



Niagara Region

Niagara Escarpment Crossing
Comprehensive Environmental
Assessment
Proposed Terms of Reference

Appendix H
Groundwater Work Plan

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Prepared by:



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1 Introduction

This document outlines the proposed work plan that will be carried out during the Niagara Escarpment Crossing Environmental Assessment (EA) to generate a more detailed description and understanding of the environment from a groundwater perspective. Further, this document describes how that information will be used to assess the effects of the alternatives and proposed project on the environment through evaluation criteria and indicators. This work plan forms **Appendix H** to the proposed Niagara Escarpment Crossing Comprehensive EA Terms of Reference (ToR) and should be read in conjunction with it.

The ToR presently provides a preliminary description of the environment to gain a general understanding of the potential effects that should be examined in the Niagara Escarpment Crossing EA based on the range of alternatives to the project currently anticipated. This description reflects all components included within the Ontario *Environmental Assessment Act* (EA Act) definition of the environment: natural, social, built, economic, and cultural.

Several investigative studies are proposed as part of the Niagara Escarpment Crossing EA to expand on this preliminary description, including, but not limited to the following:

- Air Quality
- Agricultural
- Archaeology
- Built Heritage and Cultural Heritage Landscapes
- Contaminated Property
- Groundwater
- Land Use
- Natural Heritage
- Noise and Vibration
- Surface Water
- Visual Impact

The details associated with the groundwater investigation are provided in this document while details of the other investigative studies are provided as separate work plans. In addition to the investigative studies, the proposed ToR includes three other work plans: Traffic, Operations, and Safety, Transportation Planning and Engineering, and Financial all of which are included as separate appendices.

2 Establishment of Groundwater Conditions

2.1 Confirmation of the Preliminary Study Area

The preliminary study area provided in the ToR will be utilized as a starting point for establishing existing and future environmental conditions (**Figure 2-1**). This preliminary study area will be finalized during preparation of the Niagara Escarpment Crossing EA when more detailed information has been obtained, the alternatives to the project have been confirmed, and the potential environmental effects are better understood.

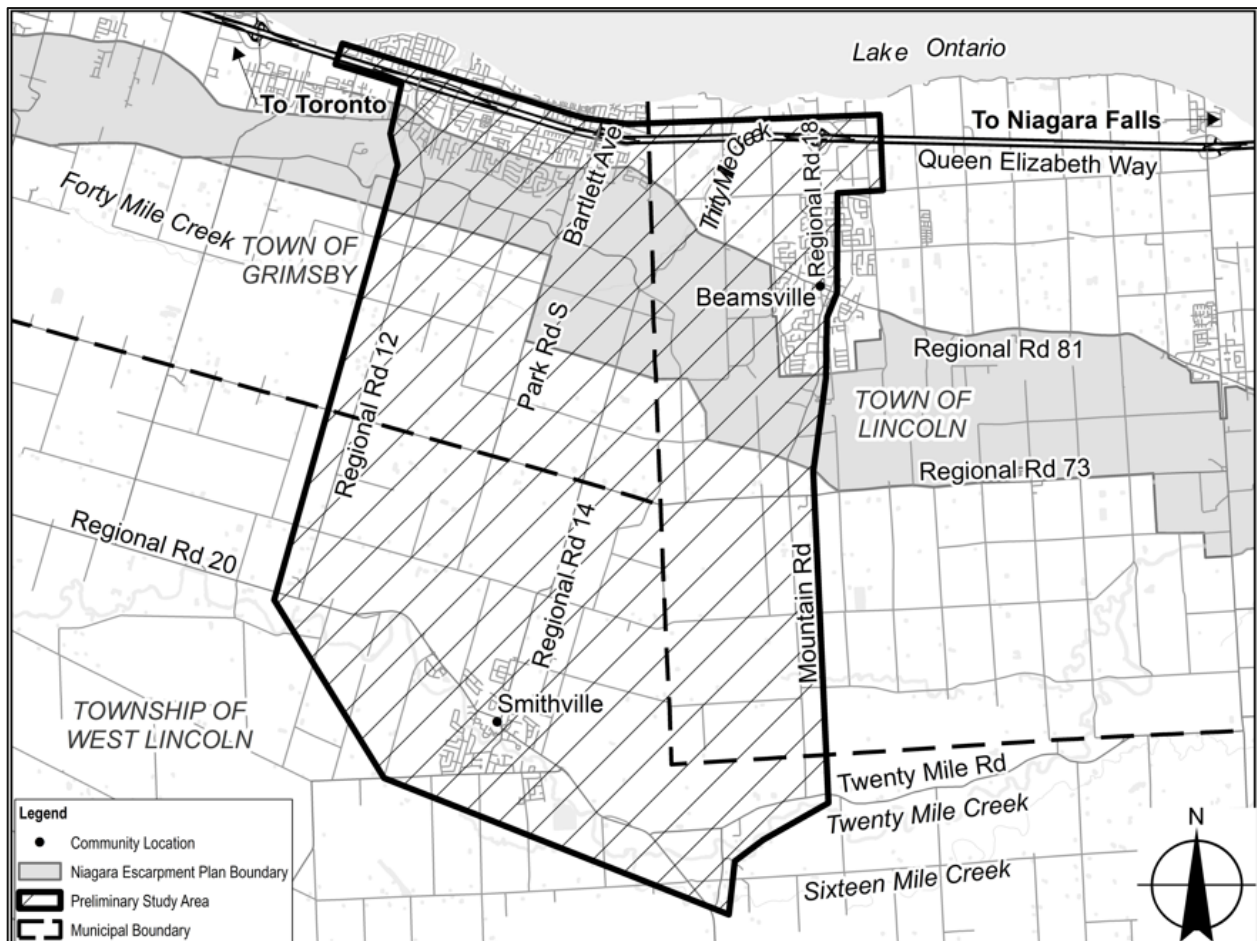


Figure 2-1 : Preliminary Study Area

2.2 Review of Available Existing Information Sources

Available existing sources of information will be collected and reviewed to determine existing and future environmental conditions, including any data gaps that need to be addressed through subsequent work (e.g., field investigations, modeling, etc.).

Presently, the list of existing information sources that will be collected and reviewed as part to the proposed Groundwater Work Plan includes, but may not be limited to, the following:

- Niagara Escarpment Crossing Study, 1997
- Niagara Crossing Transportation Study, 2016
- Niagara Escarpment Plan, 2017
- Niagara Escarpment Commission Policies, Guidelines and Technical Criteria
- Niagara Drinking Water Source Protection and Source Protection Information Atlas;
- Niagara Peninsula Conservation Authority (NPCA)
Source Protection Plan ;
- NPCA available stream gauge and climate data;
- Available watershed and sub-watershed study reports;
- Regional groundwater studies;
- Region's Aquifer Management Plan;
- Soils reports and geotechnical investigations;
- Local physiography and topography;
- Surficial soils, overburden geology and bedrock geology of the area and their hydraulic properties, including karst features;
- Existing well records, groundwater level, quantity and quality datasets (e.g.: MECP Water Well Record Information Database and Provincial Groundwater Monitoring Network, geotechnical borehole data, etc.);
- Groundwater taking and use (e.g.: MECP Permit to Take Water Database, Water Taking Reporting System Database, etc.);
- Significant groundwater features (recharge areas, watersheds etc.);

- Local climate data, Environment Canada climate data;
- Hydrology reports and Water Survey of Canada data;
- Aerial photographs;
- Reports of contamination and complaint files (MECP).

In addition, documentation prepared during the Niagara Escarpment Crossing EA from the other proposed work plans (e.g., Surface Water, Natural Heritage, etc.) will also be considered, as appropriate, along with the preceding existing information sources.

There are currently no field investigations proposed at this time for establishing existing conditions as part of the Groundwater Work Plan.

Documentation

The results of reviewing available existing information sources will be documented in a Groundwater Baseline Conditions Report.

3 Assessment of the Alternatives

3.1 Alternatives To the Project

Following confirmation of the preliminary list of alternatives to the project, they will be assessed and comparatively evaluated leading to a recommended alternative(s) to the project. The recommended alternative(s) will be presented to review agencies, Indigenous Communities, and the public for a defined period to receive comments, following which a preferred alternative(s) will be identified. The assessment of the alternatives to the project (through the application of evaluation criteria) will be based on available existing information sources contained in the Baseline Conditions Reports.

3.1.1 Preliminary Criteria and Indicators

The preliminary evaluation criteria and indicators that will be used for assessing the alternatives to the project from a Groundwater perspective include, but may not be limited to, those set out in **Table 3-1**. The preliminary evaluation criteria and indicators will be finalized based on comments received during the Niagara Escarpment Crossing EA and documented in the EA Report.

Table 3-1: Preliminary Criteria and Indicators for Assessing the Alternatives To the Project

Category	Criterion	Indicator
Natural Environment	- Effect on groundwater resources	- Changes to groundwater resources
Natural Environment	- Effect on groundwater and surface water interactions	- Changes to groundwater and surface water interactions
Natural Environment	- Effect on groundwater from impacted geological features including karst	- Changes to groundwater from impacted geological features including karst
Social Environment	- Effect on private water wells	- Approximate number of wells and type affected

3.2 Alternative Methods of Carrying Out the Project

Following the identification of the preferred alternative(s) to the project, alternative methods of carrying out the project will be generated, screened, assessed, and comparatively evaluated leading to a recommended method(s). The recommended method(s) will be presented to review agencies, Indigenous communities, and the public for a defined period to receive comments, following which a preferred method(s) will be identified.

The generation and possible screening of the alternative methods will be based on available existing information sources contained in the Baseline Conditions Reports. The assessment of the alternative methods of carrying out the project (through the application of evaluation criteria) will be based more on the information provided through subsequent work (e.g., field investigations, modelling, etc.) contained in the Baseline Conditions Reports, as appropriate.

3.2.1 Preliminary Criteria and Indicators

The preliminary evaluation criteria and indicators that will be used for assessing the alternative methods of carrying out the project from a groundwater perspective include, but may not be limited to, those set out in **Table 3-2**. The preliminary evaluation criteria and indicators will be finalized based on comments received during the Niagara Escarpment Crossing EA and documented in the EA Report.

Table 3-2: Preliminary Criteria and Indicators for Assessing the Alternative Methods of Carrying Out the Project

Category	Criterion	Indicator
Natural Environment	- Effect on groundwater resources	- Changes to groundwater resources
Natural Environment	- Effect on groundwater and surface water interactions	- Changes to groundwater and surface water interactions
Natural Environment	- Effect on groundwater from impacted geological features including karst	- Changes to groundwater from impacted geological features including karst

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Category	Criterion	Indicator
Social Environment	- Effect on private water wells	- Approximate number of wells and type affected

4 Impact Assessment of the Proposed Project

Once selected, the preferred method(s) of carrying out the project (i.e., proposed project) will be further developed at a preliminary design level of detail so that the potential environmental effects can be identified with more certainty, more site-specific impact management measures (i.e., avoidance, mitigation, and compensation measures) can be developed for application, net environmental effects can be identified with more certainty, appropriate monitoring requirements can be clearly defined, and specific approval/permitting requirements for constructing the proposed project can be identified.

In concert with preparing the preliminary design level of detail, it may be necessary to undertake additional work (e.g., field investigations, modelling, etc.) at the impact assessment stage of the Niagara Escarpment Crossing EA. The additional work proposed as part of the Groundwater Work Plan could include the following subject to preparation of the EA:

- Establish a groundwater monitoring network sufficient to
 - Understand geological and hydrogeological conditions in the area.
 - Determine the key characteristics of the bedrock and overburden systems and their functions in terms of controlling groundwater movement, availability, and quality in the area within the regional hydrogeological setting, including karst features.
 - Assess significant groundwater features (recharge areas, watersheds etc.).
- Undertake the following:
 - An analysis of groundwater contribution to maintaining the existing natural areas (wetlands, environmentally sensitive areas, etc.).
 - An assessment of the interaction between the groundwater and surface water systems to determine the overall role or function in relation to the vulnerable areas delineated through Source Water Protection studies (significant groundwater recharge etc.).
 - An assessment of groundwater discharge and recharge areas and impact on surface water / natural environment.
 - A water balance assessment/analysis for the existing (pre) and post-development conditions pertaining to development phases, and mitigation measures.

- A Karst assessment to confirm local conditions.

Additional studies would be applicable to identified sensitive areas (wetlands etc.) or to the entire project area as deemed necessary during the preliminary design stage of the project.

Documentation

The results of the impact assessment, including any additional work such as groundwater monitoring, assessments, etc., will be documented in a Groundwater Impact Assessment Report. Recommendations for avoidance, mitigation and compensation relevant to impacts of the proposed project to groundwater will be provided as required.

5 Documentation

The results of implementing this work plan will be documented in two reports during the Niagara Escarpment Crossing EA:

- **Groundwater Baseline Conditions Report** – will document the results of collecting and reviewing available existing sources of information.
- **Groundwater Impact Assessment Report** – will document the results of the impact assessment of the proposed project including any additional work such as monitoring and assessments.

Upon completion, each report will be made available during the Niagara Escarpment Crossing EA to review agencies, Indigenous Communities, and the public for their information via the project website and upon request and will become either a reference or supporting document to the submitted EA Report. The EA Report will be based on and reflect the information contained in the two reports.