible with the purpose of the Plan;*
6. *To provide for adequate public access to the Niagara Escarpment; and*
7. *To support municipalities within the Niagara Escarpment Plan Area in their exercise of the planning functions conferred upon them by the Planning Act.*

The proposed undertaking will be considered with respect to each of the above NEP objectives. A preferred solution to the alternative solutions considered will be evaluated favorably based on minimal potential impacts against the need for infrastructure improvements at Dominion Street.

Escarpment Natural Area Designation

In accordance with the NEP, Escarpment Natural Area designation is defined as, *"Escarpment features which are in a relatively natural state and associated stream valleys, wetlands, and forests which are relatively undisturbed are included within this designation. These contain important plant and animal habitats and geological features and cultural heritage features and area the most significant natural and scenic areas of the escarpment. The policy aims to maintain these natural areas."*

Objectives under the Escarpment Natural Area designation are as follows:

1. *To maintain the most natural Escarpment features, stream valleys, wetlands and related significant natural areas and associated cultural heritage features*
2. *To encourage compatible recreation, conservation and education activities*
3. *To maintain and enhance the landscape quality of the Escarpment features*

Potential impacts to NEP Escarpment Natural Area designated lands affecting *Policy 1.3* of the NEP based on the alternative solutions considered are described as follows:

Alternative 1 – Do Nothing

No improvements to the existing infrastructure will be undertaken. No impacts to natural escarpment features, stream valleys, wetlands, significant natural areas, and cultural heritage features will occur. Current infrastructure conditions will continue to deteriorate, potentially affecting access to and routes of the Bruce Trail. Infrastructure conditions will continue to deteriorate affecting the use of the Bruce Trail. No impacts to landscape quality will be experienced.

Alternative 2 – Re-alignment of Dominion Street

Significant impacts to escarpment features, stream valleys, wetlands, significant natural areas, and landscape quality are anticipated. Impacts to recreation, conservation, and education activities are expected. However, improvements to safety and access of the Bruce Trail are expected.

Alternative 3 – Rehabilitate Existing Dominion Street and Bridge

Impacts to escarpment features, stream valleys, wetlands, significant natural areas, and landscape quality are anticipated. Impacts to recreation, conservation, and education activities are expected to be minimal overall and most significant during rehabilitation works.

Development Criteria – 2.15 Transportation and Utilities

"The objective is to design and locate new and expanded transportation and utility facilities so the least possible change occurs in the environment and the natural and cultural landscape."

Policy provisions under the *Policy 2.15* of the NEP are as follows:

1. *All new and reconstructed transportation and utility facilities shall be designed and located to minimize the impact on the Escarpment environment and be consistent with the objectives of this Plan.*
2. *New transportation and utility facilities should avoid Escarpment Natural Areas.*

Potential Impacts to NEC protected lands affecting provisions of *Policy 2.15* of the NEP based on the alternatives solutions considered are described as follows:

Alternative 1 – Do Nothing

No rehabilitation or development of new transportation facilities will be undertaken. No impacts to Escarpment features will occur.

Alternative 2 – Re-alignment of Dominion Street

Alternative 2 will consider *Provision 1* to *Policy 2.15* of the NEP, where impacts will be minimized where possible. However, Alternative No. 2 requires the development of new transportation facilities and right-of-ways (ROW) through Escarpment Natural Area designations, which is non-compliant with *Policy 2.15*. Significant impacts to Escarpment Natural Areas are expected due to the development of additions ROWs.

Alternative 3 – Rehabilitate Existing Dominion Street and bridge

Alternative 3 will consider *Provision 1* to *Policy 2.15* of the NEP, where impacts will be minimized where possible. Alternative No. 3 considers the rehabilitation of existing infrastructure, minimizing potential impacts to Escarpment Natural Areas.

2.16 Bruce Trail

"The objective is to design and locate uses within the Bruce Trail Corridor in an environmentally sound manner:"

The Bruce Trail Association/Conservancy is responsible for planning, designing, developing, maintaining, and managing the Trail Corridor. The NEP considers the security of a continuous route for the Bruce Trail a high priority based on provisions of maintaining the NEP parks and open space system. For this reason, the Bruce Trail Association/Conservation will continue to be consulted, as this study progresses to ensure any potential impacts to the trail are appropriately mitigated, dependent on the individual impacts of the alternatives considered.

General provisions under the *Section 2.16* of the NEP are as follows:

1. *The Trail shall be designed and located within the corridor so as to:*
    a. *Minimize potential conflicts with adjacent private landowners and surrounding land uses (e.g. agriculture, housing); and*
    b. *Comply with municipal official plans and by-laws (where applicable).*
2. *All uses within the corridor shall be designed to minimize the need for environmental change (e.g. tree removal).*
3. *All Trail activities shall be compatible with the natural and cultural character of the area, avoiding wherever possible the need for major engineering works and site modifications over the long term.*
4. *In locations which are particularly sensitive to foot traffic, or which experience heavy use, periodic reroutes of the Trail may be necessary to allow for natural regeneration and minimize negative environmental impacts.*
5. *All uses within the Trail corridor shall be located and designed, where possible, to avoid steep slopes, wetlands, erosion prone soils and ecologically sensitive areas such as sensitive plant and animal habitats and sensitive areas within Areas of Natural and Scientific Interest.*

Potential impacts to the Bruce Trail affecting provisions of *Policy 2.16* of the NEP based on the Alternatives considered are described as follows:

Alternative 1 – Do Nothing

Infrastructure conditions of Dominion Street and the bridge will continue to deteriorate impacting conditions of the Bruce Trail route at this location, eventually rendering the Bruce Trail inoperable at this location, requiring new trail linkages and access points.

Alternative 2 – Re-alignment of Dominion Street

New Bruce Trail linkages and access points will be required. However, *Section 2.16.7* identifies locational preferences for Bruce Trail access points to be developed outside Escarpment Natural Areas. Significant impacts to natural and cultural character of the area are expected. Significant disturbances to erosion prone soils and ecological sensitive areas are also expected.

Alternative 3 – Rehabilitate Existing Dominion Street and bridge

Alterations to existing Bruce Trail linkages are expected to be minor, where no new access points will or linkages will be required. Impacts to natural and cultural character of the area may be avoided over the long term.

Each of the above NEP objectives and policy provisions were carried forward and considered as part of the next phase of alternatives evaluation process. Moving forward, the alternative solutions considered will be evaluated based on the potential for environmental impacts and disturbances, while considering the need for infrastructure improvements at Dominion Street.

7.3 Comparative Evaluation of the Alternative Solutions

As part of this phase of the EA, the evaluation criteria were used to comparatively evaluate the alternative solutions and identify a recommended alternative solution. The recommended alternative solution was then further studied and used to develop alternative design concepts for a separate evaluation in subsequent phases of this Class EA study. The detailed comparative Alternative Solutions Evaluation is reflected in **Table 7.2** and **Table 7.3**.

Table 7.2 Evaluation of Potential Effects of the Alternative Solutions (1, 2A, 2B)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Solutions (1, 2A, 2B)		
				Alternative Solution 1 – Do Nothing	Alternative Solution 2A	Alternative Solution 2B
Group 1	Technical Assessment	Potential for improved public access	An assessment of the potential for the alignment and proposed works to accommodate and improve public access to Dominion Street and existing recreational features of the study area via vehicular and pedestrian travel.	**POOR** No potential for improved public access.	**GOOD** Improved access by eliminating access over the deteriorated bridge.	**GOOD** Improved access over the new structure and alignment.
		Constructability of proposed infrastructure	An assessment of the feasibility to construct the proposed infrastructure based on existing physical environmental conditions of the study area, including existing environmental constraints, such as the variant topography of the study area and the crossing of the Credit River.	**MODERATE** No proposed infrastructure is required.	**POOR** Deep cuts to the escarpment are required.	**MODERATE** Moderate cuts mostly on the one side of the road and new bridge on new location.
		Future maintenance requirements	Potential for effects on future maintenance required	**POOR** High potential for future maintenance requirements, given current deterioration conditions.	**POOR** Very difficult maintenance during winter: snowdrifts due to the deep cuts.	**MODERATE** Higher maintenance during winter: potential snowdrifts due to the alignment through the valley.
		Land or easement requirements	Potential for temporary or permanent disturbance to existing aquatic features	**GOOD** No land or easements required.	**POOR** Substantial property requirement due to the deep cuts (maximum width of the cut ~119 m)	**POOR** Moderate property requirement (up to 54 m width of the grading width – split cut/fill)
		Potential effect on general pedestrian, cyclist, and vehicle activity	An assessment of the potential effects to pedestrian, cyclist, and vehicular transport modes based on the proposed infrastructure characteristics including required slope.	**MODERATE** No significant change.	**POOR** Grades up to +/-11 percent not favorable for safety of vehicles, cyclists and pedestrians	**MODERATE** Grades up to +/-9.6 percent not so favorable for safety of vehicles, cyclists, and pedestrians.
		Potential effect on property access	What is the effect on property access based on the proposed infrastructure under consideration?	**MODERATE** No significant change.	**MODERATE** No significant change.	**MODERATE** No significant change.
	Potential Net Effect (Group 1 Ranking)			***Fourth (4th)***	***Tied Fifth (5th)***	***Third (3rd)***
Group 2	Natural Environment	Effect on the terrestrial environment	Potential for temporary or permanent disturbance to existing terrestrial features	**GOOD** No potential impacts to the terrestrial environment would occur.	**POOR** Significant Escarpment cuts affecting ecological communities will be required. Permanent removal of vegetation and habitat for road construction.	**POOR** Significant Escarpment cuts affecting ecological communities will be required. Permanent removal of vegetation and habitat for road construction.
		Effect on the aquatic environment	Potential for temporary or permanent disturbance to existing aquatic features	**GOOD** No potential impacts to the aquatic environment would occur.	**GOOD** Aquatic environment not directly impacted by Alternative 2A	**MODERATE** A new bridge would be required at this location. Potential for aquatic disturbance may be experienced during construction works of the new bridge. Clear span bridge will mitigate permanent impacts to the aquatic environment.
		Effect on known SAR and SAR habitat	Potential for effects associated with temporary or permanent disturbances to SAR and SAR habitat.	**GOOD** No potential impacts to known SAR habitats	**POOR** High potential for disturbance of habitat and SAR habitat.	**POOR** High potential for disturbance of habitat and SAR habitat.

Table 7.2 Evaluation of Potential Effects of the Alternative Solutions (1, 2A, 2B)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Solutions (1, 2A, 2B)		
				Alternative Solution 1 – Do Nothing	**Alternative Solution 2A**	**Alternative Solution 2B**
Group 3		Effects on Areas of Natural Scientific Interest (ANSI), Environmentally Significant Areas (ESA), wetlands, or hazard lands	Potential for temporary or permanent disturbance to woodlots, Environmental Significant Areas, Areas of Natural or Scientific Interest, wetlands and hazard lands.	**GOOD** No potential impacts to ANSIs, ESAs, wetlands, or hazard land would occur.	**POOR** The alignment of Alternative 2A does not impede any ANSIs or ESAs. Potential impacts to unevaluated wetland at the north end of Dominion Street. Puckering Lane is currently located within a Provincially Significant Wetland. An easement through the Forks of the Credit Provincial Park would be required.	**GOOD** The alignment of Alternative 2B does not impede any ANSIs, ESAs, or wetlands. A new crossing of the Credit River would be required.
		Potential for effects on baseflow and/or groundwater resources	An assessment of the potential for disturbance to existing baseflow and groundwater resources.	**GOOD** No potential effects to current baseflow and groundwater resources.	**POOR** Potential for disturbance to existing baseflow conditions. Proposed alignment adjacent to numerous water well locations.	**POOR** Potential for disturbance to existing baseflow conditions. Proposed alignment adjacent to numerous water well locations.
		Potential for effects on surface water resources	An assessment of the potential for disturbance to existing surface water resources.	**GOOD** No potential effects on existing surface water resources	**POOR** Potential for offset disturbance to existing wetlands within the Study Area.	**POOR** Potential for offset disturbance to existing wetlands and waterbodies within the Study Area.
	Potential Net Effect (Group 2 Ranking)			***Tied First (1st)***	***Tied Third (3rd)***	***Tied Third (3rd)***
	Built, Social, and Cultural Environment	Potential for disturbing existing residences through temporary and/or permanent effects (i.e., construction noise, dust, traffic disruption, temporary property access disruption, etc.)	Number and type of residences and recreational facilities displaced and/or temporarily or permanently disrupted; or future planned land uses affected.	**MODERATE** No potential for disturbance to existing residents resulting from new construction works. However, residents may experience future and on-going disturbances due to required maintenance of the road and bridge.	**MODERATE** Temporary construction and use of equipment may periodically affect residential access. Ongoing generation of noise and/or dust will result from construction works. Permanent easements of private and public park property will be required.	**MODERATE** Temporary construction and use of equipment may periodically affect residential access. Ongoing generation of noise and/or dust will result from construction works. Permanent easements of private property will be required.
		Potential for disturbing existing recreational facilities/users through temporary and/or permanent effects (i.e., construction noise, dust, traffic disruption, temporary property access disruption, etc.)	Number and type of residences and recreational facilities displaced and/or temporarily or permanently disrupted; or future planned land uses affected.	**GOOD** No potential for disturbance to existing use of the Bruce Trail and the Forks of the Credit Provincial Park, resulting from new construction works. However, users of these recreational facilities may experience future and on-going disturbances due to required maintenance of the road and bridge.	**POOR** The existing alignment and use of the Bruce Trail will experience disturbance due to temporary construction. Paving of the existing trail, north of Dominion Street to Puckering Lane, will be required, affecting the Trails' existing alignment. Temporary closure of the Bruce Trail at these locations will be required.	**GOOD** The existing alignment and use of the Bruce Trail may experience some disturbance based on the relocation of the road alignment. Construction is to occur on land east of existing Bruce Trail route. The Bruce Trail may remain in operation during construction works.
		Potential effect on properties	An assessment of property potentially affected from permanent or temporary easements and associated effects on property use.	**MODERATE** Access to properties may be impacted due to future and on-going maintenance requirements	**POOR** Private properties on Dominion Street have the potential for minor impacts resulting from re-alignment. Permanent easements of private property and the Forks of the Credit Provincial Park would be required in order to facilitate this re-alignment. Further investigation would be required.	**MODERATE** Permanent easements of private property would be required in order to facilitate this re-alignment. This re-alignment would not affect and lands of the Forks of the Credit Provincial Park. Further investigation would be required.
		Effect on archaeological/built heritage resources	Potential for effects on known archaeological resources.	**GOOD** Archaeological resources will remain in present condition.	**POOR** Re-alignment has the potential to affect known areas of archaeological potential. Proposed ROW alignment would cross known areas of archaeological potential.	**MODERATE** The new bridge crossing required for this alignment would be constructed in an area of archaeological potential. Re-alignment of the road would not impede any know areas of archaeological potential.

Table 7.2 Evaluation of Potential Effects of the Alternative Solutions (1, 2A, 2B)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Solutions (1, 2A, 2B)		
				Alternative Solution 1 – Do Nothing	**Alternative Solution 2A**	**Alternative Solution 2B**
		Potential for effects on cultural/built heritage resources	Potential for effects on known cultural/built heritage resources.	**MODERATE** Cultural/built heritage resources will remain in present condition, but allowed to deteriorate.	**GOOD** Proposed re-alignment would not affect any identified Cultural Heritage Resource features.	**POOR** Proposed realignment would require an additional ROW through an existing Cultural Heritage Resource feature. A new bridge structure would be required in an area identifies as a Cultural Heritage Resource feature.
	Potential Net Effect (Group 3 Ranking)			***Tied First (1st)***	***Fourth (4th)***	***Third (3rd)***
Group 4	Regulatory Compliance	Potential to ensure that all new development is compatible with the purpose of the NEP	An assessment with the development objectives of the NEP with respect to applicable NEP designations and proposed infrastructure	**GOOD** No new development will be considered.	**POOR** Disturbance to Escarpment Natural Area and Escarpment Protection Area designations would occur because of this re-alignment. NEP amendments would be required, as Alternative 2A is not compatible with the existing natural environment	**POOR** Disturbance to an Escarpment Natural Area designation would occur because of this re-alignment. NEP amendments would be required, as Alternative 2B is not compatible with the existing natural environment
		Potential to maintain and enhance the quality and character of natural streams and water supplies	An assessment of the potential impacts to natural streams and water supplies based the proposed infrastructure.	**MODERATE** Natural streams and water supplies will remain in present condition, with no improvements and continued erosion of the embankment.	**GOOD** Natural streams and water supplies are not anticipated to experience potential impacts.	**POOR** A new permanent bridge will be required at the proposed locations to facilitate re-alignment. This will further impact dynamics of the Credit River
		Potential to provide adequate opportunities for outdoor recreation	Areas of permanent or temporary disruption of public access to the Niagara Escarpment, Bruce Trail, and/or the Forks of the Credit Provincial Park.	**MODERATE** Current opportunities for outdoor recreation will remain with no potential for improvements. Structural features supporting outdoor recreation will continue to deteriorate.	**POOR** Paving of the existing Bruce Trail, north of Dominion Street, in the proposed locations will be required, potentially affecting the current utilization of the Bruce Trail at this location.	**GOOD** Existing route of the Bruce Trail will be maintained with an additional connection via the proposed realignment of Alternative 2B.
		Potential to maintain and enhance the open landscape character of the Niagara Escarpment in so far as possible, by such means as compatible farming or forestry and by preserving the natural scenery	Extent of required reformation of the Niagara Escarpment from proposed infrastructure development.	**GOOD** Natural scenery will remain in present condition.	**POOR** The natural scenery of the Escarpment will be disturbed from new road development requiring various cuts and fill.	**POOR** The natural scenery of the Escarpment will be disturbed from new road development requiring various cuts and fill.
		Potential to provide adequate public access to the Niagara Escarpment	An assessment of potential alternate access to the Niagara Escarpment within the study area during and after construction.	**MODERATE** Public access will remain in present condition, but allowed to deteriorate.	**MODERATE** An alternate/additional public access would be developed. An extended connection to Dominion street from Puckering Lane would provide an additional access to recreational facilities within the Escarpment, including the Bruce Trail and Forks of the Credit Provincial Park. This access would require significant alterations to the affected Escarpment.	**MODERATE** An alternate/additional public access would be developed. This access would require significant alterations to the affected Escarpment.
		Compliance with Part One – Land Use Policies of the NEP – Escarpment Natural Area Designation	An assessment of compliance to Part One of the NEP, consistency with goals and policy provisions.	**MODERATE** Escarpment features, recreational features, and landscape quality will remain in present condition.	**POOR** Would require significant alterations to Escarpment Features and landscape quality	**POOR** Would require significant alterations to Escarpment Features and landscape quality

Table 7.2 Evaluation of Potential Effects of the Alternative Solutions (1, 2A, 2B)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Solutions (1, 2A, 2B)		
				Alternative Solution 1 – Do Nothing	**Alternative Solution 2A**	**Alternative Solution 2B**
		Compliance with provisions of *Policy 2.15* of the NEP-Transportation and Utilities	An assessment of compliance with *Policy 2.15* of the NEP.	**GOOD** No new transportation related facilities or additional roadways would be considered.	**POOR** Development of an additional road through Escarpment Natural Area and Escarpment Protection Area designations would be required, which are non-compliant with *Policy 2.15*	**POOR** Development of an additional road through an Escarpment Natural Area designation would be required, which is non-compliant with *Policy 2.15*
		Compliance with provisions of *Policy 2.16* of the NEP-The Bruce Trail	An assessment of compliance with *Policy 2.16* of the NEP.	**MODERATE** Bruce Trail access will remain in present condition, with no improvements.	**POOR** Significant alterations to the existing Bruce Trail linkages would occur because of this re-alignment. Significant tree removal and other natural environmental change would occur.	**POOR** Significant alterations to the existing Bruce Trail linkages would occur because of this re-alignment. Significant tree removal and other natural environmental change would occur.
		Potential to maintain and enhance the natural environment of the Niagara Escarpment	Areas of which may experience improvement or enhancement of the natural environment and integrity of the Niagara Escarpment.	**GOOD** Natural environment of the Niagara Escarpment will remain in present condition.	**POOR** Significant alterations to the natural environment and features of the Escarpment would occur. Significant fill and cuts to the Escarpment would be required to facilitate this re-alignment.	**POOR** Significant alterations to the natural environment and features of the Escarpment would occur. Significant fill and cuts to the Escarpment would be required to facilitate this re-alignment.
		Permits and Approvals requirements	Assessment of regulatory Federal, provincial and municipal approvals required.	**GOOD** No permits and approvals are required.	**POOR** CA, MNRF, and NEC approvals required	**POOR** CA, MNRF, and NEC approvals required. May require DFO review
	Potential Net Effect (Group 4 Ranking)			***Second (2nd)***	***Tied Fourth (4th)***	***Tied Fourth (4th)***
Group 5	Economic and Financial Feasibility	Costs associated with property acquisition and/or temporary working easements	Relative difference in cost of property acquisition based on the total area of property required and the number and type of buildings on the properties to be acquired as compared to the other alignments.	**GOOD** No acquisitions required.	**POOR** Easements required at the Forks of the Credit Provincial Park. Permanent easement required at private property. Property disposition and acquisition required	**POOR** Permanent easement required at private property. Property disposition and acquisition required
		Costs for implementation (i.e., Capital Costs)	Relative difference in capital construction costs associated with the capital investment of the alignment as compared to the other alignments, not including the property acquisition costs.	**GOOD** No works to be completed.	**POOR** Estimated cost for implementation of Alternative 2A: $5,000,000 to $6,000,000	**MODERATE** Estimated cost for implementation of Alternative 2B: $2,000,000 to $3,000,000
		Operations and Maintenance Costs	Relative difference in costs associated with the maintenance and operation of the alignment as compared to the other alignments.	**MODERATE** No works to be completed. On-going maintenance costs due to deterioration would be required.	**POOR** Development of an additional approx. 750 m of road would require significant maintenance.	**POOR** Development of an additional approx. 700 m of road and a new bridge crossing would require significant maintenance.
	Potential Net Effect (Group 5 Ranking)			***Tied Second (2nd)***	***Tied Fourth (4th)***	***Third (3rd)***
Overall Ranking of Alternative Solutions				***Second (2nd)***	***Fifth (5th)***	***Fourth (4th)***

Table 7.3 Evaluation of Potential Effects of the Alternative Solutions (2C, 3A, 3B)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Solutions (2C, 3A, 3B)		
				Alternative Solution 2C	Alternative Solution 3A	Alternative Solution 3B
Group 1	Technical Assessment	Potential for improved public access	An assessment of the potential for the alignment and proposed works to accommodate and improve public access to Dominion Street and existing recreational features of the study area via vehicular and pedestrian travel.	**GOOD** Improved access by eliminating access over the deteriorated bridge.	**MODERATE** Improved access.	**GOOD** Improved access through new and wider structure.
		Constructability of proposed infrastructure	An assessment of the feasibility to construct the proposed infrastructure based on existing physical environmental conditions of the study area, including existing environmental constraints, such as the variant topography of the study area and the crossing of the Credit River.	**POOR** Deep cuts to the escarpment are required.	**POOR** Structure and road rehabilitation under traffic, with lane reduction.	**MODERATE** New structure on new location and road rehabilitation under traffic, with lane reduction.
		Future maintenance requirements	Potential for effects on future maintenance required	**POOR** Very difficult maintenance during winter: snowdrifts due to the deep cuts.	**GOOD** Lower potential for future maintenance.	**GOOD** Lower potential for future maintenance
		Land or easement requirements	Potential for temporary or permanent disturbance to existing aquatic features	**POOR** Substantial property requirement due to the deep cuts (maximum width of the cut ~150 m).	**GOOD** No land or easements required.	**GOOD** Insignificant property requirement for new bridge and connection to existing Dominion Street.
		Potential effect on general pedestrian, cyclist, and vehicle activity	An assessment of the potential effects to pedestrian, cyclist, and vehicular transport modes based on the proposed infrastructure characteristics including required slope.	**POOR** Grades up to +/-11 percent not favorable for safety of vehicles, cyclists and pedestrians.	**GOOD** No significant effect on safety of vehicles, cyclists and pedestrians.	**GOOD** No significant effect on safety of vehicles, cyclists, and pedestrians.
		Potential effect on property access	What is the effect on property access based on the proposed infrastructure under consideration?	**MODERATE** No significant change.	**MODERATE** No significant change.	**MODERATE** No significant change.
	Potential Net Effect (Group 1 Ranking)			***Tied Fifth (5th)***	***Second (2nd)***	***First (1st)***
Group 2	Natural Environment	Effect on the terrestrial environment	Potential for temporary or permanent disturbance to existing terrestrial features.	**POOR** Significant Escarpment cuts affecting ecological communities will be required. Permanent removal of vegetation and habitat for road construction.	**GOOD** Potential for impacts to existing terrestrial environment would be temporary in nature. Mitigation measures could be put in place to reduce temporary impacts.	**MODERATE** Permanent removal of a limited area of vegetation and habitat for road construction to lead to new bridge.
		Effect on the aquatic environment	Potential for temporary or permanent disturbance to existing aquatic features.	**GOOD** Aquatic environment not directly impacted by Alternative 2C	**GOOD** Potential for impacts to existing aquatic environment would be temporary (i.e., during construction). Mitigation measures would be put in place to reduce temporary impacts.	**MODERATE** Moderate potential for impacts to existing aquatic environment, primarily during construction. Clear span bridge will mitigate permanent impacts to the aquatic environment.
		Effect on known SAR and SAR habitat	Potential for effects associated with temporary or permanent disturbances to SAR and SAR habitat.	**POOR** High potential for disturbance of habitat and SAR habitat.	**MODERATE** Potential for disturbance of habitat and SAR habitat because of temporary construction activities.	**MODERATE** Potential for disturbance of habitat and SAR habitat as a result of temporary construction activities.

Table 7.3 Evaluation of Potential Effects of the Alternative Solutions (2C, 3A, 3B)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Solutions (2C, 3A, 3B)		
				Alternative Solution 2C	**Alternative Solution 3A**	**Alternative Solution 3B**
Group 3		Effects on Areas of Natural Scientific Interest (ANSI), Environmentally Significant Areas (ESA), wetlands, or hazard lands	Potential for temporary or permanent disturbance to woodlots, Environmental Significant Areas, Areas of Natural or Scientific Interest, wetlands and hazard lands.	**POOR** The alignment of Alternative 2C impedes the Caledon Meltwater ANSI. Easements through the Forks of the Credit Provincial Park would be also required.	**GOOD** No potential impacts to ANSIs, ESAs, or wetlands. Minimal impact to hazard lands would occur.	**MODERATE** No potential impacts to ANSIs, ESA would occur. A new crossing of the Credit River would be required.
		Potential for effects on baseflow and/or groundwater resources	An assessment of the potential for disturbance to existing baseflow and groundwater resources.	**POOR** Potential for disturbance to existing baseflow conditions. Proposed alignment adjacent to numerous water well locations.	**GOOD** No potential for disturbance to existing groundwater resources.	**MODERATE** Potential for temporary disturbance to baseflow.
		Potential for effects on surface water resources	An assessment of the potential for disturbance to existing surface water resources.	**POOR** Potential for disturbance to existing surface water resources within the Forks of the Credit Provincial Park.	**MODERATE** Potential for disturbance to Credit River resources.	**MODERATE** Potential for disturbance to Credit River resources.
	Potential Net Effect (Group 2 Ranking)			***Fourth (4th)***	***Tied First (1st)***	***Second (2nd)***
	Built, Social, and Cultural Environment	Potential for disturbing existing residences through temporary and/or permanent effects (i.e., construction noise, dust, traffic disruption, temporary property access disruption, etc.)	Number and type of residences and recreational facilities displaced and/or temporarily or permanently disrupted; or future planned land uses affected.	**MODERATE** Temporary construction and use of equipment may periodically affect residential access. Ongoing generation of noise and/or dust will result from construction works. Permanent easements of private and public park property will be required.	**POOR** Temporary construction and use of equipment affect residential access. Road and bridge closure is required to complete construction and rehabilitation works. Permanent easements of private property will be required.	**MODERATE** Temporary construction and use of equipment may periodically affect residential access. The bridge at Dominion Street will remain in operation during the construction of the new bridge. Permanent easements of private property will be required.
		Potential for disturbing existing recreational facilities/users through temporary and/or permanent effects (i.e., construction noise, dust, traffic disruption, temporary property access disruption, etc.)	Number and type of residences and recreational facilities displaced and/or temporarily or permanently disrupted; or future planned land uses affected.	**POOR** The existing alignment and use of the Bruce Trail will experience disturbance due to temporary construction. Paving of the existing trail, north of Dominion Street through the existing Forks of the Credit Provincial Park, will be required, affecting the Trails' existing alignment. Temporary closure of the Bruce Trail at these locations will be required.	**MODERATE** Temporary closure of the existing Bruce Trail route along Dominion Street and the bridge will be required for the duration of road and bridge rehabilitation and construction.	**MODERATE** Temporary closure of the existing Bruce Trail route along Dominion Street will be required for the duration of road rehabilitation and construction works.
		Potential effect on properties	An assessment of property potentially affected from permanent or temporary easements and associated effects on property use.	**POOR** Private properties on Dominion Street have the potential for minor impacts resulting from re-alignment. Permanent easements of private property and the Forks of the Credit Provincial Park would be required in order to facilitate this re-alignment. Further investigation would be required.	**GOOD** Potential effects on private property are anticipated to be minor due to rehabilitation works. Lands of the Forks of the Credit Provincial will not be impacted.	**MODERATE** Easements to facilitate the development of a new bridge structure would be required. Further investigation would be required.
		Effect on archaeological/built heritage resources	Potential for effects on known archaeological resources.	**POOR** Re-alignment has the potential to impact known areas of archaeological potential. Proposed ROW alignment would cross known areas of archaeological potential.	**GOOD** Rehabilitation works would not occur within any known areas of archaeological potential.	**MODERATE** The new bridge crossing required for this alignment would be constructed in an area of archaeological potential. Remaining rehabilitation works would not occur within any known areas of archaeological potential.

Table 7.3 Evaluation of Potential Effects of the Alternative Solutions (2C, 3A, 3B)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Solutions (2C, 3A, 3B)		
				Alternative Solution 2C	Alternative Solution 3A	Alternative Solution 3B
		Potential for effects on cultural/built heritage resources	Potential for effects on known cultural/built heritage resources.	**POOR** Proposed realignment would require an additional ROW through an existing Cultural Heritage Resource feature.	**GOOD** Identified as a Cultural Heritage Resource feature, the current bridge connecting Dominion Street will be rehabilitated and preserved. There is a low potential for impacts to identified Cultural Heritage Resource features resulting from rehabilitation works.	**GOOD** A new bridge structure would be required in an area identifies as a Cultural Heritage Resource feature. There is a low potential for impacts to identified Cultural Heritage Resource features resulting from rehabilitation works.
	Potential Net Effect (Group 3 Ranking)			***Fifth (5th)***	***Tied First (1st)***	***Second (2nd)***
Group 4	Regulatory Compliance	Potential to ensure that all new development is compatible with the purpose of the NEP	An assessment with the development objectives of the NEP with respect to applicable NEP designations and proposed infrastructure	**POOR** Disturbance to Escarpment Natural Area and Escarpment Protection Area designations would occur because of this re-alignment. NEP amendments would be required, as Alternative 2C is not compatible with the existing natural environment	**GOOD** Rehabilitation of the existing road and bridge is compatible under the general provisions of the NEP.	**MODERATE** Development applications under the NEP would be required for the new bridge and road connection.
		Potential to maintain and enhance the quality and character of natural streams and water supplies	An assessment of the potential impacts to natural streams and water supplies based the proposed infrastructure.	**GOOD** Natural streams and water supplies are not anticipated to experience potential impacts.	**MODERATE** Potential for temporary impacts during construction and rehabilitation works are expected.	**POOR** A new permanent bridge will be required at the proposed. This will further impact dynamics of the Credit River
		Potential to provide adequate opportunities for outdoor recreation	Areas of permanent or temporary disruption of public access to the Niagara Escarpment, Bruce Trail, and/or the Forks of the Credit Provincial Park.	**POOR** Paving of the existing Bruce Trail, north of Dominion Street, in the proposed locations will be required, potentially affecting the current utilization of the Bruce Trail at this location.	**GOOD** The existing route of the Bruce Trail and access to the Forks of the Credit Provincial Park will be improved through rehabilitation works.	**GOOD** The existing route of the Bruce Trail and access to the Forks of the Credit Provincial Park will be improved through new bridge construction and existing road rehabilitation works.
		Potential to maintain and enhance the open landscape character of the Niagara Escarpment in so far as possible, by such means as compatible farming or forestry and by preserving the natural scenery	Extent of required reformation of the Niagara Escarpment from proposed infrastructure development.	**POOR** The natural scenery of the Escarpment will be disturbed from new road development requiring various cuts and fill.	**GOOD** Natural scenery will remain in present condition, with minimal potential for disturbance to the adjacent Escarpment Natural Area.	**MODERATE** A new bridge and connecting road extension would be required, affecting the natural scenery of the Natural Escarpment Area in the proposed location.
		Potential to provide adequate public access to the Niagara Escarpment	An assessment of potential alternate access to the Niagara Escarpment within the study area during and after construction.	**MODERATE** An alternate/additional public access would be developed. An extended connection to Dominion street from the Forks of the Credit Park Parking Facility would provide an additional access to recreational facilities within the Escarpment, including the Bruce Trail and Forks of the Credit Provincial Park. This access would require significant alterations to the affected Escarpment.	**GOOD** Current access/egress will remain and be improved with temporary disturbance during construction and rehabilitation works.	**GOOD** An alternate/additional public access would be developed. This access would require minor alterations to the affected Escarpment.
		Compliance with Part One-Land Use Policies of the NEP-Escarpment Natural Area Designation	An assessment of compliance to Part One of the NEP, consistency with goals and policy provisions.	**POOR** Would require significant alterations to Escarpment Features and landscape quality	**GOOD** Insignificant alterations to Escarpment Features and landscape quality are anticipated.	**MODERATE** Would require minor alterations to Escarpment Features and landscape quality

Table 7.3 Evaluation of Potential Effects of the Alternative Solutions (2C, 3A, 3B)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Solutions (2C, 3A, 3B)		
				Alternative Solution 2C	**Alternative Solution 3A**	**Alternative Solution 3B**
		Compliance with provisions of *Policy 2.15* of the NEP-Transportation and Utilities	An assessment of compliance with *Policy 2.15* of the NEP.	**POOR** Development of an additional road through Escarpment Natural Area and Escarpment Protection Area designations would be required, which are non-compliant with *Policy 2.15*	**GOOD** Rehabilitation works will be designed and located to minimize impact on the Escarpment.	**POOR** Development of an additional road through an Escarpment Natural Area designation would be required, which is non-compliant with *Policy 2.15*
		Compliance with provisions of *Policy 2.16* of the NEP-The Bruce Trail	An assessment of compliance with *Policy 2.16* of the NEP.	**POOR** Significant alterations to the existing Bruce Trail linkages would occur because of this re-alignment. Significant tree removal and other natural environmental change would occur.	**GOOD** Current Bruce trail linkages and configuration would be maintained and improved.	**MODERATE** Minor alterations to current Bruce Trail linkages would occur, specifically at the current bridge location. Minor cuts and tree removal would be required to facilitate this alternative.
		Potential to maintain and enhance the natural environment of the Niagara Escarpment	Areas of which may experience improvement or enhancement of the natural environment and integrity of the Niagara Escarpment.	**POOR** Significant alterations to the natural environment and features of the Escarpment would occur. Significant fill and cuts to the Escarpment would be required to facilitate this re-=-alignment.	**GOOD** Rehabilitation works will be designed to minimize environmental impacts and preserve the natural environment of the escarpment	**MODERATE** Significant alterations to the natural environment and features of the Escarpment would occur. Minor cuts and tree removal would be required to facilitate this alternative.
		Permits and Approvals requirements	Assessment of regulatory Federal, provincial, and municipal approvals required.	**POOR** CA, MNRF, and NEC approvals required	**MODERATE** CA, approvals are required; MNRF or NEC approvals may be required. May require DFO review.	**POOR** CA, MNRF, and NEC approvals required (new river crossing). May require DFO review crossing)
	Potential Net Effect (Group 4 Ranking)			***Tied Fourth (4th)***	***First (1st)***	***Third (3rd)***
Group 5	Economic and Financial Feasibility	Costs associated with property acquisition and/or temporary working easements	Relative difference in cost of property acquisition based on the total area of property required and the number and type of buildings on the properties to be acquired as compared to the other alignments.	**POOR** Easements required at the Forks of the Credit Provincial Park. Permanent easement required at private property. Property disposition and acquisition required.	**GOOD** No acquisitions required.	**GOOD** Minor easements required adjacent to existing bridge structure.
		Costs for implementation (i.e., Capital Costs)	Relative difference in capital construction costs associated with the capital investment of the alignment as compared to the other alignments, not including the property acquisition costs.	**POOR** Estimated cost for implementation of Alternative 2C: $6,000,000 to $8,000,000.	**GOOD** Bridge Rehabilitation: $450,000 to $600,000.	**MODERATE** Bridge Replacement: $1,400,000 to $1,800,000.
		Operations and Maintenance Costs	Relative difference in costs associated with the maintenance and operation of the alignment as compared to the other alignments.	**POOR** Development of an additional approx. 1,700 m of road would require significant maintenance.	**GOOD** No additional maintenance would be required.	**GOOD** Would require the maintenance of an additional bridge crossing.
	Potential Net Effect (Group 5 Ranking)			***Tied Fourth (4th)***	***First (1st)***	***Tied Second (2nd)***
Overall Ranking of Alternative Solutions				***Sixth (6th)***	***First (1st)*** **Most Preferred**	***Third (3rd)***

The following **Table 7.4** provides a summary of the detailed Alternative Solutions Evaluation representative of individual evaluation category rankings:

Table 7.4 Alternative Solutions Evaluation Summary Matrix

Assessment Group	Alternative 1	Alternative 2A	Alternative 2B	Alternative 2C	Alternative 3A	Alternative 3B
Group 1	4th	Tied 5th	3rd	Tied 5th	2nd	1st
Group 2	Tied 1st	Tied 3rd	Tied 3rd	4th	Tied 1st	2nd
Group 3	Tied 1st	4th	3rd	5th	Tied 1st	2nd
Group 4	2nd	Tied 4th	Tied 4th	Tied 4th	1st	3rd
Group 5	Tied 2nd	Tied 4th	3rd	Tied 4th	1st	Tied 2nd
Overall Ranking	**2nd** (However, not feasible given current condition of infrastructure)	**5th**	**4th**	**6th** Least Preferred	**1st** Most Preferred	**3rd**

The recommended alternative solution was determined based on its relative advantages and disadvantages compared to other alternative solutions considered. With this in mind, all six alternative solutions were qualitatively assessed and ranked according to their advantages and disadvantages, as identified in the **Tables 7.2 and 7.3**.

After completion of the alternatives solution evaluation, Alternative 3A was identified as the recommended alternative solution to present to the public and carried forward under Phase III of the Class EA study. This was confirmed as the preferred alternative solution after completion of the Public Information Centre #1, based on the public input received during this event and correspondence received shortly thereafter.

7.4 Confirmation of the Preferred Alternative Solution

After considering the comments and input received by government agencies and the public during Phases 1 and 2 in association with the studied existing environmental conditions of the Study Area and the Alternatives Solution Evaluation, the recommended Alternative Solution to carry forward into Phase 3 of the Harmonized Class EA process is Alternative 3A.

8. MCEA Phase 3: Alternative Design Concepts

8.1 Identification of Alternative Design Concepts

As part of the Schedule C MCEA process, it is necessary to consider alternative design concepts (alternative designs) for the confirmed preferred alternative solution, which can be evaluated by incorporating and building on the evaluation criteria developed to establish a preferred alternative solution. Alternative design concepts to the project are functionally different methods of designing the preferred alternative solution. The alternative design concepts for the Dominion Street Class EA consist of options for roadway configuration, various geotechnical methods for road rehabilitation options, and structure rehabilitation or replacement alternatives pursuant to the preferred alternative solutions.

Roadway Configuration Options

- Option 1: Original Road Reconfiguration
- Option 2: Two-lane 'Local Road' Configuration

Geotechnical Methods for Road Rehabilitation

- Method 1: Soldier Pile and Lagging System
- Method 2: Sheet Pile Walls
- Method 3: Reinforced Soil Slopes (RSS) Systems
- Method 4: Mechanically Stabilized Earth (MSE) Retaining Walls
- Method 5: Soil Nails/Micro-piles and Shotcrete Facing
- Method 6: Soil Mixed Walls
- Method 7: Tangent/Secant Pile Walls

Dominion Street Structure Alternatives

- Alternative 1: Structure Rehabilitation
- Alternative 2: Structure Replacement (Precast Concrete Box Girders)
- Alternative 3: Structure Replacement (Precast Concrete NU Girders)
- Alternative 4: Structure Replacement (Precast Concrete CPCI Girders)

8.1.1 Alternative Designs – Roadway Configuration Options

The following two (2) alternative designs for roadway configuration of Dominion Street are considered and evaluated in part of the Dominion Street Class EA:

Figure 8.1 Road Option 1 – Original Configuration

Road Option 1 – Original Road Reconfiguration

Road configuration Option 1 consists of full road rehabilitation to the original road configuration of Dominion Street.

Reconstruction of failed sections with a various single lane road width from 4.90 m to 6.20 m, unpaved shoulder, and roadside safety elements are considered for implementation.

Figure 8.2 Road Option 2 – Two Lane 'Local Road' Configuration

Road Option 2 – Two Lane 'Local Road' Configuration

Road configuration Option 2 consists of the implementation and widening of Dominion Street to a two-lane "Local Road" with 2.7 m lane widths and the addition of 1.0 m unpaved shoulders, road safety elements, concrete curb gutter, or ditch on east side of road.

Option 2 considers the full reconstruction of the existing roadway in addition to widening.

8.1.2 Alternative Designs – Geotechnical Methods

The following geotechnical methods, as described and assessed in **Table 8.1** utilizing relative advantages and disadvantages for the road rehabilitation of Dominion Street are considered and evaluated in part of the Dominion Street Class EA. The Geotechnical Investigation Report for the proposed Dominion Street Improvements, 2017, may be referred in **Appendix I**.

Table 8.1 Alternative Designs – Geotechnical Methods

Geotechnical Method	Example Image	Advantages	Disadvantages
Method 1 – Soldier Pile and Lagging System		• Cost effective ($500-$800/m^2) • Minimal road closure required • Versatile system and easily adapted • Little impact to riverbank vegetation	• Problems with high groundwater • Problems with non-cohesive ground • Cost increases if bedrock is in the soldier pile
Method 2 – Sheet Pile Walls		• Cost effective ($500-$800/m^2) • Minimal road closure required • Externally or internally braced	• Not typical in deep excavations • May cause neighbourhood disturbances • May decrease safety if slope cannot stabilize

Table 8.1 Alternative Designs – Geotechnical Methods

Geotechnical Method	Example Image	Advantages	Disadvantages
Method 3 – Reinforced Soil Slopes (RSS) Systems		• Cost effective (half MSW walls) • Length of reinforcement will deepen • Additional safety against slope failure • Blend with natural environment	• Area behind wall is required for reinforcement • Significant road closure • Removes existing riverbank vegetation • Road widening will encroach on riverbank
Method 4 – Mechanically Stabilized Earth (MSE) Retaining Walls		• Cost effective ($400-$800/m^2) • Simple and rapid construction • Road width can be increased • Little impact to riverbank vegetation	• Area behind wall is required for reinforcement • Cost associated with MSE walls may make it uneconomical
Method 5 – Soil Nails/Micro-piles and Shotcrete Facing		• Cost effective ($350-$800/m^2) • Can be installed in bedrock • Aesthetically pleasing facing can be included	• Problems with high groundwater • Problems in non-cohesive ground • Not typical in deep excavations

Table 8.1 Alternative Designs – Geotechnical Methods

Geotechnical Method	Example Image	Advantages	Disadvantages
Method 6 – Soil Mixed Walls		• Can be installed to depths of up to 100 m • Road width can be increased • Minimal vibrations	• Problems with high groundwater • Problems in non-cohesive ground • Not typical in deep excavations
Method 7 – Tangent/Secant Pile Walls		• Can be installed to depths of up to 100 m • Road width can be increased • Minimal vibrations	• More expensive ($1,000-1,600/$m^2$) • Difficult installation and long construction • May decrease safety if slope cannot stabilize

8.1.3 Alternative Designs – Dominion Street Bridge Alternatives

The Dominion Street Bridge Alternatives are considered for evaluation solely based on the assessment of a Life Cycle Cost Analysis, in order to determine the most financially viable option for the Town's consideration, as this is reflected in the Problem and Opportunity identified in Phase 1 of this Class EA for Dominion Street (**Section 5**).

The following four (4) bridge design alternatives were considered as part of the evaluation of alternative design concepts:

Structure Alternative 1: Structure Rehabilitation

Alternative 1 consists of rehabilitation of the existing bridge and includes the following works:

- Scarification and overlay of the existing bridge deck. The deck will also be waterproofed and paved to minimize future chloride penetration into the deck. A minor deck widening will be incorporated to facilitate minimum 3.0 m lanes during construction and provide a final deck width of 6.5 m between curbs.
- Removal of existing curbs and handrail systems and replacement with Canadian Highway Bridge Code compliant barrier systems.
- Patch repair of concrete deck soffit, abutments, and wingwalls.
- Upgrading guide rail on the approaches.
- Staging of deck widening will enable traffic flow for duration of construction.

The remaining service life of the bridge is estimated to be at least 30-years for this alternative, and the life span could be increased provided regular maintenance is carried out.

Structure Alternative 2: Structure Replacement – Precast Concrete Box Girders

Alternative 2 consists of replacement of the existing bridge alongside the existing bridge. This will permit traffic to be maintained on the existing bridge while the new bridge is constructed. The new bridge would have a 20 m span. Alternative 2 considers the construction of a precast B700 box girder bridge. The replacement bridge will provide a 7.0 m width between curbs due to the low traffic volume and poor geometrics available for the approach roads at the site. Open box beam handrail systems have been utilized to improve sight lines due to the abrupt turns at the ends of the bridge.

The remaining service life of the bridge is estimated to be at least 75-years for this alternative, and the life span could be increased provided regular maintenance is carried out.

Structure Alternative 3: Structure Replacement – Precast Concrete NU Girders

Alternative 3 consists of replacement of the existing bridge alongside the existing bridge. This will permit traffic to be maintained on the existing bridge while the new bridge is constructed. The new bridge would have a 20 m span. Alternative 3 considers the construction of a precast NU 1200 girders. The replacement bridge will provide a 7.0 m width between curbs due to the low traffic volume and poor geometrics available for the approach roads at the site. Open box beam handrail systems have been utilized to improve sight lines due to the abrupt turns at the ends of the bridge.

The remaining service life of the bridge is estimated to be at least 75-years for this alternative, and the life span could be increased provided regular maintenance is carried out.

Structure Alternative 4: Structure Replacement – Precast Concrete CPCI Girders

Alternative 4 consists of replacement of the existing bridge alongside the existing bridge. This will permit traffic to be maintained on the existing bridge while the new bridge is constructed. The new bridge would have a 20 m span. Alternative 4 considers a precast CPCI 1400 girders. The replacement bridge will provide a 7.0 m width between curbs due to the low traffic volume and poor geometrics available for the approach roads at the site. Open box beam handrail systems have been utilized to improve sight lines due to the abrupt turns at the ends of the bridge.

The remaining service life of the bridge is estimated to be at least 75-years for this alternative, and the life span could be increased provided regular maintenance is carried out.

8.2 Evaluation Criteria for the Alternative Design Concepts

Utilizing the existing conditions analysis, as identified in **Section 6** of this report, the alternative design concept evaluation criteria was developed in order to assess and compare each alternative design based on the existing conditions explored during Phases 1 and 2 of the MCEA process.

In order to identify the potential effects of the alternative designs on the environment in a traceable, logical, understandable, and reproducible manner, the alternative design evaluation criteria is derived from the alternative solutions evaluation criteria. The alternative design evaluation criteria are linked to each aspect of the environment (natural, built, social, economic, and cultural) as defined in the OEAA, since the description of the effects of each alternative on the environment is required by the EA process. In addition, technical assessment criteria were included to account for these aspects associated with the alternative designs. Economic and financial feasibility evaluation criteria have been added to the alternative design concept evaluation. In total, the following Phase 3 environmental components are assessed:

- Technical Assessment (Transportation, Design and Operations) *(Group 1)*
- Natural Environment *(Group 2)*
- Built Environment, Social Environment, and Cultural Environment *(Group 3)*
- Economic and Financial Feasibility *(Group 4)*

Table 8.2 Evaluation Criteria and Indicators for the Alternative Design Concepts

Group	Environmental Component	Criteria	Indicators
Group 1	Technical Assessment	Effect on property access	Potential for effects to property access because of long-term or short-term road closures during construction.
		Effect on constructability	An assessment of the feasibility to construct the proposed infrastructure based on existing physical environmental conditions of the study area, including existing environmental constraints, such as the variant topography of the study area and the crossing of the Credit River.
		Effect on timing for construction	Potential effects from construction duration and mobility requirements.
		Potential effect on future maintenance requirements	Potential for effects on future maintenance required
		Effect on construction operations	Potential effects from excavation required.
		Effect on site vibrations	Potential effects from on-site vibrations during constructions operations.
Group 2	Natural Environment	Effect on the natural environment (terrestrial and aquatic)	Potential for temporary or permanent disturbance to existing terrestrial and aquatic features
		Effect on baseflow and/or groundwater resources	An assessment of the potential for disturbance to existing baseflow and groundwater resources.
		Effect on surface water resources	Potential to maintain and enhance the quality and character of natural streams and water supplies
Group 3	Built, Social, and Cultural Environment	Effect on current land uses, Official Plan policies and objectives	Potential for effects on current land uses and conformity to current Official Plan objectives at the local and regional levels, including the Niagara Escarpment Plan.
		Effect on existing sensitive receptors	Potential disturbance to existing sensitive receptors[2]/facilities through temporary and/or permanent effects (i.e. construction noise, dust, traffic disruption, temporary property access disruption, etc.)
		Effect on property disturbance and business operations	Potential effects or disturbance to properties and/or existing business operations due to site alteration.
		Effect on archaeological, built/cultural heritage resources	Potential for effects on known archaeological and/or built/cultural heritage resources.
Group 4	Economic and Financial Feasibility	Costs associated with implementation	Potential capital costs required for implementation
		Costs associated with on-going operation and maintenance	Potential costs required for operation and maintenance

[2] Sensitive Receptor – Place of human activity and/or congregation susceptible to potential disturbance (i.e., place of work, place of worship, residential dwelling, parkland, education facility).

8.3 Evaluation Methodology for the Alternative Design Concepts

The alternative design concept evaluation was derived from the criteria and indicators used to evaluate comparatively the alternative solutions and are a high-level analysis that identifies potential effects to the environmental components of the study area, while taking in consideration the technical components of the proposed undertaking. The alternative design concepts for the Dominion Street Class EA have been evaluated qualitatively, where the alternative designs considered are evaluated and ranked according to applicable benefits and trade-offs in relation to the applied evaluation criteria and indicators. The alternative designs considered have been evaluated through the following rating system, applied to each indicator, as follows:

- **Good** – limited to positive potential effects and no permanent disturbance to the study area with high potential for improvements to the study area.
- **Minor** – some potential for negative effects and temporary disturbance to a localized area within the study area. Potential for positive net effects with implementation of best management practices or mitigation measures.
- **Moderate** – potential for negative effects and temporary or permanent disturbance to a localized area within the study area. Potential for positive net effects with implementation of best management practices or site-specific mitigation measures.
- **Poor** – high potential for negative net effects and temporary or permanent disturbance to the broader study area. Potential for positive net effects with implementation of best management practices, site-specific mitigation measures and/or specific monitoring practices.
- **Neutral/No Effect** – no effects anticipated beyond disturbances caused by existing site or study area operations. The alternative designs considered are consistent with the same anticipated level of effect.

8.4 Comparative Evaluation of the Alternative Design Concepts

The alternative design concept evaluation criteria allow for a comparative evaluation of the alternative designs and identify a recommended alternative design to carry forward to the implementation phase of the Dominion Street Class EA. The recommended alternative design will be implemented subject to required permitting, approvals, and implementation of best management practices and mitigations measures. **Table 8.3** provides a detailed comparative evaluation of roadway options. **Table 8.4** and **Table 8.5** provide the detailed comparative evaluation of the geotechnical methods considered for Dominion Street.

Table 8.3 Evaluation of Potential Effects of the Alternative Design Concepts (Road Options)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Design Concepts (Road Options)	
				Road Option 1 (Original Road Configuration)	Road Option 2 (Two-lane Local Road Configuration)
Group 1	Technical Assessment	Effect on property access	Potential for effects to property access because of long-term or short-term road closures during construction.	**Good** Short-term disruption and closure in required reconstruction zones.	**Poor** Longer road closure requirements for construction.
		Effect on constructability	An assessment of the feasibility to construct the proposed infrastructure based on existing physical environmental conditions of the study area, including existing environmental constraints, such as the variant topography of the study area and the crossing of the Credit River.	**Good** Restricted operational area to required zones for reconstruction	**Poor** Extensive operational area and difficult construction operations from site limitations in specific zones.
		Effect on timing for construction	Potential effects from construction duration and mobility requirements.	**Good** Potential for intermittent construction timing in required reconstruction zones. Possible implementation of construction staging.	**Poor** Longer construction duration required.
		Potential effect on future maintenance requirements	Potential for effects on future maintenance required	**No Effect** No effects anticipated beyond routine maintenance requirements	**No Effect** No effects anticipated beyond routine maintenance requirements
		Effect on construction operations	Potential effects from excavation required.	**Minor** Excavation operations restricted to zones of required reconstruction	**Poor** Extensive fill operations and soil removal required during construction.
		Effect on site vibrations	Potential effects from on-site vibrations during constructions operations.	**No Effect** No anticipated effects beyond geotechnical operations for road rehabilitation.	**No Effect** No anticipated effects beyond geotechnical operations for road rehabilitation.
	Potential Net Effect (Group 1 Ranking)			**Good**	**Poor**
Group 2	Natural Environment	Effect on the natural environment (terrestrial & aquatic)	Potential for temporary or permanent disturbance to existing terrestrial and aquatic features	**Minor** Restoration of the river embankment and slope stabilization. Minimal areas of permanent impact in required zones for reconstruction.	**Poor** Extensive temporary areas of impact due to construction requirements; some areas affected by permanent areas of impact.
		Effect on baseflow and/or groundwater resources	An assessment of the potential for disturbance to existing baseflow and groundwater resources.	**Good** Returning the existing road to its original configuration minimizes potential impacts and disturbance to river embankment and flood-lines.	**Poor** Increased road width affecting slope of river embankment, potentially impeding meander-belt width and flood-lines in confined area.
		Effect on surface water resources	Potential to maintain and enhance the quality and character of natural streams and water supplies	**Good** Prevention against slope failure and road slippage in required zones, protecting adjacent natural heritage features such as the Credit River and embankment.	**Good** Prevention against slope failure and road slippage throughout the full road, protecting adjacent natural heritage features such as the Credit River and embankment.
	Potential Net Effect (Group 2 Ranking)			**Good**	**Poor**
Group 3	Built, Social, and Cultural Environment	Effect on current land uses, Official Plan policies and objectives	Potential for effects on current land uses and conformity to current Official Plan objectives at the local and regional levels, including the Niagara Escarpment Plan.	**Neutral** Both options require cuts to the existing escarpment along the river embankment and upper slope in order to implement slope stabilization measures to prevent further road slippage.	**Neutral** Both options require cuts to the existing escarpment along the river embankment and upper slope in order to implement slope stabilization measures to prevent further road slippage.
		Effect on existing sensitive receptors	Potential disturbance to existing sensitive receptors/facilities through temporary and/or permanent effects (i.e. construction noise, dust, traffic disruption, temporary property access disruption, etc.)	**Neutral** Use of recreational facilities (Bruce Trail and Forks of the Credit Provincial Park) will be temporarily inaccessible via Dominion Street during construction operations. Duration is dependent on timing for construction.	**Neutral** Use of recreational facilities (Bruce Trail and Forks of the Credit Provincial Park) will be temporarily inaccessible via Dominion Street during construction operations. Duration is dependent on timing for construction.
		Effect on property disturbance and business operations	Potential effects or disturbance to properties and/or existing business operations due to site alteration.	**Neutral** No direct effects to properties anticipated beyond construction.	**Neutral** No direct effects to properties anticipated beyond construction.
		Effect on archaeological, built/cultural heritage resources	Potential for effects on known archaeological and/or built/cultural heritage resources.	**Neutral** Construction works are anticipated to occur within disturbed and/or sloped areas. There is anticipated potential for effects to identified Cultural Heritage Resource features within the study area as a result from rehabilitation works. Rehabilitation of the bridge connecting Dominion Street and the Forks of the Credit Road is required, where design features will consider the cultural value of the bridge.	**Neutral** Construction works are anticipated to occur within disturbed and/or sloped areas. There is anticipated potential for effects to identified Cultural Heritage Resource features within the study area as a result from rehabilitation works. Rehabilitation of the bridge connecting Dominion Street and the Forks of the Credit Road is required, where design features will consider the cultural value of the bridge.

Table 8.3 Evaluation of Potential Effects of the Alternative Design Concepts (Road Options)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Design Concepts (Road Options)	
				Road Option 1 (Original Road Configuration)	Road Option 2 (Two-lane Local Road Configuration)
	Potential Net Effect (Group 3 Ranking)			**Neutral**	**Neutral**
Group 4	Economic and Financial Feasibility	Costs associated with implementation	Potential capital costs required for implementation	**Good**	**Poor**
				Approximate cost for implementation of road rehabilitation in required zones: $3.3 Million Approximate cost for implementation of bridge rehabilitation: $430,000	Approximate cost for implementation of full road rehabilitation: $7.4 Million Approximate cost for implementation of bridge rehabilitation: $430,000
		Costs associated with on-going operation and maintenance	Potential costs required for operation and maintenance	**No Effect**	**No Effect**
				No effects anticipated beyond routine maintenance requirements	No effects anticipated beyond routine maintenance requirements
	Potential Net Effect (Group 4 Ranking)			**Good**	**Poor**
Overall Ranking of Alternative Design Concepts (Road Options)				**Most Preferred**	**Least Preferred**

Table 8.4 Evaluation of Potential Effects of the Alternative Design Concepts (Geotechnical Methods 1-4)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Design Concepts (Geotechnical Methods 1-4)			
				Method 1 (Soldier Pile and Lagging System)	Method 2 (Sheet Pile Walls)	Method 3 (RSS Systems)	Method 4 (MSE Retaining Walls)
Group 1	Technical Assessment	Effect on property access	Potential for effects to property access as a result of long-term or short-term road closures during construction.	**Minor**	**Good**	**Poor**	**Poor**
				Minimal road closure requirements.	Least number of road closures required.	Significant road closure requirements.	Most disruptive construction methodology. Requires full road closure.
		Effect on constructability	An assessment of the feasibility to construct the proposed infrastructure based on existing physical environmental conditions of the study area, including existing environmental constraints, such as the variant topography of the study area and the crossing of the Credit River.	**Good**	**Poor**	**Moderate**	**Good**
				Versatile system: Soldier piles (Driven/drilled) (H Piles, drilled shafts, auger cast piles) Facing (Wood lagging, Shotcrete facing, Cast-in-place (CIP)/precast reinforced concrete) Less vertical drilling requirements	Cannot be driven through manmade or natural obstructions (cobbles, boulders or bedrock). Cannot be used to stabilize a slope. In fact may decrease the factor of safety by impeding the natural groundwater drainage.	Increase in the length of reinforcement to enhance the slope stability factor of safety may be limited by the site topographic and geological conditions. Any increase in road width will require further encroachment onto the river bank beyond the ROW.	Simple and rapid construction procedures. Does not require large construction equipment
		Effect on timing for construction	Potential effects from construction duration and mobility requirements.	**Good**	**Good**	**Moderate**	**Poor**
				Time to construct approx. 2-3 months	Time to construct approx. 2-3 months	Significant construction duration for construction compared to other alternatives	Long duration for construction compared to other alternatives
		Potential effect on future maintenance requirements	Potential for effects on future maintenance required	No Effect	No Effect	No Effect	No Effect
				No ongoing maintenance is required for properly designed and implemented retention systems.	No ongoing maintenance is required for properly designed and implemented retention systems.	No ongoing maintenance is required for properly designed and implemented retention systems.	No ongoing maintenance is required for properly designed and implemented retention systems.
		Effect on construction operations	Potential effects from excavation required.	**Good**	**Good**	**Minor**	**Poor**
				Common in excavations <20 m deep.	Common in excavations <20 m deep. Easily removed during backfill operations once tiebacks are de-tensioned	Clean inorganic landslide debris can be used as backfill materials	MSE walls require the use of select granular fill. The cost of importing suitable fill material may render the system uneconomical.

Table 8.3 Evaluation of Potential Effects of the Alternative Design Concepts (Road Options)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Design Concepts (Road Options)			
				Road Option 1 (Original Road Configuration)		Road Option 2 (Two-lane Local Road Configuration)	
							Increase in the length of reinforcement to enhance the slope stability factor of safety may be limited by the site topographic and geological conditions.
		Effect on site vibrations	Potential effects from on-site vibrations during constructions operations.	**Good**	**Poor**	**Good**	**Good**
				Minimal vibration	Slope movements in adjacent slopes may take place due to installation vibrations	Minimal vibration	Minimal vibration
	Potential Net Effect (Group 1 Ranking)			**Good**	**Minor**	**Moderate**	**Moderate**
Group 2	Natural Environment	Effect on the natural environment (terrestrial and aquatic)	Potential for temporary or permanent disturbance to existing terrestrial and aquatic features	**Minor**	**Minor**	**Moderate**	**Moderate**
				Minimal permanent impact to riverbank vegetation is anticipated. Potential for permanent effects to aquatic environment are not anticipated.	Minimal permanent impact to riverbank vegetation is anticipated. Potential for permanent effects to aquatic environment are not anticipated.	Permanent removal of existing riverbank vegetation in the reinforced zone. Compensation planting may be required. Minimal potential for permanent effects to aquatic environment through loss of aerial cover.	Permanent removal of existing riverbank vegetation in the reinforced zone. Compensation planting may be required. Minimal potential for permanent effects to aquatic environment through loss of aerial cover
		Effect on baseflow and/or groundwater resources	An assessment of the potential for disturbance to existing baseflow and groundwater resources.	**Minor**	**Good**	**Good**	**Good**
				Soldier pile and lagging system may encounter problems with high groundwater during implementation.	Sheet pile walls perform well in saturated non-cohesive ground.	Can be designed to permit drainage in high groundwater elevation, if constructed with proper materials.	Can be designed to permit drainage in high groundwater elevation, if constructed with proper materials.
		Effect on surface water resources	Potential to maintain and enhance the quality and character of natural streams and water supplies	**Good**	**Good**	**Good**	**Good**
				Natural streams and water supplies are not anticipated to experience potential net negative effects. Methods to improve embankment stabilization and erosion control measures will be implemented.	Natural streams and water supplies are not anticipated to experience potential net negative effects. Methods to improve embankment stabilization and erosion control measures will be implemented.	Natural streams and water supplies are not anticipated to experience potential net negative effects. Methods to improve embankment stabilization and erosion control measures will be implemented.	Natural streams and water supplies are not anticipated to experience potential net negative effects. Methods to improve embankment stabilization and erosion control measures will be implemented.
	Potential Net Effect (Group 2 Ranking)			**Minor**	**Minor**	**Moderate**	**Moderate**
Group 3	Built, Social, and Cultural Environment	Effect on current land uses, Official Plan policies and objectives	Potential for effects on current land uses and conformity to current Official Plan objectives at the local and regional levels, including the Niagara Escarpment Plan.	**Neutral**	**Neutral**	**Neutral**	**Neutral**
				Proposed works are not anticipated to be in contravention with Municipal, Regional, or Provincial Plans, Policies or Strategies. Construction operations and roadway improvements are to occur within the existing municipal right-of-way.	Proposed works are not anticipated to be in contravention with Municipal, Regional, or Provincial Plans, Policies or Strategies. Construction operations and roadway improvements are to occur within the existing municipal right-of-way.	Proposed works are not anticipated to be in contravention with Municipal, Regional, or Provincial Plans, Policies or Strategies. Construction operations and roadway improvements are to occur within the existing municipal right-of-way.	Proposed works are not anticipated to be in contravention with Municipal, Regional, or Provincial Plans, Policies or Strategies. Construction operations and roadway improvements are to occur within the existing municipal right-of-way.
		Effect on existing sensitive receptors	Potential disturbance to existing sensitive receptors/facilities through temporary and/or permanent effects (i.e., construction noise, dust, traffic disruption, temporary property access disruption, etc.)	**Neutral**	**Neutral**	**Neutral**	**Neutral**
				Use of recreational facilities (Bruce Trail and Forks of the Credit Provincial Park) will be temporarily inaccessible via Dominion Street during construction operations. Duration is dependent on timing for construction.	Use of recreational facilities (Bruce Trail and Forks of the Credit Provincial Park) will be temporarily inaccessible via Dominion Street during construction operations. Duration is dependent on timing for construction.	Use of recreational facilities (Bruce Trail and Forks of the Credit Provincial Park) will be temporarily inaccessible via Dominion Street during construction operations. Duration is dependent on timing for construction.	Use of recreational facilities (Bruce Trail and Forks of the Credit Provincial Park) will be temporarily inaccessible via Dominion Street during construction operations. Duration is dependent on timing for construction.
				Neutral	**Neutral**	**Neutral**	**Neutral**

Table 8.3 Evaluation of Potential Effects of the Alternative Design Concepts (Road Options)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Design Concepts (Road Options)			
				Road Option 1 (Original Road Configuration)		Road Option 2 (Two-lane Local Road Configuration)	
		Effect on property disturbance and business operations	Potential effects or disturbance to properties and/or existing business operations due to site alteration.	No direct effects to properties anticipated beyond construction.	No direct effects to properties anticipated beyond construction.	No direct effects to properties anticipated beyond construction.	No direct effects to properties anticipated beyond construction.
		Effect on archaeological, built/cultural heritage resources	Potential for effects on known archaeological and/or built/cultural heritage resources.	**Neutral**	**Neutral**	**Neutral**	**Neutral**
				Construction works are anticipated to occur within disturbed and/or sloped areas. There is anticipated potential for effects to identified Cultural Heritage Resource features within the study area as a result from rehabilitation works. Rehabilitation of the bridge connecting Dominion Street and the Forks of the Credit Road is required, where design features will consider the cultural value of the bridge.	Construction works are anticipated to occur within disturbed and/or sloped areas. There is anticipated potential for effects to identified Cultural Heritage Resource features within the study area as a result from rehabilitation works. Rehabilitation of the bridge connecting Dominion Street and the Forks of the Credit Road is required, where design features will consider the cultural value of the bridge.	Construction works are anticipated to occur within disturbed and/or sloped areas. There is anticipated potential for effects to identified Cultural Heritage Resource features within the study area as a result from rehabilitation works. Rehabilitation of the bridge connecting Dominion Street and the Forks of the Credit Road is required, where design features will consider the cultural value of the bridge.	Construction works are anticipated to occur within disturbed and/or sloped areas. There is anticipated potential for effects to identified Cultural Heritage Resource features within the study area as a result from rehabilitation works. Rehabilitation of the bridge connecting Dominion Street and the Forks of the Credit Road is required, where design features will consider the cultural value of the bridge.
	Potential Net Effect (Group 3 Ranking)			**Neutral**	**Neutral**	**Neutral**	**Neutral**
Group 4	Economic and Financial Feasibility	Costs associated with implementation	Potential capital costs required for implementation	**Minor**	**Minor**	**Minor**	**Good**
				$500-$800/m^2	$550-$800/m^2	$550-$800/m^2	$400-$800/m^2
		Costs associated with on-going operation and maintenance	Potential costs required for operation and maintenance	**No Effect**	**No Effect**	**No Effect**	**No Effect**
				No maintenance is required for properly designed and implemented retention systems. Routine road structure maintenance may be undertaken, as needed.	No maintenance is required for properly designed and implemented retention systems. Routine road structure maintenance may be undertaken, as needed.	No maintenance is required for properly designed and implemented retention systems. Routine road structure maintenance may be undertaken, as needed.	No maintenance is required for properly designed and implemented retention systems. Routine road structure maintenance may be undertaken, as needed.
	Potential Net Effect (Group 4 Ranking)			**Minor**	**Minor**	**Minor**	**Good**
Overall Ranking of Alternative Design Concepts (Geotechnical Methods 1-4)				**First** *(Most Preferred – Recommended Method)*	**Second** *(More Preferred)*	**Fourth** *(Moderately Preferred)*	**Third** *(More Moderately Preferred)*

Table 8.5 Evaluation of Potential Effects of the Alternative Design Concepts (Geotechnical Methods 5-7)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Design Concepts (Geotechnical Methods 5-7)		
				Method 5 (Soil Nails / Micro-piles and Shotcrete Facing)	Method 6 (Soil Mixed Walls)	Method 7 (Tangent / Secant Pile Walls)
Group 1	Technical Assessment	Effect on property access	Potential for effects to property access because of long-term or short-term road closures during construction.	**Minor** Minimal road closure requirements.	**Poor** Significant road closure requirements.	**Poor** Significant road closure requirements.
		Effect on constructability	An assessment of the feasibility to construct the proposed infrastructure based on existing physical environmental conditions of the study area, including existing environmental constraints, such as the variant topography of the study area and the crossing of the Credit River.	**Moderate** Installation in poorer soils can be challenging due to the time required for the soil to stand open to place reinforcing steel and mesh. Excavation may be expedited, as there are no large diameter vertical drilling requirements.	**Poor** Cannot be used to stabilize a slope. May decrease the factor of safety by impeding the natural groundwater drainage.	**Poor** Continuous/sealed wall system; acts as water cut-off (Site-specific disadvantage). Cannot be used to stabilize a slope. In fact may decrease the factor of safety by impeding the natural groundwater drainage.
		Effect on timing for construction	Potential effects from construction duration and mobility requirements.	**Minor** Average time to construct.	**Moderate** Significant construction duration for construction compared to other alternatives	**Moderate** Significant construction duration for construction compared to other alternatives
		Potential effect on future maintenance requirements	Potential for effects on future maintenance required	**No Effect** No ongoing maintenance is required for properly designed and implemented retention systems.	**No Effect** No ongoing maintenance is required for properly designed and implemented retention systems.	**No Effect** No ongoing maintenance is required for properly designed and implemented retention systems.
		Effect on construction operations	Potential effects from excavation required.	**Good** Common in excavations <20 m deep. Can be installed in bedrock, if required.	**Poor** Difficult installation through manmade or natural obstructions (cobbles, boulders or bedrock)	**Poor** Installation depth limit of about 30 m required
		Effect on site vibrations	Potential effects from on-site vibrations during constructions operations.	**Good** Minimal vibration	**Good** Minimal vibration	**Good** Minimal vibration
	Potential Net Effect (Group 1 Ranking)			**Moderate**	**Poor**	**Poor**
Group 2	Natural Environment	Effect on the natural environment (terrestrial and aquatic)	Potential for temporary or permanent disturbance to existing terrestrial and aquatic features	**Moderate** Permanent removal of existing riverbank vegetation in the reinforced zone. Compensation planting may be required. Minimal potential for permanent effects to aquatic environment through loss of aerial cover	**Moderate** Permanent removal of existing riverbank vegetation in the reinforced zone. Compensation planting may be required. Minimal potential for permanent effects to aquatic environment through loss of aerial cover	**Moderate** Permanent removal of existing riverbank vegetation in the reinforced zone. Compensation planting may be required. Minimal potential for permanent effects to aquatic environment through loss of aerial cover
		Effect on baseflow and/or groundwater resources	An assessment of the potential for disturbance to existing baseflow and groundwater resources.	**Poor** Soil nails/micro-piles and shotcrete facing may encounter problems with high groundwater during implementation. Shotcrete facing can result in groundwater cutoff	**Poor** Soil Mixed walls have the potential to impede natural groundwater drainage. Continuous/sealed wall system; acts as water cut-off (Site-specific disadvantage).	**Poor** Tangent/secant pile walls have the potential to impede natural groundwater drainage.
		Effect on surface water resources	Potential to maintain and enhance the quality and character of natural streams and water supplies	**Good** Natural streams and water supplies are not anticipated to experience potential net negative effects. Methods to improve embankment stabilization and erosion control measures will be implemented.	**Good** Natural streams and water supplies are not anticipated to experience potential net negative effects. Methods to improve embankment stabilization and erosion control measures will be implemented.	**Good** Natural streams and water supplies are not anticipated to experience potential net negative effects. Methods to improve embankment stabilization and erosion control measures will be implemented.
	Potential Net Effect (Group 2 Ranking)			**Poor**	**Poor**	**Poor**
Group 3	Built, Social, and Cultural Environment	Effect on current land uses, Official Plan policies and objectives	Potential for effects on current land uses and conformity to current Official Plan objectives at the local and regional levels, including the Niagara Escarpment Plan.	**Neutral** Proposed works are not anticipated to be in contravention with Municipal, Regional, or Provincial Plans, Policies or Strategies. Construction operations and roadway improvements are to occur within the existing municipal right-of-way.	**Neutral** Proposed works are not anticipated to be in contravention with Municipal, Regional, or Provincial Plans, Policies or Strategies. Construction operations and roadway improvements are to occur within the existing municipal right-of-way.	**Neutral** Proposed works are not anticipated to be in contravention with Municipal, Regional, or Provincial Plans, Policies or Strategies. Construction operations and roadway improvements are to occur within the existing municipal right-of-way.

Table 8.5 Evaluation of Potential Effects of the Alternative Design Concepts (Geotechnical Methods 5-7)

Group	Environmental Component	Criteria	Indicators	Potential Effects of the Alternative Design Concepts (Geotechnical Methods 5-7)		
				Method 5 (Soil Nails / Micro-piles and Shotcrete Facing)	Method 6 (Soil Mixed Walls)	Method 7 (Tangent / Secant Pile Walls)
		Effect on existing sensitive receptors	Potential disturbance to existing sensitive receptors/facilities through temporary and/or permanent effects (i.e. construction noise, dust, traffic disruption, temporary property access disruption, etc.)	**Neutral**	**Neutral**	**Neutral**
				Use of recreational facilities (Bruce Trail and Forks of the Credit Provincial Park) will be temporarily inaccessible via Dominion Street during construction operations. Duration is dependent on timing for construction.	Use of recreational facilities (Bruce Trail and Forks of the Credit Provincial Park) will be temporarily inaccessible via Dominion Street during construction operations. Duration is dependent on timing for construction.	Use of recreational facilities (Bruce Trail and Forks of the Credit Provincial Park) will be temporarily inaccessible via Dominion Street during construction operations. Duration is dependent on timing for construction.
		Effect on property; disturbance and business operations	Potential effects or disturbance to properties and/or existing business operations due to site alteration.	**Neutral**	**Neutral**	**Neutral**
				No direct effects to properties anticipated beyond construction.	No direct effects to properties anticipated beyond construction.	No direct effects to properties anticipated beyond construction.
		Effect on archaeological, built/cultural heritage resources	Potential for effects on known archaeological and/or built/cultural heritage resources.	**Neutral**	**Neutral**	**Neutral**
				Construction works are anticipated to occur within disturbed and/or sloped areas. There is anticipated potential for effects to identified Cultural Heritage Resource features within the study area as a result from rehabilitation works. Rehabilitation of the bridge connecting Dominion Street and the Forks of the Credit Road is required, where design features will consider the cultural value of the bridge.	Construction works are anticipated to occur within disturbed and/or sloped areas. There is anticipated potential for effects to identified Cultural Heritage Resource features within the study area as a result from rehabilitation works. Rehabilitation of the bridge connecting Dominion Street and the Forks of the Credit Road is required, where design features will consider the cultural value of the bridge.	Construction works are anticipated to occur within disturbed and/or sloped areas. There is anticipated potential for effects to identified Cultural Heritage Resource features within the study area as a result from rehabilitation works. Rehabilitation of the bridge connecting Dominion Street and the Forks of the Credit Road is required, where design features will consider the cultural value of the bridge.
	Potential Net Effect (Group 3 Ranking)			**Neutral**	**Neutral**	**Neutral**
Group 4	Economic and Financial Feasibility	Costs associated with implementation	Potential capital costs required for implementation	**Good**	**Moderate**	**Poor**
				\$350-\$800/m^2	\$800-\$1,400/m^2	\$1,000-\$1,600/m^2
		Costs associated with on-going operation and maintenance	Potential costs required for operation and maintenance	**No Effect**	**No Effect**	**No Effect**
				No maintenance is required for properly designed and implemented retention systems. Routine road structure maintenance may be undertaken, as needed.	No maintenance is required for properly designed and implemented retention systems. Routine road structure maintenance may be undertaken, as needed.	No maintenance is required for properly designed and implemented retention systems. Routine road structure maintenance may be undertaken, as needed.
	Potential Net Effect (Group 4 Ranking)			**Good**	**Moderate**	**Poor**
Overall Ranking of Alternative Design Concepts (Geotechnical Methods 5-7)				**Fifth** *(Less Moderately Preferred)*	**Sixth** *(Less Preferred)*	**Seventh** *(Least Preferred)*

8.5 Confirmation of the Preferred Alternative Design

8.5.1 Dominion Street Roadway Configuration Options

The recommended roadway option is selected based on its relative advantages and disadvantages compared to the additional option considered. **Table 9.6** summarizes potential effects and overall ranking of the roadway options considered:

Table 8.6 Roadway Options Comparative Evaluation Summary

Assessment Group	Roadway Option 1 (Original Road Configuration)	Roadway Option 2 (Two-lane Local Road Configuration)
Group 1	Good	Poor
Group 2	Good	Poor
Group 3	Neutral	Neutral
Group 4	Good	Poor
Overall Ranking	**1st** *Most Preferred*	**2nd** *Least Preferred*

Upon consideration of comments received by government agencies and the public during the proceedings of MCEA Phases 1, 2 and 3, the recommended preferred alternative design concept to proceed to implementation of the Dominion Street Class EA is Roadway Option 1 (Original Road Configuration).

Roadway Option 1 was confirmed as the preferred alternative design after completion of the Public Information Centre #2, based on public input received during this event and correspondence received shortly thereafter.

8.5.2 Geotechnical Methods for Road Rehabilitation

The recommended geotechnical method is selected based on its relative advantages and disadvantages compared to the additional methods considered. **Table 8.7** summarizes potential effects and overall ranking of the geotechnical methods considered:

Table 8.7 Geotechnical Methods Comparative Evaluation Summary

Group	Method 1 (soldier pile and lagging)	Method 2 (sheet pile walls)	Method 3 (RSS)	Method 4 (MSE wall)	Method 5 (soil nails)	Method 6 (soil mixed walls)	Method 7 (tangent / secant wall)
Group 1	Good	Minor	Moderate	Moderate	Moderate	Poor	Poor
Group 2	Minor	Minor	Moderate	Moderate	Poor	Poor	Poor
Group 3	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Group 4	Minor	Minor	Minor	Good	Good	Moderate	Poor
Overall Ranking	**1st** *Most Preferred*	**2nd**	**4th**	**3rd**	**5th**	**6th**	**7th** *Least Preferred*

Upon consideration of comments received by government agencies and the public during the proceedings of MCEA Phases 1, 2 and 3, the recommended preferred alternative design concept to proceed to implementation of the Dominion Street Class EA is Geotechnical Method 1 (soldier pile and lagging).

Geotechnical Method 1 (soldier pile and lagging) was confirmed as a preferred alternative design method for consideration after completion of the Public Information Centre #2, based on public input received during this event and correspondence received shortly thereafter.

8.5.3 Dominion Street Structure Alternatives – Life Cycle Cost Analysis

A life cycle cost analysis has been carried out for the four presented Alternatives. Alternative 1 (Structure Rehabilitation) consists of rehabilitation of the existing bridge at the present time, and subsequent replacement in Year 30. Following replacement, minor and major rehabilitations would be carried out in increments of 25 to 30-years. For comparison purposes, minor rehabilitations are estimated to be approximately 10 percent of the replacement value and major rehabilitations are estimated to be approximately 20 percent of the replacement value. These values are typical for minor and major rehabilitation of similar structures. Structure Alternatives 2 to 4 consist of replacing the entire structure at the current time, and carrying out minor and major rehabilitations to the new structure in increments of 25 to 30-years. The structure would need to be replaced again in 75-years.

The life cycle cost analysis, in addition to the current cost estimates for each alternative, is attached. Based on the results of the life cycle cost analysis summarized in Table 8.8, Alternative 1 provides the lowest present value cost alternative for maintenance of the structure crossing. Structure rehabilitation is the preferred alternative design of the structure alternative design considered.

Table 8.8 Life Cycle Cost Analysis Summary

Structure Alternative	Initial Construction Cost	Net Present Value
Alternative 1: Structure Rehabilitation	$430,000	$890,000
Alternative 2: Structure Replacement (Precast Concrete Box Girders)	$1,230,000	$1,430,000
Alternative 3: Structure Replacement (Precast Concrete NU Girders)	$1,330,000	$1,440,000
Alternative 4: Structure Replacement (Precast Concrete CPCI Girders)	$1,130,000	$1,430,000

9. Property Requirements

Refinement of the design for the confirmed Preferred Alternative Design has identified the following:

- No requirements for permanent disposal of provincial park property (i.e., no permanent infrastructure or grading will be located on land that is currently regulated as Forks of the Credit Provincial Park)
- No requirements for temporary staging areas / lay down areas within the park as these will be located within the existing municipal road allowance
- May require a “temporary construction easement” on provincial park property in two locations to facilitate construction of retaining walls

Therefore, based on the current design completed for the purposes of this MCEA, it is envisioned that all works and equipment access would be contained within the Dominion Road road allowance, and that no permanent or temporary negative impacts to park lands occur as a result of the road improvements (See **Appendix M** for Property Plans). As such, at this time, there would be no need for Ontario Parks’ environmental assessment or permitting processes, in particular as part of the MNRF PPCR Class EA.

In the event that temporary or permanent impacts to park lands occur or are likely to occur, then the Town would be required to continue with the MNRF PPCR Class EA process and seek authorization from the Park Superintendent, as required. The Town is committed to consulting further with Ontario Parks throughout the Detailed Design stage of the project and will advise if there are any impacts to Ontario Parks land with the understanding that the Record of Screening and the MNRF PPCR Class EA would need to be recommissioned to satisfy their requirements.

10. Mitigation Measures and Net Effects

Table 10.1, below, examines mitigation measures and net effects of the preferred Alternative Design Concepts. Mitigation measures relative to each applicable environmental component will be applied where there is the potential for negative effects associated with the implementation of alternative design concepts. The mitigation measures identified will be confirmed prior to commencement of construction in order to assure a positive or neutral net effect.

Table 10.1 Summary of Net Environmental Effects and Recommended Mitigation

Potential Negative Effects/Concerns	Mitigation Measures	Net Effects
Group 1: Transportation, Design and Operation Considerations		
Temporary effect on property access and operations by modification to driveway access and boulevards	• Contact property owners and notify them of the temporary modifications to their driveways and any potential for temporary disruptions to their access in advance of commencing such activities. • Minimize impacts on adjacent properties by confining all construction activities to the working area and not entering upon or occupying any private property outside of the working area for any purpose unless written permission from the landowner has been obtained in advance. • Take photographs of areas to be disturbed prior to construction operations. • Restore private property to its original condition or better following construction operations. The Contract Administrator will be the sole judge of whether the disturbed areas are restored to a satisfactory condition.	Disruptions to driveway/entrance access would be minimized and any damaged boulevards would be fully restored.
Temporary Disruption to Traffic on Roads	• Utilize a traffic management plan and standard traffic control measures on the project to coordinate traffic flow safely.	Temporary construction related effects on roadway users would be minimized.
Temporary Effects on Work Area Aesthetics	• Maintain the work area in a tidy condition free from the accumulation of debris, waste, rubble, etc. in order to minimize the visual impact of the work area. • Group sheds, site offices, other temporary structures and storage areas for materials and equipment in a compact manner and maintain in a neat and orderly condition at all times.	Construction area would be maintained in a neat and orderly manner at all times during construction.

Table 10.1 Summary of Net Environmental Effects and Recommended Mitigation

Potential Negative Effects/Concerns	Mitigation Measures	Net Effects
Generation of Excess Materials	• Utilize material identification and management options both inside and outside the construction area during construction. • Manage all excess and unsuitable materials generated during construction appropriately. The materials may be reused as a construction material or managed as engineered fill. Materials may also be temporarily stockpiled in preparation for these uses or removed from the site if required. • Take all contaminated wastes that cannot be reused or meet constraints to an appropriately approved waste disposal site and transport by an appropriately licensed waste disposal carrier. The Contractor will be required to manage all waste materials generated by construction activities in accordance with all provincial and federal regulations/approval requirements. A copy of all approvals and agreements will be provided to the CA, including waste manifests.	Proper utilization/disposal of excess waste materials would occur.
Group 2: Natural Environment Considerations		
Temporary and/or permanent effect on existing vegetation wildlife habitat	• Minimize removal of vegetation where possible. • Clearly delineate work areas. • Avoid operating heavy equipment outside work areas. • Implement Erosion and Sediment Control to prevent release of substances to nearby natural areas. Tree preservation and compensation plan to be developed during detailed design. Ensure trees to be removed are clearly marked. • Ensure post construction planting and landscaping efforts include native vegetation species appropriate for the habitats to be restored.	Temporary construction related effects and potential for permanent areas of disturbance to existing vegetation and wildlife habitat would be minimized.
Temporary impacts to Species at Risk (SAR) and wildlife species including breeding birds	• Complete any vegetation clearing outside of the breeding bird window for zone C2 (no clearing between early April to late August). • Inspect any structures to be disturbed (e.g., bridges and culverts) for the presence of nests prior to construction. • Silt fencing around work areas can work to exclude amphibians from entering the work area. • Advise drivers/workers to be aware of potential wildlife presence, maintain low speed, and stop to allow wildlife to cross and exit the work area. • In the event that an animal encountered during construction activities does not move from the area, or is injured, the Site Supervisor, a biologist, and MNRF will be notified. • In the event that a known or suspected SAR, the Site Supervisor will contact MNRF SAR biologists for advice.	Temporary construction related effects on SAR and wildlife would be minimized.

Table 10.1 Summary of Net Environmental Effects and Recommended Mitigation

Potential Negative Effects/Concerns	Mitigation Measures	Net Effects
Temporary effects to area watercourses and water resources	• Respect in-water work timing restrictions for coldwater fish species. • Isolate in-water work area to minimize impact to fish and prevent debris entry. • In-water works to be completed during low flow, and favourable weather conditions. • Have a qualified individual conduct a rescue and relocation of any fish from within the isolated in-water work areas. • Comply with DFO's "Freshwater Intake End of Pipe Fish Screen Guideline" for any water intake or outlet pipes/hoses. • Implement an Erosion and Sediment Control (ESC) Plan to prevent entry of sediment into water features and associated riparian and floodplain areas and prevent any migration of sediment beyond the construction area. Conduct regular inspection and maintenance of implemented ESC measures throughout project duration, and upgrade/amend as site conditions change. • Implement a Spills Prevention and Emergency Response Plan to prevent entry of any petroleum products, debris or other potential contaminants/deleterious substances. • Restrict entry of equipment into water features. • To prevent erosion and downstream transport, only place material free of fine particulate matter within water features, re-stabilized and re-vegetated any disturbed areas, locate temporary stockpiles at least 30 m from water features, and implement appropriate energy dissipation and/or settling/filtration measures where dewatering is required.	Temporary construction related effects on watercourse and water resources would be minimized.
Group 3: Built, Social and Cultural Considerations		
Temporary Construction Related Nuisance (i.e., Noise, Vibration, Dust, Odour and Fumes)	• Comply with Town of Caledon noise control by-laws. • Prevent unnecessary noise by maintaining equipment in proper operating condition, including but not limited to non-defective muffler systems, properly secured components, and the lubrication of moving parts. • Undertake dust/debris control measures as necessary. • Use low dust generating construction techniques/equipment • Maintain equipment in proper working order and operate only as required (no excessive idling) to reduce engine emissions. • Environmental monitoring should include periodic site visits by the CA to confirm proper adherence to confirmed mitigation measures.	Temporary construction related effects on adjacent sensitive receptors would be minimized.

Table 10.1 Summary of Net Environmental Effects and Recommended Mitigation

Potential Negative Effects/Concerns	Mitigation Measures	Net Effects
Temporary effect on property disturbance	• Contact property owners and notify them of the temporary modifications to their driveways and any potential for temporary disruptions to their access in advance of commencing such activities. • Minimize impacts on adjacent properties by confining all construction activities to the working area and not entering upon or occupying any private property outside of the working area for any purpose unless written permission from the land owner has been obtained in advance. • Take photographs of areas to be disturbed prior to construction operations. • Restore private property to its original condition or better following construction operations. The Contract Administrator will be the sole judge of whether the disturbed areas are restored to a satisfactory condition.	Short-term construction related effects on private property would only occur with land owner permission and be fully restored following construction.
Encountering Deeply Buried Archaeological Resources	• Contact the office of the Regulatory and Operations Group, Ministry of Culture immediately in the event that deeply buried archaeological remains are encountered during construction activities.	Disturbance to any discovered archaeological resources would be minimized.
Encountering Human Remains	• Contact both the Ministry of Culture, and the Registrar or Deputy Registrar of the Cemeteries Regulation Unit of the Ministry of Consumer and Business Services immediately in the event that human remains are encountered during construction.	Disturbance to any discovered human remains would be minimized.

10.1 Technical Assessment – Transportation, Design and Operations

10.1.1 Temporary Disruption of Traffic on Roads

Traffic on Dominion Street as well as property accesses adjacent to this road will be temporarily impacted in order to undertake the proposed road rehabilitation. A traffic management plan will be developed during detailed design to ensure the least possible impact, and standard traffic control measures will be implemented to safely co-ordinate traffic flow. Motorists will encounter reduced speeds and there may be times when construction will limit traffic to one lane controlled by flag persons.

10.1.2 Work Area Aesthetics

During construction, the Contractor will be required to maintain the work area in a tidy condition, free from the accumulation of debris, waste, rubble, etc. in order to minimize the visual impact of the work area. In addition, the Contractor's sheds, site offices, other temporary structures and storage areas for materials, equipment will be grouped in a compact manner and maintained in a neat, and orderly condition at all times.

10.1.3 Generation of Excess Materials

The proposed improvements will require excavation and filling. Various types of materials, including asphalt, rock, and soil will be generated during these project activities and requires appropriate management.

Material identification and management options will be used both inside and outside the construction area during construction. All excess and unsuitable materials generated during construction will be managed appropriately. The materials may be reused as a construction material or managed as engineered fill. Materials may also be temporarily stockpiled in preparation for these uses or removed from the site if required. Where an excess material management option cannot meet environmental constraints, another option must be pursued or the material must be managed as waste.

All contaminated wastes must be taken to an appropriately approved waste disposal site and transported by an appropriately licensed waste disposal carrier as per the operational constraint for the management of contaminated materials. The Contractor will be required to manage all waste materials generated by construction activities in accordance with all provincial and federal regulations/approval requirements. The Contractor will be required to provide a copy of all approvals and agreements, including waste manifests to the Contract Administrator.

10.2 Natural Environment

10.2.1 Disturbance to Area Watercourses

Construction activities may result in temporary disturbance to surface water features. Potential impacts include disturbance/removal of riparian vegetation, sedimentation of watercourses, and the potential for the release of deleterious substances. There is also potential to harm fish and fish

habitat because of in-water works during the construction period. While it is anticipated that these effects will be temporary, the following mitigating measures have been recommended for implementation to minimize or eliminate the potential adverse effects:

- Time in-water construction to minimize impacts to aquatic features by respecting the cold-water window (i.e., no in-water works between October 1 and May 31).
- Temporary containment of any in-water work area within the water features (e.g., coffer dams constructed of non-erodible materials) to confine the work area(s) from the main stream flow to prevent entry of debris and sediment into the water during construction.
- Any fish within temporary work zones isolated for the in-water works will be rescued using appropriate techniques by qualified individuals and released 'downstream of'/away from the temporary work zones, and in accordance with licensing received from MNRF.
- Any water intake or outlet pipes/hoses will have screens to prevent the entrainment or impingement of fish and follow the measures outlined in DFO's "Freshwater Intake End of Pipe Fish Screen Guideline."
- Where dewatering is required, appropriate energy dissipation and settling/filtration measures will be used for discharge of dewatering water to ensure no erosion or sediment release occurs in the water features.
- The Contractor will implement an Erosion and Sediment Control (ESC) Plan to meet all legislative requirements to prevent entry of sediment into watercourses and associated riparian and floodplain areas and prevent any migration of sediment beyond the construction area.
- All construction-related activities will be controlled so as to prevent entry of any petroleum products, debris or other potential contaminants/deleterious substances (in addition to sediment as outlined above), to the water features and in accordance with a Spills Prevention and Emergency Response Plan. The Plan, as well as appropriate emergency response materials, will be kept on site throughout construction and all employees made aware of its requirements and response protocols.
- Only clean materials free of fine particulate matter will be placed in the water features for temporary construction measures (e.g., coffer dams will be constructed of 'pea gravel' bags, geotextile fabric, sheet pile or other clean material).
- Any temporarily stockpiled soil, debris or other excess materials, and any construction-related materials, will be properly contained (e.g., inside silt fencing) in areas separated at least 30 m from the water features. All construction materials, excess materials, and debris will be removed and appropriately disposed of following construction.
- No equipment shall ford or otherwise enter any of the watercourses except as specified in the contract or unless authorized by the appropriate environmental agency/permit.
- Any clearing of riparian vegetation will be limited as much as possible and any disturbed areas will be re-stabilized and re-vegetated to prevent erosion and downstream sediment transport following construction.

The proposed works will require in-water and near water construction activities. These works will take place during the approved coldwater fisheries timing window of July 1 to September 15, or as otherwise approved by MNRF, to prevent impacts to migrating and spawning fish.

Any in-water work areas will be isolated with the use of cofferdams, or other appropriate methods, to allow construction works to take place in the dry, and prevent the release of sediment to downstream fish habitat. In addition, in-stream works will be timed to take place during low flow periods, and during favourable weather, conditions to ensure storm flows do not affect the ESC measures. A qualified biologist will conduct a fish rescue within any isolated in-stream work area, prior to dewatering, under a valid MNRF License to Collect Fish, and if required, a DFO SARA permit. Stranded fish within the isolated in-water work areas will be located immediately downstream. Any pumping will involve screened intakes, as per DFO's "Freshwater Intake End of Pipe Fish Screen Guideline" for any water intake or outlet pipes/hoses to prevent injury to fish.

An Erosion and Sediment Control (ESC) Plan will be implemented to prevent entry of sediment into water features and associated riparian and floodplain areas and prevent any migration of sediment beyond the construction area. Regular inspection and maintenance of the implemented ESC measures will occur throughout the project duration until site restoration is completed and the site is deemed to be in a stabilized state. The ESC Plan will not be static and ESC measures will be upgraded/amended as site conditions change. A Spills Prevention and Emergency Response Plan will be developed to prevent entry of any petroleum products, debris or other potential contaminants/deleterious substances into adjacent watercourses. Machinery will not enter the Credit River, or its tributaries, at any time.

To prevent erosion and downstream transport, only material free of fine particulate matter will be placed within water features. Disturbed areas will be re-stabilized and re-vegetated as work progresses. Temporary stockpiles will be located at least 30 m from water features, and any dewatering will incorporate appropriate energy dissipation and/or settling/filtration measures.

10.2.2 Disturbance to Species at Risk, Wildlife, and Breeding Birds

Construction activities have the potential to impact SAR, and wildlife, including breeding birds. The mitigation measures outlined in **Sections 11.2.1 and 11.2.3** will also protect the associated wildlife habitat functions. However, it is also necessary to ensure the protection of breeding birds and animals that may nest or otherwise use areas where construction is proposed.

Migratory birds are protected under the Migratory Birds Convention Act (MBCA). No work is permitted to proceed that would result in the incidental take of birds, nests and eggs of bird species protected under the MBCA and/or Regulations under that Act.

In order to protect nesting migratory birds, in accordance with the MBCA, the following mitigation measures will be followed:

- Ensure that no active nests (nests with eggs or young birds) will be removed or disturbed in accordance with the MBCA. Any structures to be impacted (such as bridges and culverts) shall be inspected by a qualified biologist in advance of construction works. If nests are identified, the biologist will detail required actions.

- Any vegetation clearing will be completed outside of the breeding bird window for zone C2 (no clearing between early April to late August). Although the general nesting period covers most federally protected migratory bird species, the general nesting period may not be accurate for species, which nest earlier, or later in the season. A qualified biologist shall be consulted for advice prior to clearing.

Equipment and work areas will be inspected for wildlife each day prior to work. To protect wildlife and SAR in general, the following mitigation measures are recommended:

- Advise drivers/workers to be aware of potential wildlife presence, maintain low speed, and stop to allow wildlife to cross and exit the work area.
- In the event that an animal encountered during construction activities does not move from the area, or is injured, all works that could potentially harm the animal will cease and the Site Supervisor, a biologist, and MNRF will be notified. All relevant handling and MNRF notification protocols will be adhered to.
- In the event that a known or suspected SAR is encountered, the Site Supervisor will contact MNRF SAR biologists for advice.
- Silt fencing around work areas can work to exclude amphibians from entering the work area.

10.2.3 Disturbance and Removal of Existing Vegetation and Associated Wildlife Habitat

Vegetation communities and associated wildlife habitat may be temporarily disturbed as part of the works. The following mitigation measures are recommended to minimize effects to local vegetation communities and their associated habitat functions:

- To mitigate impacts to vegetation, an ecologist will be required on-site during project start-up to participate in the clear delineation of the construction area and to flag any high sensitivity areas for avoidance. Staging areas will be kept to a minimum to reduce unnecessary vegetation clearing, and situated in existing disturbed areas if possible.
- Heavy equipment will not be operated outside of delineated work areas.
- An ESC Plan will be developed to prevent release of substances to nearby natural areas. ESC measures should be kept in place and be routinely inspected, modified as required, and maintained during the construction and vegetation establishment period. The ESC plan will include details on inspection frequency and restoration. Post construction planting and landscaping efforts will include native vegetation species appropriate for this project.
- The requirement for tree preservation and/or compensation will be discussed with the Town of Caledon at the time of detailed design.

10.3 Built and Social Environment

10.3.1 Temporary Access to Private Property

The Contractor will minimize impacts on adjacent private properties by confining all construction activities to the working area and not entering upon or occupying any private property outside of the

working area for any purpose unless written permission from the landowner has been obtained in advance. Should access to private property be granted, the property will be restored to its original condition or better following the completion of construction operations. Photographs are to be taken of the areas to be disturbed prior to construction operations. The Contract Administrator will be the sole judge of whether the disturbed areas are restored to a satisfactory condition.

10.3.2 Temporary Modifications to Driveway Access

Access to residences will be affected during the construction phase of the project. Roadway work will require full road closures during some phases of construction, and accommodation for residents affected by these closures will be developed during detailed design. The Contractor will be responsible for contacting property owners directly and notifying them of the temporary modifications to their access and any potential for temporary disruptions to their access well in advance of commencing such activities in order to allow for the development of alternative arrangements.

10.3.3 Temporary Construction Related Nuisance Effects (Noise, Vibration, Dust, Odours and Fumes)

The Contractor's activities, specifically the operation of construction equipment, will result in a temporary increase in noise, vibration, dust, and odours in the project area during the construction period. While it is anticipated that these effects will be short in duration and limited to periods of construction machinery operation, the following mitigating measures have been recommended for implementation to minimize or eliminate the potential adverse effects:

Increase in Noise Related to Operation of Construction Equipment:

- Comply with Town of Caledon Noise Control By-law.
- Prevent unnecessary noise by maintaining equipment in proper operating condition, including, but not limited to, proper muffler systems, properly secured components, and the lubrication of moving parts.
- Any complaints associated with noise will be monitored throughout the construction period and adjustments made as warranted.

Increase in Dust, Odours and Fumes Related to Operation of Construction Equipment:

- Undertake dust/debris control measures as necessary (i.e., apply water or calcium chloride to control dust emissions, minimize soil disturbances during dry periods, etc.).
- It is recommended that the Contractor use low dust generating construction techniques/equipment and wet type blades and grinders where asphalt sawing or concrete sawing/grinding is required.
- Equipment shall be maintained in an operating condition that maintains low emission rates and operated only as required (idling of equipment shall be restricted to the minimum necessary to perform the specified work).
- The MECP criteria for noxious gases and particulate matter are not expected to be exceeded as long as the recommended mitigation measures are employed.

10.4 Cultural Environment

10.4.1 Encountering Deeply Buried Archaeological Remains

Property inspection determined that parts of the Study Area possess archaeological potential and will require Stage 2 AA. The scope and extent of the Stage 2 AA will be confirmed and undertaken during detailed design. Should any deeply buried archaeological remains be encountered during construction, the MTCS regulations under the Ontario Heritage Act require the Contractor to immediately cease activities in the affected area and contact the office of the Regulatory and Operations Group, MTCS (416-314-7147).

10.4.2 Encountering Human Remains

In the event that human remains are encountered during construction, both MTCS and the Registrar or Deputy Registrar of the Cemeteries Regulation Unit of the Ministry of Government and Consumer Services shall be contacted immediately.

10.5 Utilities

Further consultation efforts with local utility providers including Hydro One and Bell service providers are required prior to the implementation of the preferred alternative design. Possible re-alignment of existing utility facilities and/or replacement of hydro wood poles may be required to facilitate the road rehabilitation of Dominion Street. A site meet with Hydro One, the Town, and GHD was held on December 8, 2017, to conduct an initial conditions assessment of supporting infrastructure and discuss potential utility re-alignment options. The most feasible alternative would likely be to temporary relocate the existing overhead utilities from the west side of the road to the east on temporary poles and then re-instate them onto the west side after construction. Permanent relocation to the east side was dismissed due to significant tree clearing and potential resultant erosion on the steep eastern embankment. Similarly underground relocation was dismissed due to high costs. Further coordination with local utility providers is required during detailed design.

10.6 Stormwater Management

The existing drainage system is poorly defined. Most of the roadway is drained by sheet flow. Ditches generally do not exist. Given the nature of the selected design solution, only minor drainage improvements are proposed since providing extensive ditching would cause significant disturbance to the existing mature vegetation on both the east and west sides while providing limited benefit.

11. Monitoring and Commitments

11.1 Construction Monitoring

At the time of implementation of this project, monitoring during construction, undertaken by the Contract Administrator, will ensure that; mitigation measures are providing expected control and adequate protection to minimize or eliminate adverse effects; additional mitigation measures are implemented if required, to address any unanticipated adverse effects that may arise during construction.

Environmental monitoring during construction is to include periodic site visits and inspections throughout the course of implementation by the Contract Administrator. The Town of Caledon will rely on the Contract Administrator to administer the environmental control measures of the contract and to ensure the effectiveness of the environmental control measures.

11.2 Post-EA Commitments

The following post-EA commitments, as described in Table 11.1, shall be considered by the Town of Caledon for detailed design and confirmed prior to contract tender.

Table 11.1 Post-EA Commitments for Dominion Street

Category	ID#	Commitment	Commitment Timing
Technical Assessment	1.0	Required permits and approvals will be obtained for the preferred alternative design.	Pre-construction, Construction
	2.0	Any unforeseen change to the preferred alternative solution or alternative design will be reviewed by the Town to determine if it should follow the Municipal Class EA addendum process.	Pre-construction
	3.0	Mitigation measures associated with the preferred alternative design will be implemented unless determined and documented to be no longer applicable or required.	Construction
	4.0	Review agencies and approval authorities (e.g., MNRF, CVC, Peel Region, Hydro One) will be consulted through meetings and correspondence on an as needed basis during detailed design and construction to coordinate the construction and implementation of the preferred alternative design.	Pre-construction, Construction
	5.0	Confirm in consultation with utility providers locations of all utility infrastructure prior to construction and relocate utility infrastructure as required as part of pre-construction activities.	Pre-construction
	6.0	Maintain access to residential properties where feasible during construction.	Construction
	7.0	Implement a Traffic Staging Plan during structural rehabilitation of the Dominion Street bridge and temporary full road closures necessitated to carry out the road rehabilitation activities. The Traffic Management Plan should also include a detour route for local trail users.	Pre-construction
	8.0	Review and assessment of retaining wall on the northbound travel lane, and slope failure on private property.	Pre-construction
	9.0	Review and assess potential hazard from elevation portion of private property and potential for public safety and Town infrastructure.	Pre-construction
Natural Environment	10.0	Develop and implement a Planting Compensation Plan/ Tree Preservation Plan, as required, in consultation with the Town of Caledon and CVC.	Pre-construction
	11.0	Develop and implement an Erosion and Sediment Control Plan	Pre-construction, Construction
	12.0	Develop and implement a Spills Prevention and Emergency Response Plan	Pre-construction, Construction
	13.0	Consult with the MECP Central Region as part of detailed design to confirm any approval requirements for water takings (e.g., a Permit to Take Water) during construction or operation, along with associated discharge water quality and quantity monitoring and mitigation programs.	Pre-construction
	14.0	Conduct DFO Self-Assessment and/or DFO Request for Review, to confirm any approval under the Fisheries Act or SARA is required	Pre-construction
	15.0	Consult with CVC during detailed design to facilitate required CVC permit under O. Reg. 160/06	Pre-construction
	16.0	Continue consultation efforts with Ontario Parks and MNRF to during detailed design.	Pre-construction
	17.0	Consult with MNRF during detailed design to confirm SAR permit requirements.	Pre-construction
	18.0	Consult with NEC during detailed design to confirm permitting requirements	Pre-construction
	19.0	Implement mitigation measures of natural environment impact assessment study, as appropriate	Construction

Table 11.1 Post-EA Commitments for Dominion Street

Category	ID#	Commitment	Commitment Timing
Built, Social, Cultural Environment	20.0	All property acquisition requirements will be confirmed and agreements obtained with the affected property owners prior to construction.	Pre-construction
	21.0	Develop and implement a Traffic Management Plan, as required	Pre-construction
	22.0	Affected residents immediately adjacent to construction and located on Dominion Street will be notified of construction activities (i.e., road/lane closures, municipal service/utility disruptions, driveway access) a minimum of 2-week prior to construction in the immediate area.	Pre-construction, Construction
	23.0	Confirm the requirement for a Stage 2 Archaeological Assessment during detailed design, for areas subject to disturbance during construction.	Pre-construction
	24.0	Develop an Emergency Response Plan with local authorities for implementation during construction	Pre-construction

11.3 Permitting and Approval Requirements

In addition to *EA Act* approval, there are a number of municipal and provincial approvals, as well as property agreements anticipated prior to implementation of the preferred alignment. Table 11.2 identifies the anticipated post-EA permits and approvals by approval authority, to be confirmed during detailed design efforts.

Table 11.2 Anticipated Post-EA Permits and Approvals

Approval Authority	Anticipated Post-EA Permits and Approvals Required	Legislation or By-law Reference
Municipal and Regional		
Town of Caledon	Road Occupancy Permit	Road Occupancy/Road Closure By-law
Peel Region	Road Occupancy Permit	Road Occupancy/Road Closure By-law
CVC	CVC permit under O.Reg. 160/06	O.Reg. 160/06
NEC	NEC Development permit under the Niagara Escarpment Plan	Niagara Escarpment Planning and Development Act
Utility Authorities	Coordination with the following utility authorities: • Bell • Rogers • Hydro One • Region of Peel Public Works	Not subject to legislation or by-law
Provincial		
MECP	Permit to Take Water (PTTW)	Ontario Water Resources Act O.Reg. 387/04
MNRF	License to collect fish for scientific purposes	Fish and Wildlife Conservation Act
MNRF	SAR Permit under ESA, 2007	Endangered Species Act (ESA), 2007
Federal		
DFO	DFO Self-Assessment and/or DFO Request for Review for near or in-water work and impacts to federally listed SAR	Fisheries Act and Species at Risk Act
Property Agreements		
Property Owners	Property acquisitions and/or permanent and/or temporary easements	Not subject to legislation of By-law

11.4 Emergency Response Plan

In order to accommodate for future road closures during construction, further consultation efforts with local emergency services including, the Peel Regional Police, Regional Paramedic and Fire Services should be undertaking prior to implementation of the preferred alternative design to facilitate the completion and implementation of an Emergency Response Plan during construction operations.

12. Implementation of the Project

12.1 Notice of Completion

The last step of the Class EA process following documentation of Phases 1 to 3, involves issuing a "Notice of Completion" to review agencies and the public, and filing of the ESR for public and agency review for a minimum period of 30-calendar days. Following the end of the review period, if there are no outstanding Part II Order Requests, the Town may proceed to Phase 5 of the Class EA process to complete the contract drawings and tender documents, and then move on to construction.

The notice (published on June 18, 2020) informs stakeholders and the general public of the project's completion, the filing of the ESR, and their rights regarding the Part II Order provisions.

12.2 Summary

Rehabilitation of Dominion Street will consist of full road rehabilitation to the original road configuration of Dominion Street, prior to existing erosion. Failed sections of the existing road will be reconstructed with a various road (single lane) width from 4.90 m to 6.20 m, consisting of unpaved shoulders and other roadside safety elements. It is recommended that a soldier pile and lagging system be considered for implementation at the identified failed slope sections within the existing Dominion Street right-of-way.

A single lane of traffic will be maintained on the existing bridge during construction due to the lack of alternative detour routes, which will not accommodate a full closure of the structure. Traffic staging for the rehabilitation of the existing bridge is restricted by the narrow deck width of the existing bridge. Minor widening of the bridge will facilitate maintenance of the crossing during construction with a minimum 3.0 m lane width. Four stages are recommended, as follows:

- **Stage 1** – Widen the bridge superstructure on one side by constructing a deck cantilever to support the new railing. Precast barriers will separate the work zone from traffic and providing protection to traffic crossing the bridge.
- **Stage 2** – Widen the bridge superstructure on the other side by constructing a deck cantilever to support the new railing. Precast barriers will separate the work zone from traffic and providing protection to traffic crossing the bridge.
- **Stage 3** – Rehabilitate one half of the bridge deck with flexible delineators separating the work zone from traffic.
- **Stage 4** – Rehabilitate the other half of the bridge deck with flexible delineators separating the work zone from traffic.

Following completion of Stage 4, the deck can be waterproofed and paved with flagging operations or a one-day closure. Below deck repairs can be completed independent of the top of deck rehabilitation works.

All of Which is Respectfully Submitted,

GHD

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