TRANSPORTATION ENVIRONMENTAL STUDY REPORT

STUDY #1 PRELIMINARY DESIGN AND CLASS ENVIRONMENTAL ASSESSMENT FOR HIGHWAY 401 FROM CRANBERRY ROAD TO COUNTY ROAD 28 (ONTARIO STREET), PORT HOPE

G.W.P. 4005-17-00

Prepared for:
Ministry of Transportation – Eastern Region

Prepared by:

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March 2022

McINTOSH PERRY

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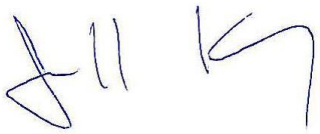

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Jeff King, B.Sc., mMBA
Senior Environmental Planner
McIntosh Perry Consulting Engineers Ltd.

THE PUBLIC RECORD

Due to the ongoing COVID-19 pandemic, viewing supporting materials in person is not available at this time.

To facilitate the public comment period of this document, copies are accessible during the 30-day comment period electronically on the project website (www.hwy401porthopeea.com) or in hard copy upon request.

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Interested persons may provide written comments to our project team by **April 30th, 2022**. All comments and concerns should be directed to Chris Teepell, C.E.T., Project Manager at the Ministry of Transportation – Project Delivery East at 613-583-3109, or via email at Chris.teepell@ontario.ca.

In addition, a Section 16 Request may be made to the Ministry of the Environment, Conservation and Parks (MECP) for an order requiring a higher level of study (i.e., requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g., require further studies), only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other grounds will not be considered. Requests should include the requester contact information and full name for the MECP.

Requests should specify what kind of order is being requested (request for additional conditions or a request for an individual/comprehensive environmental assessment), how an order may prevent, mitigate or remedy those potential adverse impacts, and any information in support of the statements in the request. This will ensure that the MECP is able to efficiently be reviewing the request.

The request should be sent in writing or by email to:

Minister of the Environment, Conservation and Parks
Ministry of the Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto, ON M7A 2J3
Minister.mecp@ontario.ca

Director, Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Ave. W., 1st Floor
Toronto, ON M4V 1P5
EABDirector@ontario.ca

Requests should also be sent to the MTO Project Manager and Consultant Project Manager listed above.

Information will be collected in accordance with the *Freedom of Information and Protection of Privacy Act*. With the exception of personal information, all comments will become part of the public record. If you have accessibility requirements in order to participate in this project, please contact one of the project team members listed above.

Cette publication hautement spécialisée n'est disponible qu'en anglais en vertu du règlement 671/92, qui en exempte la traduction selon l'application de la loi sur les services en français. Pour des renseignements en français au sujet de ce projet, veuillez rejoindre Patrick Leblanc en composant le 613-714-4586.

EXECUTIVE SUMMARY

A Preliminary Design and Class Environmental Assessment (Class EA) study has been undertaken to identify the most appropriate strategy to replace the Cranberry Road, Choate Road and Ganaraska River bridge crossings and to develop the Highway 401 Future Footprint as part of Study #1 (GWP 4005-17-00).

The current study is primarily focused on the replacement of the bridges in the study area, however replacement bridges are designed with a 75 year lifespan so it is prudent to consider the future highway needs that may arise and what space may be needed to ensure the new structures can be maintained over their lifespan, including how traffic will be managed during both structure construction and maintenance. In addition, there is benefit in understanding what the future highway footprint may be to appropriately evaluate elements such as material movement/placement, environmental impacts, utility relocations, and property impacts.

The initial study, which included Highway 401 from 500m west of Cranberry Road to 450m east of County Road 28, including the Cranberry Road bridge, Choate Road bridge, Ganaraska River bridge, Hamilton Road bridge and County Road 28 (Ontario Street) Interchange has since been divided into two separate studies:

Study #1 (GWP 4005-17-00) includes the structural needs of 3 bridges (Cranberry Road Bridge, Choate Road Bridge and Ganaraska River Bridge) and establishing the eight (8) and ten (10) lane future footprint of Highway 401 from 500m west of Cranberry Road to 450m east of County Road 28 (Ontario Street).

Study #2 (GWP 4010-21-00) includes the future operational long-term needs at the County Road 28 (Ontario Street) interchange, and the structural needs of 2 bridges (County Road 28 Bridge and Hamilton Road Bridge).

The focus of this report is to outline the Preliminary Design and Class EA process for Study #1.

The Study #1 consultation plan included a project website, contact letters, newspaper notices, two (2) online Public Information Centres (PIC), consultation with Indigenous Communities, and meetings with individual stakeholders, members of the public and external agencies.

Study #1 followed the approved environmental planning process for Group 'B' projects under the MTO "*Class Environmental Assessment for Provincial Transportation Facilities*" (2000).

The Recommended Plan

The Recommended Plan for Study #1 evolved through a process that included the development and evaluation of alternatives, with additional details being developed as the study progressed, as documented in this report. Multiple options were reviewed for each of the locations using a Multi Attribute Trade-off analysis by the project team in order to determine the Recommended Plan.

Based on the study's findings, the Recommended Plan for Study #1 is as follows:

- Replace the Cranberry Road bridge on the existing alignment with a full closure of Cranberry Road (Alternative 2);
- Replace the Choate Road and Ganaraska River bridges in the same location with a larger configuration to the north to accommodate the future footprint of Highway 401 (Alternative 1); and
- Establish the Highway 401 Future Footprint to the north (see **Figure 39 – Figure 41)**

In order to construct the Recommended Plan, there will be temporary impacts including but not limited to; municipal road closures during construction, Highway 401 closures during off peak times and single lane closures on Highway 401. During the full road closures, detour routes will be in effect.

Public Consultation

Public consultation for Study #1 that has been completed as part of the preliminary design includes:

- The Ontario Government Notice (OGN) for project commencement was published in the Northumberland News on June 25, 2020. Notice of Commencement letters were also mailed through Canada Post to nearby residents and businesses and provided to the local MPP and Indigenous Communities in advance of the OGN publishing;
- A dedicated project website was created for the project at www.hwy401porthopeea.com. The webpage went live on June 25, 2020, to provide additional project information to interested stakeholders as the study progresses;
- A Municipal Advisory Meeting was held on Wednesday, June 2, 2021, with representatives from the County of Northumberland, Township of Hamilton, Municipality of Port Hope, Township of Hamilton Fire, Port Hope Fire, Northumberland Paramedics, the Ganaraska Region Conservation Authority, and the Port Hope Area Initiative.
- The Ontario Government Notice (OGN) to announce the Online Public Information Centre (PIC) for Study #1 was published in the Northumberland News on August 5, 2021. Notice of PIC letters for Study #1 were also mailed through Canada Post to nearby residents and businesses and provided to the local MPP and Indigenous Communities in advance of the OGN publishing.
- An Online Public Information Centre (PIC) was held on the project website from August 5, 2021 to September 2, 2021 to provide detailed information about Study #1, including the Class EA process, existing conditions, identified alternatives and evaluation process, associated impacts and mitigation, as well as next steps.
- A second online PIC was held from December 16, 2021 to January 16th, 2022 to provide information regarding the Recommended Plans for Study #1;
- Property owner meetings were held with the majority of impacted property owners to inform them of the property needs and address any concerns; and
- The Transportation Environmental Study Report (TESR) for Study #1 will be published for a 30-day public comment period before it is filed with the Ministry of Environment, Conservation and Parks (MECP).

Commitments for Future Work

Following the 30-day public comment period and 30-day Ministry of Environment, Conservation, and Parks (MECP) review of the Transportation Environmental Study Report (TESR), the preliminary design phase will be considered complete.

During the next phase of the project, detail design, the Project Team will continue to consult with the local property owners, municipalities, agencies, interest groups, Indigenous communities, the public and stakeholders regarding the proposed works.

Timing of the detail design phase initiation will be dependent upon transportation needs within the corridor.

A preliminary assessment of the environmental impacts associated with the Recommended Plan was completed and is outlined in this report. Key environmental factors that will be further assessed during detail design include the following:

- A fisheries impact assessment, including detailed mitigation will be completed;
- A Landscaping Plan will be prepared;
- The Erosion and Sediment Control (ESC) strategy will be further developed;
- Traffic Management Plans will be prepared to include finalized detour provisions for the road/lane closures and traffic mitigation measures;

- An air quality assessment will be undertaken during the detail design of the Highway 401 Future Footprint; and
- A Stage 4 Archaeological Assessment will be conducted for archaeological site AlGn-39 during detail design, if impacts to these lands are anticipated.

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GLOSSARY OF TERMS

Alignment - The vertical and horizontal position of a road

Alternatives - Well-defined and distinct course of action that fulfills a given set of requirements. Both alternative methods and alternatives to a proposed undertaking. The *Environmental Assessment Act* distinguishes between alternatives to the undertaking and alternative methods of carrying out the undertaking

Alternative Methods - Alternative ways of carrying out the selected alternative which may include Preliminary Design, Detail Design, construction, or maintenance alternatives

Alternatives To - Alternative ways of solving a documented transportation deficiency or taking advantage of an opportunity

ANSI - Area of Natural or Scientific Interest

Class Environmental Assessment Document - An individual environmental report documenting a planning process that is formally submitted under the EA Act. Once the Class EA document is approved, projects covered by the class can be implemented without having to seek further approvals under the *Environmental Assessment Act* provided the Class EA process is followed

Class Environmental Assessment Process - A planning process established for a group of projects to ensure compliance with the Environmental Assessment (EA) Act. The EA Act, in Section 13 makes provision for the establishment of Class Environmental Assessments

Corridor - A band of variable width between two locations. In transportation studies, a corridor is defined as an area where a new or improved transportation facility might be located

DCPT - Dynamic Cone Penetration Tests

Designated Areas – Areas defined by resource agencies, municipalities, the government, and/or the public, and through legislation, policies, or approved management plans, to have a special or unique value. These areas may have a variety of ecological, recreational, or aesthetic features and functions that are highly valued

Detail Design - The final stage in the design process in which the engineering and environmental components of a Preliminary Design are refined and details concerning, for example, property, drainage, utility relocations and quantity estimate requirements are prepared, and contract documents and drawings are produced. This is typically at a 1:500 scale

EA - Environmental Assessment

EA Act - *Environmental Assessment Act* (as amended by S.O. 1996 C.27), RSO 1980

EBL – Eastbound lane

EMS – Emergency Management Services

Environment

- air, land or water
- plant and animal life, including man
- the social, economic and cultural conditions that influence the life of a man or a community
- any building structure, machine or other device or thing made by man
- any solid, liquid, gas, odour, heat, sound, vibration, or radiation resulting directly or indirectly from the activities of man, or
- any part or combination of the foregoing

Environmental Effect - A change in the existing conditions of the environment which may have either beneficial (positive) or detrimental (negative) effects

ESA – Endangered Species Act. Legislation that provides automatic species protection, species classified as endangered or threatened automatically receive legal protection. Habitat protection: when a species is classified endangered or threatened, its habitat is also protected

ESC – Erosion and Sediment Control

Evaluation - The outcome of a process that appraises the advantages and disadvantages of alternatives

External Agencies - Include Federal departments and agencies, provincial ministries and agencies, conservation authorities, municipalities, Crown corporations or other agencies other than MTO

Grade Raise – A vertical separation between a road/road or road/rail crossing

GRCA – Ganaraska Region Conservation Authority

IAA – Impact Assessment Act. Legislation that outlines a process for assessing the impacts of major projects and project carried out on federal lands or outside of Canada. Replaced the former Canadian Environmental Assessment Act, 2012

LIO – Land Information Ontario database

Mitigation Measure - A measure that is incorporated into a project to reduce, eliminate, or ameliorate detrimental environmental effects

Mitigation - Taking actions that either remove or alleviate to some degree the negative impacts associated with the implementation of alternatives

MNDMNRF –Ministry of Northern Development, Mines, Natural Resources and Forestry.

MECP – Ministry of the Environment, Conservation and Parks

MTO – Ministry of Transportation

MHSTCI – Ministry of Heritage, Sport, Tourism and Cultural Industries

OGN – Ontario Government Notice

PDR – Preliminary Design Report

PIC – Public Information Centre. One of the consultation techniques used in an informal setting with information, displays and project representatives to share thoughts and identify concerns with the public and agencies.

Preliminary Design - That part of the planning and design process during which various alternative solutions are examined and evaluated including consideration of environmental effects and mitigation

PSW – Provincially Significant Wetland

PTE – Permission to Enter

ROW - Right-of-Way: easement granted or reserved by the Crown over the land for transportation purposes, i.e. highway

SAR – Species at Risk

Section 16 Request - The act of requesting that an environmental assessment initiated as a Class EA be required to follow the individual EA process. Such requests are only available on the grounds that the order may prevent, mitigate, or remedy adverse impacts on the existing aboriginal and treaty rights of the aboriginal peoples of Canada

STEO – Student Transportation of Eastern Ontario

TLI – Temporary Limited Interest

TESR - Transportation Environmental Study Report

Underpass – A bridge carrying the highway under another road

Undertaking - In keeping with the definition of the *Environmental Assessment Act*, a project or activity subject to the Class Environmental Assessment

Vertical Clearance - The vertical distance measured from the underside of the bridge to the top of the pavement

WBL - Westbound lane

1.0 OVERVIEW OF THE UNDERTAKING

A Preliminary Design and Class Environmental Assessment (Class EA) study has been undertaken by McIntosh Perry Consulting Engineers Ltd. and LEA Consulting Ltd. Joint Venture (MP-LEA Joint Venture) to identify the most appropriate strategy to replace the Cranberry Road, Choate Road and Ganaraska River bridge crossings and to develop the Highway 401 Future Footprint as part of Study #1 (GWP 4005-17-00).

The initial study has since been divided into two (2) separate Class EA studies:

STUDY #1 GWP 4005-17-00 includes structural needs of 3 bridges (Cranberry Road Bridge, Choate Road Bridge and Ganaraska River Bridge) and establishing the eight (8) and ten (10) lane future footprint of Highway 401 from 500m west of Cranberry Road to 450m east of County Road 28 (Ontario Street).

STUDY #2 GWP 4010-21-00 includes future operational long-term needs at the County Road 28 (Ontario Street) interchange, and structural needs of 2 bridges (County Road 28 bridge and Hamilton Road Bridge). Study #2 will be presented as part of a separate consultation process.

This Transportation Environmental Study Report (TESR) documents the Class Environmental Assessment (Class EA) process that was completed for Study #1 (GWP 4005-17-00) - Highway 401 from Cranberry Road to County Road 28 (Ontario Street).

1.1 General Description of Project

The current study is primarily focused on the replacement of the bridges in the study area, however replacement bridges are designed with a 75 year lifespan so it is prudent to consider the future highway needs that may arise and what space may be needed to ensure the new structures can be maintained over their lifespan, including how traffic will be managed during both structure construction and maintenance. In addition, there is benefit in understanding what the future highway footprint may be to appropriately evaluate elements such as material movement/placement, environmental impacts, utility relocations, and property impacts.

The project was initiated after a Planning Study was completed by WSP in 2019, which identified the need to establish a future eight (8) to ten (10) lane footprint for Highway 401 and to replace the Cranberry Road, Choate Road and Ganaraska River bridges to improve substandard conditions and accommodate for the future footprint of the highway to eight and ten lanes.

Study #1 includes the following:

- Establishing the Highway 401 Future Footprint from Cranberry Road to County Road 28 (Ontario Street);
- Replacing the Cranberry Road bridge;
- Replacing the Choate Road bridge; and
- Replacing the Ganaraska River bridge.

Study #1 has followed the requirements of a Group 'B' project under the MTO's "Class Environmental Assessment for Provincial Transportation Facilities" (2000). The study included environmental and engineering field investigations and seeking input from the public, local municipalities, external ministries/agencies, and impacted property owners. The study reviewed existing conditions and developed/evaluated a range of reasonable alternatives to determine the most appropriate plan. A Recommended Plan was selected as part of the evaluation and reviewed in more detail in Sections 6.0 – 11.0.

1.1.1 Study Area

Study #1 is located along Highway 401 within the Municipality of Port Hope, County of Northumberland. The study area for the Highway 401 Future Footprint is from approximately 500m west of Cranberry Road to 450m east of County Road 28 (Ontario Street). There are three municipal roadways included in the study area, Cranberry Road, Choate Road and County Road 28. Choate Road extends southeast from County Road 74 (Dale Road) to McKibbon Street, where it crosses under Highway 401 and continues as Cavan Street. Cranberry Road extends south from County Road 74 (Dale Road) to Highway 401, where it crosses over Highway 401 and then continues as Victoria Street North. County Road 28 extends north from Highway 401 as County Road 28; the roadway continues south of Highway 401 as Ontario Street and includes the County Road 28 interchange with access ramps to Highway 401. The Ganaraska River flows south under Highway 401 adjacent to Choate Road. It flows through the Corbett's Dam and outlets into Lake Ontario approximately 3km downstream. The areas surrounding the study area are primarily rural agricultural north of Highway 401 and medium density residential south of Highway 401. The study area is shown in **Figure 1**.

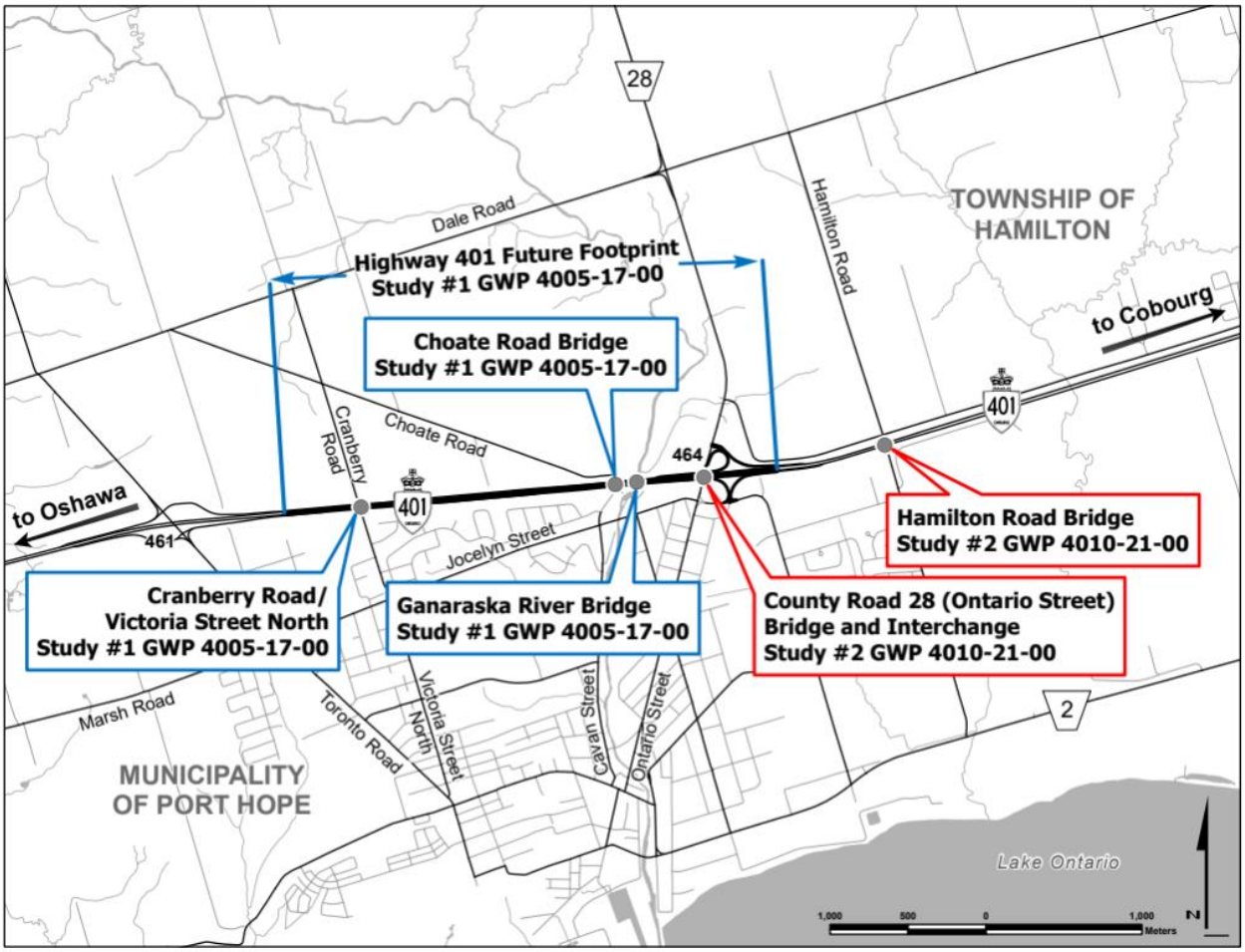

Figure 1: Study Area

1.2 Project Background

The study was initiated to evaluate the interim and ultimate options for the mainline Highway 401 Future Footprint. Interim options are defined as those that require a future footprint of the highway to eight (8) lanes. The ultimate options

are defined as those that require a future footprint of 10 lanes. The study was also initiated to consider the future vehicle capacity and operational safety needs of mainline Highway 401 through the project limits and identify any potential property requirements.

The Choate Road, Ganaraska River and Cranberry Road bridges are reaching the end of their service life. Choate Road bridge and Ganaraska River bridge are considered to be in poor condition, and the Cranberry Road bridge has a substandard vertical clearance resulting in high load strikes on Highway 401. Additionally, the existing spans of all three bridges will not accommodate the Future Footprint of Highway 401. As a result of these identified deficiencies, the preliminary design and environmental assessment study was initiated to determine the structural needs of each bridge and develop the appropriate strategy for replacement. The purpose of the study is also to:

- Identify and assess all natural and social environmental constraints within the study area and recommend preliminary mitigation measures to reduce environmental impacts and to minimize disruption to Highway 401 operations for consideration during detail design;
- Evaluate several alternatives, based on structural alignment, design type, and construction staging options for the future footprint and new bridges;
- Ensure the alternatives are technically feasible, reasonable, and constructible based on highway geometrics and bridge construction methods;
- Identify any property requirements – temporary limited interest or permanent and work with landowners to acquire property as needed;
- Recommend the most appropriate strategy for staging the construction of the bridges (e.g., detour routes and/or lane shifts for Highway 401, Cranberry Road and Choate Road); and
- Prepare the TESR in compliance with the Class Environmental Assessment (Class EA), supported by all project-specific environmental reference documents.

1.3 Purpose of the Transportation Environmental Study Report

This TESR has been in ongoing development during the preliminary design and documents the environmentally significant aspects of the study. The TESR provides an overview of the project, a summary of the environmental conditions, and the potential impacts and mitigation measures to address the environmental conditions within the study area.

This TESR fulfills the documentation requirements of the Class EA process for a Group 'B' project.

This report is being made available for a 30-day comment period. Due to the ongoing COVID-19 pandemic, viewing the report in person is not available at this time. To facilitate public comment of this document, copies are accessible during the 30-day comment period electronically on the project website at www.hwy401porthopeea.com and hard copies available upon request.

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Interested persons are encouraged to comment on this document and provide comments to the Project Team by **April 30th, 2022.**

In addition, a Section 16 Request may be made to the MECP for an order requiring a higher level of study (i.e. requiring a comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g. require further studies), only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other grounds will not be considered.

1.3.1 Environmental Clearance

This study is being carried out in accordance with the approved planning process for Group 'B' projects. An overview of the Class EA process for Group 'B' projects is provided in Figure 2. As illustrated in Figure 2, this TESR is being submitted at the completion of the Preliminary Design phase. The next steps in the Environmental Assessment process involve the completion of Detail Design, followed by construction. A Design and Construction report will be prepared for public and stakeholder review to document how commitments to future work have been addressed and how recommended environmental mitigation measures will be implemented in Detail Design and construction. As per the requirements of the MTO Class EA process, the TESR documents the following:

- The generation, assessment, evaluation, selection and development of the design alternatives;
- The transportation engineering and environmental issues and how they were incorporated into the environmental assessment program;
- The identified potential environmental condition changes, effects and commitments to mitigation measures;
- Commitments to further work, including any environmental effects monitoring that is required;
- The consultation program followed throughout the study; and
- The identification of all project approvals, licenses and permits which have been or must be obtained prior to construction.

2.0 PROBLEM STATEMENT

The current study is primarily focused on the replacement of the bridges in the study area, however replacement bridges are designed with a 75 year lifespan so it is prudent to consider the future highway needs that may arise and what space may be needed to ensure the new structures can be maintained over their lifespan, including how traffic will be managed during both structure construction and maintenance. In addition, there is benefit in understanding what the future highway footprint may be to appropriately evaluate elements such as material movement/placement, environmental impacts, utility relocations, and property impacts.

Assessment of the bridges has identified numerous concerns, including:

- The deteriorating condition of the bridges warrant replacement as they are nearing the end of their service life (originally constructed in 1959);
- The existing vertical clearance from the underside of the Cranberry Road bridge to the driving surface of Highway 401 will be upgraded as it does not meet current standards;
- The Cranberry Road bridge piers are located near the travelled lanes and are not designed for impact loads if struck by a vehicle;
- The bridges require structural upgrades to conform to current seismic guidelines; and
- The existing span lengths do not accommodate the interim eight and ultimate ten lane configuration of Highway 401.

2.1 Opportunity

The interim and ultimate options for the mainline Highway 401 Future Footprint will address any future vehicle capacity and operational safety concerns within the corridor and allows the Project Team to identify potential property requirements to protect the Future Footprint of Highway 401 from development.

In addition, replacing the bridges within the study area will provide the following improvements:

- Improve the overall structural conditions of the bridges;
- Increase the minimum vertical clearance of the Cranberry Road bridge to meet the current minimum design criteria (5.0 m);
- Ensure the new bridges are built to transportation engineering standards, and
- Allow the new span openings of the bridges to accommodate for the future eight and ten-lane highway configuration.

3.0 ENVIRONMENTAL ASSESSMENT PROCESS

3.1 ENVIRONMENTAL ASSESSMENT APPROVAL REGULATIONS

This Preliminary Design and Class Environmental Assessment study was carried out in accordance with applicable environmental legislation and the current government policies and procedures. The Class EA planning document defines groups of projects and activities, and the environmental assessment process that the MTO has committed to follow for these projects. Provided that this process is followed, and its requirements are met for a project, the requirements of the *Ontario Environmental Assessment Act* are met.

The policies and legislation that apply to this study are described below.

3.1.1 Ontario Environmental Assessment Act

The environmental assessment process ensures that governments and public bodies consider potential environmental effects before an infrastructure project begins. The objectives of an environmental assessment are to minimize or avoid adverse environmental effects before they occur and incorporate environmental factors into decision-making while providing opportunities for public input into the process and investigations.

3.1.2 Class Environmental Assessment for Provincial Transportation Facilities (2000)

The MTO's Class EA was approved under the Ontario Environmental Assessment Act in 1999 and amended in 2000. MTO has prepared the MTO Class EA to manage the need to undertake transportation-related infrastructure projects using a streamlined approach and is updating the Class EA to reflect the amended EA changes. These amendments would align assessment requirements with environmental impact, reduce duplication, and increase efficiency of the assessments.

The MTO Class EA defines the EA process to be followed in respect of projects and activities similar in complexity and performed by the MTO. Provided the appropriate EA process is followed, projects and activities included under the MTO Class EA do not require formal review and approval separately under the EA Act. Under the Class EA, the groupings are largely defined by their relative complexity and potential for impacts and the undertakings, or projects are classified into three groups:

Group A: Projects that are new provincial transportation facilities and highway / freeway realignments.

Group B: Projects that modify access or add capacity to existing provincial transportation facilities, and new service / maintenance / operations facilities.

Group C: Improvements to existing provincial transportation facilities.

The MTO Class EA outlines principles and processes that must be followed for applicable projects, including consultation, development and evaluation of alternatives, and documentation. Public participation and consultation with property owners and other interested parties is a significant element of the decision-making process.

This preliminary design and environmental assessment study has followed the requirements of a Group 'B' undertaking in accordance with the MTO Class EA. Group 'B' projects include major improvements to existing transportation facilities including highway improvements that provide/cause a significant modification in traffic access (may also modify "footprint") to and from existing highways, or that introduce/remove municipal road access to local areas.

The Class EA process, which is principle-based rather than prescriptive, has culminated in this document, recognized as the Transportation Environmental Study Report, also known as the TESR.

3.1.3 Study Process

The MTO Class EA prescribes a multi-stage path through planning, to preliminary design and then detail design study phases before construction can begin on a provincial highway project.

3.1.3.1 Preliminary Design

This study is being carried out in accordance with the approved planning process for Group 'B' projects. An overview of the Class EA process for Group 'B' projects is provided in **Figure 2.** As illustrated in **Figure 2,** this TESR is being submitted at the completion of the Preliminary Design phase. The next steps in the engineering design and Environmental Assessment process involve the completion of Detail Design, followed by construction. A Design and Construction report will be prepared for public and stakeholder review to document how commitments to future work have been addressed and how recommended environmental mitigation measures will be implemented in Detail Design and construction.

In advance of the Preliminary Design, a detailed Planning Study was completed by WSP in 2019. This Planning study focused on conducting a transportation needs assessment and identifying existing conditions, determining the scope of work and evaluating construction staging requirements at sites within the study area in anticipation of the future Preliminary Design and Class EA study.

After completion of the Planning Study, the Preliminary Design phase was initiated with the overall goal of planning and designing a transportation project that achieves the greatest overall transportation benefit, while minimizing the overall net environmental effects. At the end of the Planning and Preliminary Design Stage, the design has been completed to a level of detail where the technical and economic feasibility of implementing the project, and the feasibility of securing environmental permits, approvals and authorizations required to implement the project can be determined.

The Preliminary Design Study Process entails the general project location and design concepts which are established in a context leading to better decision-making in everything from budgets to management plans. This is an important key to time-effectiveness, cost-effectiveness, and environmental responsibility before the preparation of construction plans that lead to construction work. The process includes everything necessary to evaluate alternatives and a review process that properly accounts for environmental impacts. The Planning components includes review of the transportation needs assessment process results and considers alternative methods in planning (identify and evaluate alternatives and select the preferred alternative).

The Preliminary Design usually includes aspects of preliminary engineering and other factors such as environmental assessments, geotechnical investigations, hydrologic/hydraulic analysis, and traffic studies.

As per the requirements of the MTO Class EA process, the TESR documents the following:

- The generation, assessment, evaluation, selection and development of the design alternatives;
- The transportation engineering and environmental issues and how they were incorporated into the environmental assessment program;
- The identified potential environmental condition changes, effects and commitments to mitigation measures;
- Commitments to further work, including any environmental effects monitoring that is required;
- The consultation program followed throughout the study; and
- The identification of all project approvals, licenses and permits which have been or must be obtained prior to construction.

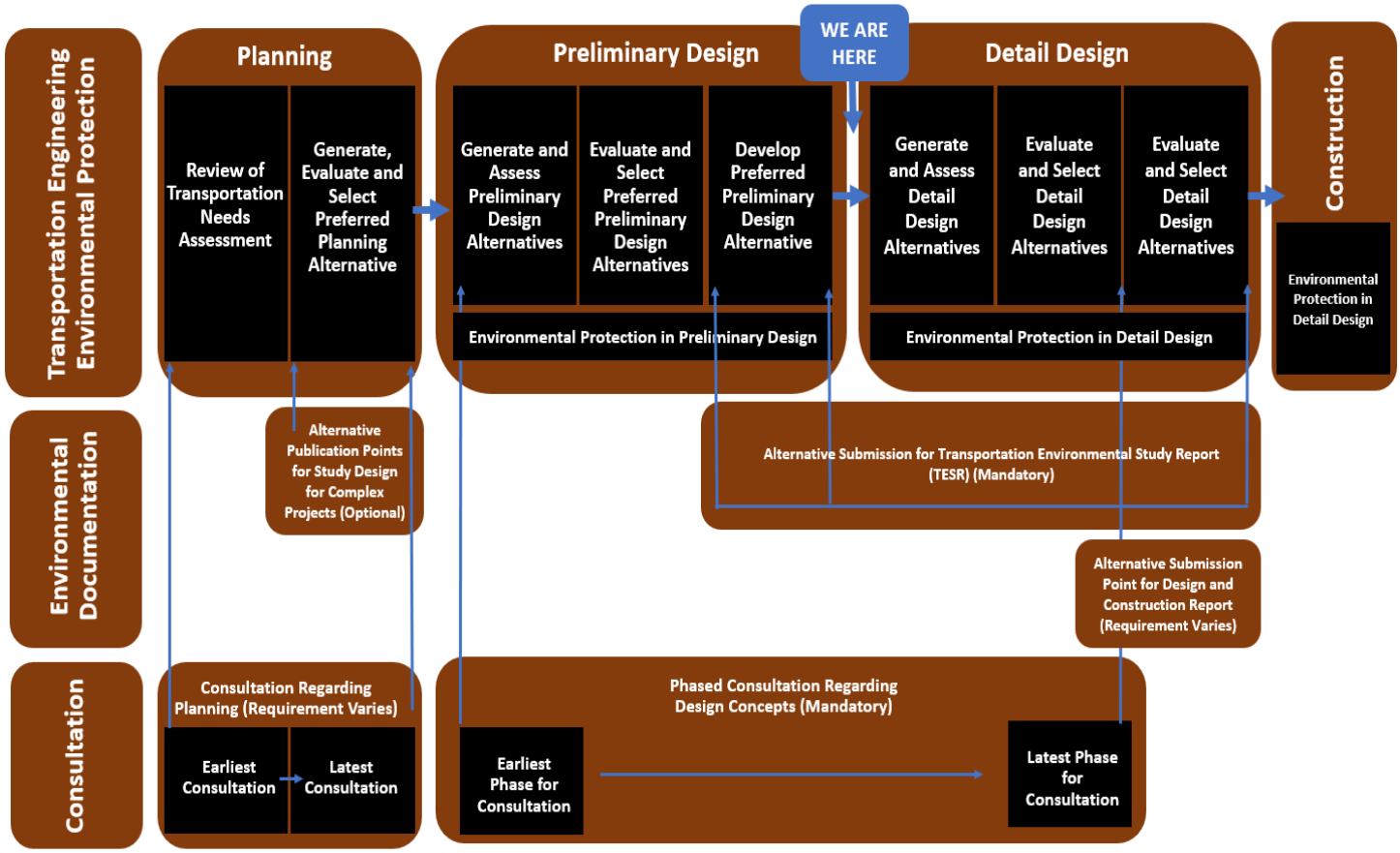


Figure 2: Overview of Class EA Process for Group 'B' Projects

3.1.4 Impact Assessment Act

On August 28, 2019, the *Impact Assessment Act* (IAA) replaced the *former Canadian Environmental Assessment Act, 2012* (CEEA, 2012). The *Impact Assessment Act* outlines a process for assessing the impacts of major projects and projects carried out on federal lands or outside of Canada. Impact assessment is a planning and decision-making tool used to assess the positive and negative environmental, economic, health and social effects of proposed projects and impacts to Indigenous groups and rights of Indigenous peoples.

The projects and activities that are subject to the IAA are very similar to those that were subject to an environmental assessment under the CEAA, 2012. The Project List focuses federal impact assessments on projects that have the most potential for adverse environmental effects in areas of federal jurisdiction. However, some changes have been made to the "Project List", such as new thresholds or projects have been introduced or increased. Under the IAA, only those projects designated by the Physical Activities Regulations or designated by the MECP on a discretionary basis may be subject to federal environmental assessment.

3.1.5 Other Environmental Approvals

3.1.5.1 Federal Fisheries Act

Amended on August 28, 2019, the Federal *Fisheries Act* provides a framework for the proper management and control of fisheries and the conservation and protection of fish and fish habitat, including and preventing pollution. Under the

amended act, "*No person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish*" and "*No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat*". Other prohibitions within the act that are applicable to MTO work include the inability to stop, impede or hinder fish from surmounting any obstruction or leap and prohibiting the deposit of deleterious substances into the watercourse and prohibiting the deposit of deleterious substances into the watercourse.

3.1.5.2 Endangered Species Act

The Endangered Species Act (2007) protects a designated species and its habitat. If a species is extirpated, endangered, or threatened, the Endangered Species Act does not allow the harming or killing of the species. Permits and approvals will be reviewed and obtained, as required.

4.0 CONSULTATION PROCESS

Public consultation is a key component of the Class EA process for this preliminary design study. The exchange of information with both the public and government agencies respecting the environmental conditions/issues and the project overview ensured a thorough and transparent consultation process to meet the requirements of this Group 'B' Class EA. The consultation process provided an opportunity for the Project Team to share the study process with the local property owners, the public, external agencies, and stakeholders.

The process aims to notify all interested parties of the project and to provide an opportunity for input to the study and decision-making processes. This was accomplished by presenting the findings of each stage of work to the public, and through ongoing discussions with various government agencies and ministries, Indigenous Communities, non-government interest groups and property owners.

The consultation process was developed through a Consultation Plan at the start of the preliminary design with the establishment of a contact list for public and agency consultation. The contact list is provided in **Appendix A** and includes the following stakeholders:

- Provincial and Municipal government agencies;
- Member of Provincial Parliament;
- Emergency services;
- School boards and school bus transportation;
- Local businesses, and
- Utilities.

The Consultation Plan's purpose is to document communication between all parties in a thorough, coordinated, and transparent consultation process to document discussions throughout the project. This provided a comprehensive approach to consultation that proactively solicited feedback and input from all stakeholders and property owners. The plan included the following key elements:

- Notice of Study Commencement;
- Ontario Government notices published in local newspapers ;
- Direct Letter mailing and brochures mailed to nearby residents
- The development of a dedicated project website;
- Ongoing communication with Indigenous Communities regarding key project interests such as potential archaeological resources;
- Communication with external agencies to obtain pertinent technical information and identify the requirement for legislative or regulatory approvals related to the undertaking;
- Meetings with municipal staff (Municipality of Port Hope, County of Northumberland), local Emergency Management Services (EMS) and other relevant stakeholders);
- Communication (including teleconference meetings) with affected property owners where permanent property impacts are anticipated;
- Two Online Public Information Centres (PIC);
- Presentation to the Port Hope City Council; and
- Notice of Study Completion.

Upon the completion of this TESR, a final contact letter will be sent to all members of the public who submitted comments or indicated their interest in the study, and to external agencies, Indigenous Communities, and stakeholders concurrent with the Notice of TESR Completion. The letter will identify how to obtain a copy of the TESR for review on the project

website or via hard copy upon request as well as the closing date for submission of comments. The "Notice of TESR Completion" will be attached to the contact letters and will conclude the consultation process for this project as environmental clearance under the Class EA is achieved.

4.1 Notice of Study Commencement

The Notice of Study Commencement announces the formal start of the MTO Class EA process, and provides information about what is being proposed and how to get involved in the process. The purpose of the Notice of Study Commencement is to inform the public and external agencies about the study and to seek input from agencies and property owners. In addition, it also directed proponents to the study website for more up to date information.

4.1.1 Ontario Government Notice of Study Commencement

A Notice of Study Commencement Ontario Government Notice (OGN) advertisement was published in the local newspaper (*Northumberland News)* on June 25, 2020.

4.1.2 General Distribution

The General Agency Notice of Study Commencement letters were distributed to individuals on the Contact List in June 2020. In addition to distributing the Notice of Study Commencement letters to individuals on the Contact List, a project notification brochure for study commencement was mailed to nearby residents, property owners and businesses in June 2020.

4.1.3 Member of Provincial Parliament

A Notice of Study Commencement letter was prepared for the Northumberland-Peterborough South Member of Provincial Parliament (MPP) who holds jurisdiction of the study area. This letter was mailed to the recipient by the MTO on June 20, 2020 prior to the distribution of public notices, to advise the MPP of the project.

4.1.4 Indigenous Communities

Consultation with Indigenous Communities is a key component of ensuring a thorough and transparent EA process is followed. Indigenous Communities received all project notifications including the letter of Study Commencement, notification of both Public Information Centres, and the Notice of Study Completion. Relevant Indigenous Communities that were consulted with as part of the project include:

- Curve Lake First Nation;
- Alderville First Nation;
- Mississaugas of Scugog;
- Mohawks of the Bay of Quinte;
- Beausoleil First Nation;
- Georgina Island First Nation;
- Chippewas of Rama First Nation;
- Hiawatha First Nation;
- Metis Nation of Ontario; and
- Williams Treaties First Nation.

Contact letters were directed towards the residing Chief or designated contact within Indigenous Communities that may have interest over any part of the study area. The MTO Project Team distributed the Indigenous Communities Notice of Commencement letters in June 2020, prior to the distribution of public notices.

All notification materials for the study commencement are provided in **Appendix A.**

4.1.5 Comments Received from Notice of Study Commencement

A total of thirteen (13) emails were received following the Notice of Study Commencement. Comments included general interest letters from the Ministry of Environment, Conservation and Parks (MECP), acknowledgement of the project from relevant Indigenous Communities requesting to be kept informed as the project progresses, comments from the public and other stakeholders such as utility companies, the Municipality, MPP, and property owners. Correspondence is provided in **Appendix B**. Comments received and responses are summarized in **Table 1.**

Table 1: Summary of Notice of Commencement Consultation

Stakeholder	Comments Received	How it was Addressed/Response Sent
Ministry of Environment, Conservation and Parks (MECP)	General interest letter indicating the MECP's areas of interest (water resources, species at risk, source protection, contamination and waste management, noise) in the project and how they would like to receive upcoming correspondence, including submission of the TESR.	General response was provided thanking the MECP for their letter.
Hiawatha First Nation	General response thanking the Project Team for the information and asking to be kept informed of the project as it progresses.	The Project Team responded that all First Nations would be kept informed of the project as it advances.
Rama First Nation	General response thanking the Project Team for the information and asking to be kept informed of the project as it progresses.	The Project Team responded that all First Nations would be kept informed of the project as it advances.
Curve Lake First Nation	General response thanking the Project Team for the information, highlighting their areas of interest and asking to be kept informed of the project as it progresses.	The Project Team responded that all First Nations would be kept informed of the project as it advances, and a letter was provided responding to Curve Lake's specific interests in the project.
MPP Northumberland	Local MPP inquired as to the consultation process and engagement opportunities	The Project Team provided additional information regarding the MPP being informed of all consultation opportunities in advance.
Local Resident	Request to have the Project Team consider nighttime lane closures only as opposed to daytime/continuous lane closures within the study area, as these would cause significant traffic queues	The Project Team ensured that the MTO Eastern region traffic office would be notified of the concerns.
Local Property Owner	Comment regarding the noise levels caused by Highway 401 traffic for	The Project Team informed the resident that a Noise Assessment report is being

Table 1: Summary of Notice of Commencement Consultation		
Stakeholder	**Comments Received**	**How it was Addressed/Response Sent**
	residents living in proximity to the highway and the potential impact to property value this may cause.	completed as part of the study and any potential to include additional noise walls along the Highway 401 corridor in proximity to impacted properties are being considered.
Mohawks of the Bay of Quinte (MBQ)	General response thanking the Project Team for the information, highlighting their areas of interest, and asking to be kept informed of the project as it progresses.	The Project Team responded that all First Nations would be kept informed of the project as it advances, and a letter was provided responding to the MBQ's specific interests in the project.
Northumberland Federation of Agriculture (NFA)	Response letter indicating the NFA's interest in the project and main concern regarding the width of the bridge lanes and potential lane closures during construction, which may impact farming operations	A meeting was held with the NFA to discuss and address their concerns on the Cranberry Road bridge, which is used by multiple farms to access their properties north and south of the bridge. The affected individuals were added to the project contact list to receive future project updates.
Municipality of Port Hope	Comment expressing concern with the possible closure of Choate Road, as the municipality has plans to urbanize this corridor and install sewers and watermains for potential future development.	A meeting was held with the municipality to discuss the alternatives for Choate Road and address any concerns the municipality has. A key message that came out of the meeting was that City Council would need to endorse the permanent Closure of Choate Road
Local Property Owner	Expressed concern over the noise levels due to the proximity of Highway 401 traffic and inquired about the inclusion of noise walls.	The Project Team informed the property owner that a Noise Assessment is being conducted as part of the preliminary design and the report will indicate any potential locations where noise walls may be installed.
Enbridge Gas	Enbridge informed the project team of the existing utility infrastructure within the study area and inquired as to whether utility conflicts are anticipated.	The Project Team informed Enbridge that it is too early in the preliminary design to confirm utility conflicts, but additional consultation will be conducted during detail design.

4.2 Notice of Online Public Information Centre #1/Study Update

The Notice of PIC for Study #1 provided information regarding the commencement of the preliminary design phase, outlined key project details, and included the website address to access the online PIC materials. The notice also provided

information regarding the splitting of the project into Study #1 (GWP 4005-17-00) and Study #2 (GWP 4010-21-00). The website details for the Online PIC were included in the Notice of PIC letter that was distributed to all contacts on the Contact List as well as any person who expressed interest in the project on August 4th, 2021. A public brochure was delivered to all nearby residents, property owners, and businesses on July 30th, 2021. The OGN PIC was advertised in the *Northumberland News* on August 5th, 2021.

4.3 Notice of Public Information Centre #2

The Notice of PIC #2 for Study #1 provided information regarding the preliminary design process and the Recommended Plan that was developed for the study area and outlined key project details including the website address to access the online PIC materials. The website details for the Online PIC #2 were included in the Notice of PIC #2 letter that was distributed to all contacts on the Contact List as well as any person who expressed interest in the project on December 13th, 2021. A public brochure was delivered to all nearby residents, property owners, and businesses on December 13th, 2021. The OGN for PIC #2 was advertised in the *Northumberland News* on December 16th, 2021.

4.4 Notice of Completion

The Notice of Completion informs external agencies and interested persons that the MTO Class EA process has been completed, and that the TESR is available for comment.

The Notice of Completion was published in the local newspaper (*Northumberland News)* on **March 31st, 2022,** when the TESR became available for public comment on the project website. The Notice of Completion was also distributed to agencies, key stakeholders, Indigenous communities, and the public on the project mailing list. A copy of the Notice of Completion can be found in **Appendix A.**

4.5 Project Website

A dedicated project website at www.hwy401porthopeea.com was developed to provide a common platform for the public to access information regarding the project. The website was updated regularly with new information regarding opportunities to view materials regarding the study. The purpose of this website was to keep members of the public informed, to share publicly available reports and other materials, and to allow for public comments.

The website was updated as the study progressed and contained all relevant study information for review, including links to project-specific documents (i.e., study notifications, Class EA process, PIC display boards, TESR), opportunities for public engagement and other relevant information.

4.6 Municipal Advisory Committee Meetings

The Project Team arranged a Municipal Advisory Committee (MAC) meeting on June 2nd, 2021, to introduce the project and a second meeting on November 30th, 2021, once the Recommended Plan had been selected. The purpose of the meetings was to disseminate information related to the study and proposed project work and discuss the potential impacts of the project. Attendees of the stakeholder meetings included the County of Northumberland, Municipality of Port Hope, Emergency Management Services (EMS), Ganaraska Region Conservation Authority (GRCA), Port Hope Area Initiative (PHAI), Student Transportation of Eastern Ontario (STEO), Ganaraska Fishway and the County Economic Development Corporation. A summary of the stakeholder meetings are provided in **Table 2**. Stakeholder meeting minutes are provided in **Appendix C.**

Table 2: Summary of Stakeholder Meetings Consultation			
Stakeholder	**Purpose**	**Comments Received**	**Response**
Stakeholder Meeting #1 (June 2nd, 2021)			
Municipality of Port Hope	Solicit comments or concerns regarding the proposed alternatives	Question regarding the accuracy of traffic counts during Covid-19.	The Project Team explained that the traffic counts were pro-rated based on previous traffic counts for the area during non-Covid-19 times, to get a true representation of traffic counts.
GRCA	Solicit comments or concerns regarding the proposed alternatives.	Question regarding the floodplain impacts between the various design alternatives.	The Project Team noted that the loss of storage within the floodplain between the various alternatives is still being quantified based on modelling provided by the GRCA.
GRCA	Solicit comments or concerns regarding road closure and detour routes.	GRCA noted that they are not in favor of options that realign Choate Road closer to the Ganaraska River.	The Project Team noted that this preference will be noted in the minutes and taken into consideration during the evaluation of alternatives.
Municipality of Port Hope	Solicit comments or concerns with the proposed Hallecks Road bridge replacement including road closures and detour routes.	The Municipality agreed with the GRCA and noted that they are not in favor of realigning Choate Road closer to the Ganaraska River.	The Project Team noted that this preference will be noted in the minutes and taken into consideration during the evaluation of alternatives.
Port Hope Fire Department/Northumberland Paramedics	Solicit comments or concerns with the proposed Hallecks Road bridge replacement including road closures and detour routes.	Both services are not in favor of closing Choate Road due to the impacts this would have on emergency response times.	The Project Team noted that this preference will be noted in the minutes and taken into consideration during the evaluation of alternatives.
Stakeholder Meeting #2 (November 30, 2021)			
County of Northumberland	Solicit comments or concerns regarding road closure and detour routes.	Inquired as to the construction timeline for the replacement of the Cranberry Road bridge	The Project Team explained that the Choate and Ganaraska River bridges will be replaced first, due to their deteriorating condition, and then the Cranberry Road

Table 2: Summary of Stakeholder Meetings Consultation			
Stakeholder	**Purpose**	**Comments Received**	**Response**
		and Highway 401 Future Footprint	bridge will be looked at within the 10-year horizon. The future footprint of the highway is more likely to take place within the 30-year horizon, due to traffic volume projections. These timeframes are dependent on environmental approvals and provincial funding requirements. It was explained that the Highway 401 Future Footprint is included with this study to reduce throw away costs as the staging for Choate Road and Ganaraska River bridges will impact the 401 corridor in this area.

4.7 Online Public Information Centre #1

Two online Public Information Centres (PIC)s were held on the dedicated project website during the preliminary design process. The first PIC was held for a 30-day public comment period from August 5th, 2021, to September 2nd, 2021, to share information related to the preliminary design and introduce the design alternatives. PIC #1 provided the following information:

- Background information including a description of the project;
- Class Environmental Assessment process;
- Challenges and opportunities;
- Planning alternatives;
- Overview of studies;
- Preliminary evaluation criteria;
- Existing traffic and environmental conditions;
- Identification of design alternatives, and
- Next steps.

An OGN for PIC #1 was published in the *Northumberland News* on August 5th, 2021, a public brochure was delivered to all nearby residents, property owners, and businesses and all individuals on the Contact List received a Notice of PIC #1 letter. The Notice of PIC letters and OGN are provided in **Appendix A** and the PIC #1 display boards are provided in **Appendix D.**

4.7.1 Comments Received from Online Public Information Centre

A total of twelve (12) comments were received during the first PIC review period. Comments predominantly focused on the design alternatives, the potential for noise walls to be included for residents within close proximity to Highway 401 as

well as potential property impacts and utility conflicts. Comments received and responses for PIC #1 are summarized in **Table 3**.

Table 3: Summary of PIC #1 Consultation

Stakeholder	Comments Received	How it was Addressed/Response Sent
PIC #1		
Local Resident	Believes the cost to establish the Highway 401 Future Footprint would be better spent on expanding the transit system, especially from an environmental point of view.	The Project Team responded by requesting that the resident take the provincial survey on Government of Ontario's long term transportation strategy for the Greater Golden Horseshoe to provide their perspective on the proposed works.
Local Resident	Provided suggestions to improving the environmental sustainability of the Highway 401 Future Footprint	The Project Team responded by requesting that the resident take the provincial survey on Government of Ontario's long term transportation strategy for the Greater Golden Horseshoe to provide their perspective on the proposed works.
Local Property Owner	Inquired as to the potential impact on their property from the proposed works.	The Project Team held a teleconference meeting with the property owner to address their concerns directly.
Local Resident	Expressed concern with the increase in noise and dust that the Future Footprint of Highway 401 may cause.	The Project Team indicated that a noise assessment is being conducted to assess the potential increase in noise and how to mitigate any impacts to nearby residents.
Hydro One	Requested to be kept informed if any existing utility infrastructure would be impacted by the project works.	The Project Team noted that all utility relocations would be determined as the study progresses and Hydro One will be kept informed of any potential conflicts.
Local Property Owner	Expressed concern with the proximity of Highway 401 to their property, the level of noise they experience from highway traffic and transport trucks, and the potential impacts to their property value if the future footprint moves closer to their property.	The Project Team held a teleconference meeting with the property owner to address their concerns directly.
County of Northumberland	Submitted a letter regarding possible detouring of highway traffic onto county owned local roads.	The Project Team responded to the County and clarified that Highway 401 traffic is not anticipated to be detoured onto County Roads. The only time County Roads will be

Table 3: Summary of PIC #1 Consultation		
Stakeholder	**Comments Received**	**How it was Addressed/Response Sent**
		utilized is during the local closure of Choate Road.
Local Resident	Provided their recommendation to keep Choate Road open due to the ability to access the conservation area lands from Choate Road and the preference to maintain the local road network.	The Project Team responded thanking the individual for their suggestions and confirming that access to the conservation area and impacts to the local road network are being considered as part of the alternatives evaluation process.
Local Resident	Provided their recommendation to keep Choate Road open to avoid traffic and emergency service impacts, and to split the extension of Highway 401 to minimize impacts to properties north of the highway.	The Project Team responded thanking the individual for their suggestions and confirming that property, traffic and emergency service impacts are being considered as part of the alternatives evaluation process.
Local Property Owner	Inquired about potential impacts to their property as a result of the project works.	The Project Team informed the individual that alternatives are currently being evaluated and more information would be available in the coming months during the online PIC. A follow up meeting was held with the property owner once the Recommended Plan was finalized, to inform them of potential impacts to their property and discuss next steps regarding property acquisition.
Local Property Owner	Inquired as to the necessity for establishing the Highway 401 Future Footprint in this area considering the constructability issues in this location such as the Ganaraska River and the substantial hill along this corridor as well as the property impacts and associated costs.	The Project Team responded thanking the individual for their feedback and confirmed that property impacts, and costs are being considered as part of the alternatives evaluation process. It was also explained that due to the 75 year life span of the replacement bridges, there is a need to consider the future highway needs when replacing the bridges.
Local Property Owner	Expressed concern over the proximity of Highway 401 to their property and the noise levels they experience and asked if there is consideration of installing noise walls within the study area.	The Project Team indicated that a noise assessment is being conducted to assess the potential increase in noise and how to mitigate any impacts to nearby residents. Details on how to access the information materials on the website and additional

Table 3: Summary of PIC #1 Consultation		
Stakeholder	**Comments Received**	**How it was Addressed/Response Sent**
		consultation opportunities were also provided.

4.8 Online Public Information Centre #2

The second PIC was held for a 30-day public comment period from December 16th, 2021, to January 16th, 2022, to disseminate information related to the preliminary design and introduce the Recommended Plan. PIC #2 provided the following information in addition to the information provided in PIC #1:

- An evaluation of the design alternatives;
- Recommended Plan and rationale;
- Property requirements;
- Traffic detours; and
- Proposed schedule.

An OGN for PIC #2 was published in the *Northumberland News* on December 16th, 2021, a public brochure was delivered to all nearby residents, property owners, and businesses and a Notice of PIC #2 letter was provided to all individuals on the Contact List. The Notice of PIC letters and OGN are provided in **Appendix A** and the PIC #2 display boards are provided in **Appendix D.**

4.8.1 Comments Received from Online Public Information Centre

A total of ten (10) comments were received during the second PIC review period. Comments focused on the Recommended Plan as well as property requirements, traffic noise generated from Highway 401 and the potential for noise walls. Comments received and responses for PIC #2 are summarized in **Table 4**.

Table 4: Summary of PIC #2 Consultation		
Stakeholder	**Comments Received**	**How it was Addressed/Response Sent**
PIC #2		
Local Resident	Inquired as to whether there had been thought given to expanding Highway 401 by constructing new lanes of traffic above the existing lanes, in order to minimize impacts to property owners and the environment.	The Project Team indicated that constructing lanes above the existing highway footprint was not considered as an option due to the constructability and economic constraints with this recommendation.

Table 4: Summary of PIC #2 Consultation		
Stakeholder	**Comments Received**	**How it was Addressed/Response Sent**
Local Resident	Provided feedback in favor of the Recommended Plan for Choate Road and Ganaraska River bridges, which is to replace both bridges on the existing alignment, as this option seems like a good combination of cost savings and efficient traffic circulation.	The Project Team thanked the individual for their support of the Recommended Plan and highlighted the benefits of this approach.
Local Resident	Inquired as to what mitigation measures will be implemented to address the noise levels along the highway corridor.	The Project Team indicated that a noise assessment is being conducted to assess the potential increase in noise and how to mitigate any impacts to nearby residents. Once this study is concluded, the findings will be evaluated, and conclusions will be shared with the public.
Local Resident	Inquired as to the possibility of acquiring additional lands adjacent to the highway to develop a new conservation area.	The Project Team confirmed that acquiring additional lands outside of those needed for the proposed works is not within the project scope, however opportunities to discuss this with the Municipality of Port Hope directly may be explored.
Local Resident	Expressed support for the replacement of both the Choate Road and Ganaraska River bridges on the existing alignment, as this will maintain the existing road network and access to the conservation area lands.	The Project Team thanked the individual for their feedback and provided them with information regarding next steps for the project.
Local Resident	Inquiring as to the purpose of expanding Highway 401 to 8-10 lanes through Port Hope and expressing their opposition to these plans.	The Project Team informed the individual that there is a need to look at the Future Footprint of Highway 401 now as the replacement bridges have a lifespan of 75 years and they will need to accommodate any expansion of the highway in the future.
Local Resident	Expressed concern with the level of noise generated by transport trucks within the study area, particularly for residents on the north side of Highway 401, as the noise barrier wall on the south side causes the sound to ricochet off that wall and towards the north. Individual recommended that any change to the footprint of the bridges should include	The Project Team indicated that a noise assessment is being conducted to assess the potential increase in noise and how to mitigate any impacts to nearby residents, including those living on the north side of Highway 401. Once this study is concluded, the findings will be evaluated, and conclusions will be shared with the public.

Table 4: Summary of PIC #2 Consultation		
Stakeholder	**Comments Received**	**How it was Addressed/Response Sent**
	noise mitigation for residents north of Highway 401 within the study area.	
Local Resident	Recommended that the 10-laning footprint of Highway 401 be shown not just the 8 lane and inquired as to whether high occupancy vehicle (HOV) lanes were considered.	The Project Team provided the individual with a rendering of the 10-lane future footprint of Highway 401 and explained that HOV lanes were not considered as part of this study but may be looked at in the future as a traffic management initiative.
Local Resident	Asked the Project Team to consider keeping the hiking trail running underneath the Ganaraska River open to the public.	The Project Team explained that this trail will be closed during construction but will be reinstated once the bridges have been replaced.
Local Resident	Asked the Project Team to consider adding signage on Highway 401 within the study area to prohibit the use of transport truck air brakes.	The MTO traffic division responded to the resident directly regarding the use of air brakes on the highway.

4.9 Property Owner Meetings

Individual meetings were arranged via teleconference with each of the impacted property owners and concerns were discussed. A summary of the property owner meetings is provided in **Table 5**.

Table 5: Summary of Property Owner Meetings Consultation		
Stakeholder	**Comments Received**	**Response**
Property Owner #1	Property Owner noted that there are significant drainage issues on their property from Highway 401. Property Owner inquired about the loss of the treeline which is the only visual and sound barrier to Highway 401, and if there is consideration to installing a noise wall. Property Owner inquired as to the property acquisition process.	The Project Team explained that drainage is a known issue in this location and will be improved during detail design. Project Team ensured that they will minimize the amount of tree loss as much as possible and that a noise assessment is currently being conducted to determine if/where noise walls will be included to minimize impacts from traffic noise. Project Team explained in detail how the property acquisition process works, including financial reimbursement of the land required.

Table 5: Summary of Property Owner Meetings Consultation		
Stakeholder	**Comments Received**	**Response**
	Property Owner noted that any impacts to their well will be difficult to rebuild due to zoning setbacks for private wells from roadways.	Project Team took note of the well location and will try to avoid impacts during construction.
	Property Owner asked to confirm if the 401 lanes will be moving closer to their house.	Project Team explained that the Highway 401 lanes will be moving slightly north, closer to the existing property.
Property Owner #2	Property Owner inquired about the loss of the treeline which is the only visual and sound barrier to Highway 401, and if there is consideration to installing a noise wall.	The Project Team ensured that they will minimize the amount of tree loss as much as possible and that a noise assessment is currently being conducted to determine if/where noise walls will be included to minimize impacts from traffic noise.
	Property Owner inquired about the project timeline.	The Project Team noted that the Choate Road and Ganaraska River bridges will be constructed in the next five years due to their condition. The Cranberry Road bridge is within the ten year horizon. The TESR will be filed in the spring for preliminary design and then will be advancing immediately into detail design.
	Property Owner inquired as to the property acquisition process.	Project Team explained in detail how the property acquisition process works, including financial reimbursement of the land required.
	Property Owner inquired as to the length of the Choate Road closure.	The Project Team explained that Choate Road closure could last approximately 2.5 years.
Property Owner #3	Property Owner inquired as to when the project works will commence.	Project Team noted that construction is currently planned for 2023 and the work is anticipated to take approximately 5 years.
	Property Owner noted that they are a fire fighter with the municipality and the Choate Road closure will impact their response time.	Project Team noted that the road closure is not anticipated to last the full construction season, and will likely be closed for approximately 2.5 years.

Table 5: Summary of Property Owner Meetings Consultation		
Stakeholder	**Comments Received**	**Response**
	Property Owner inquired as to the shed/driveway currently located where property is required. Property Owner inquired as to the loss of treeline, as this is the only privacy and sound barrier from Highway 401, and if there is consideration to installing a noise wall. Property Owner asked how the property value is determined.	Project Team confirmed that the Property owners will be reimbursed for any lost facilities/structures. The Project Team ensured that they will minimize the amount of tree loss as much as possible and that a noise assessment is currently being conducted to determine if/where noise walls will be included to minimize impacts from traffic noise. Project Team explained that it is based on fair market value for vacant land only.
Property Owner #4	Property Owner inquired as to the shed on the back of their property that may be impacted. Property Owner confirmed they understood the property needs and the property acquisition process. Property Owner noted that they will be doing upgrades to their property, but this work should not be impacted by the property needs.	Project Team noted that the shed, if impacted, would be replaced by MTO or reimbursement would be provided for any lost facilities/structures. Project Team explained the acquisition process and why the property is required.
Property Owner #5	Property Owner inquired as to when the project works will commence. Property Owner noted that their biggest concern is having a barrier for noise, privacy and protection from Highway 401, as well as the safeguarding of their property value.	Project Team noted that construction is currently planned for 2023 for the Choate Road and Ganaraska River bridge and the work is anticipated to take approximately 5 years. The Highway 401 Future Footprint is not in the current program and no specific timeline on when this work will commence has been determined. The Project Team explained that a noise assessment is currently being conducted to determine if/where noise walls will be included to minimize impacts from traffic noise.
Property Owner #6	Property Owner inquired as to when the project works will commence.	Project Team noted that construction is currently planned for 2023 for the Choate Road

Table 5: Summary of Property Owner Meetings Consultation		
Stakeholder	**Comments Received**	**Response**
		and Ganaraska River bridge and the work is anticipated to take approximately 5 years.
	Property Owner inquired as to whether the construction crew would need to access the highway through their property.	The Project Team explained that these details will be confirmed during detail design but currently it is not anticipated that access would be required through the property.
	Property Owner asked how the property acquisition process works and what the timeline of this process is	Project Team explained the acquisition process and how long it will take to acquire the property.
	Property Owner asked if there would be any noise mitigation provided.	The Project Team explained that a noise assessment is currently being conducted to determine if/where noise walls will be included to minimize impacts from traffic noise.
	Property Owner asked if any tree removals would be revegetated after construction is complete.	Project Team confirmed that the area will be revegetated with similar vegetation type once construction is complete
	Property Owner inquired as to whether Choate Road would be closed permanently.	The Project Team explained that this option was looked at but was not chosen. The Recommended Plan is to keep Choate Road open and replace both bridges in their existing location.
Property Owner #7 & 8	Property Owner inquired as to where the impact to their property begins.	Project Team explained the limits of the property impacts and explained that these will be finalized during detail design.
	Property Owner explained that there is a separate access route to their property and inquired as to whether this would be impacted by the project works.	The Project Team explained that there may be impacts to the access route and all efforts will be made to reinstate if possible. For any permanent losses, mitigation or compensation for this loss will be provided during the property acquisition process in detail design.
	Property Owner inquired as to whether a noise barrier will be installed.	The Project Team explained that a noise assessment is currently being conducted to determine if/where noise walls will be included to minimize impacts from traffic noise.

Table 5: Summary of Property Owner Meetings Consultation		
Stakeholder	**Comments Received**	**Response**
	Property Owner inquired about the construction process and timeline.	Project Team explained the construction staging work that is required for the Choate Road and Ganaraska River bridge replacements and the timeline for lane shifts on Highway 401. It was explained that the additional property is required for the Highway 401 lane shifts during construction of the bridges, which is set to last approximately 5 construction seasons, however the property requirements will remain permanent due to the eventual construction of the Highway 401 Future Footprint.
	Property Owner presented ideas on how redesign the bridges and highway within the study area to alleviate property and noise impacts and increase safety. Property Owner asked what the consensus was among emergency services regarding the potential closure of Choate Road	Project Team thanked the Property Owner's for their ideas and explained that an evaluation of alternatives was conducted early in the preliminary design phase and a Recommended Plan for the study area has been chosen. Project Team explained that emergency services were in favor of keeping Choate Road open due to the increase in emergency response times if the road were to be permanently closed. Project Team explained the acquisition process and how long it will take to acquire the property.
Property Owner #9	Property Owner inquired as to when the Future Footprint of Highway 401 will be established. Property Owner asked if in the long run the highway will get closer to their house, and if so, will it be below grade. Property Owner inquired as to whether their property has already been appraised. Property Owner inquired as to whether a noise barrier will be installed.	Project Team noted that the 8-laning of Highway 401 is anticipated with the 30 year horizon and the 10-laning beyond the 50 years horizon. The Project Team explained that the highway will remain divided, and the elevation grade will remain the same and both east and westbound lanes will be shifted to the north. Project Team explained that once preliminary design is complete, a site visit will be conducted during detail design and a market value appraisal of the property completed. The Project Team explained that a noise assessment is currently being conducted to

Table 5: Summary of Property Owner Meetings Consultation		
Stakeholder	**Comments Received**	**Response**
		determine if/where noise walls will be included to minimize impacts from traffic noise.
	Property Owner inquired as to whether they can receive compensation for window upgrades and soundproofing since the lane shifts will be moving closer to their home.	Project Team noted that these discussions can be had during detail design when property agreements are taking place, and additional mitigation measures can be explored.
	Property Owner noted that the have an invisible fence that extends along the boundary of their property.	Project Team noted that any required removal or relocation of this fence will be compensated for.
	Property Owner inquired about the construction schedule and when the lane shifts will be closer to their home.	Project Team explained that construction is anticipated for 2023 due to the condition of the Choate Road and Ganaraska River bridges. Regrading will happen first to reduce the slope, then new bridges will be built to the north which will take approximately one year. Traffic will then be moved to the north to allow work on the existing bridge platform. Choate road will be closed for 2 or 3 years and during this time a detour route using Cranberry Road to cross 401 will be in effect. The entire construction period will last approximately 5 years.

4.10 Council Meeting

An information presentation to the Port Hope City Council was conducted on January 18th, 2022 via teleconference. The Project Manager presented the following information to council members:

- Description of the project;
- Class Environmental Assessment process;
- Challenges and opportunities;
- The Recommended Plan;
- Detour routes;
- Property needs;
- Next steps.

All questions from Council were addressed by the Project Team during the session and a letter from Council was received on January 19th, 2022, thanking the Project Team for delivering the presentation for information purposes **(Appendix B).**

EXISTING CONDITIONS

Existing environmental conditions reporting was prepared in accordance with the MTO's *Environmental Reference for Highway Design (*ERD, 2013*)* and includes an overview of the existing natural, social, and cultural environmental conditions in the study area.

Background review and site-specific field investigations were carried out for archaeology, cultural heritage, designated substances, fisheries and aquatic ecosystems, and terrestrial ecosystems. Information on existing environmental conditions and sensitivities were investigated for a broad range of environmental factors. This included Natural Environmental Factors (wildlife, vegetation, fish and fish habitat, groundwater, surface water, and air quality); Social Environment Factors (land use, traffic, property, recreation and tourism and construction noise); Economic Environment Factors (agriculture and commercial), and Cultural Environment Factors (archaeology and heritage).

Background and field investigations were undertaken to document all environmentally sensitive features within 300 m of the highway Right-Of-Way (ROW). Land use considerations were extended 500 m from the highway ROW.

4.11 Natural Environment

This section describes the existing environmental conditions within the study area. Data was obtained from published sources and field investigations.

4.11.1 Fish and Fish Habitat

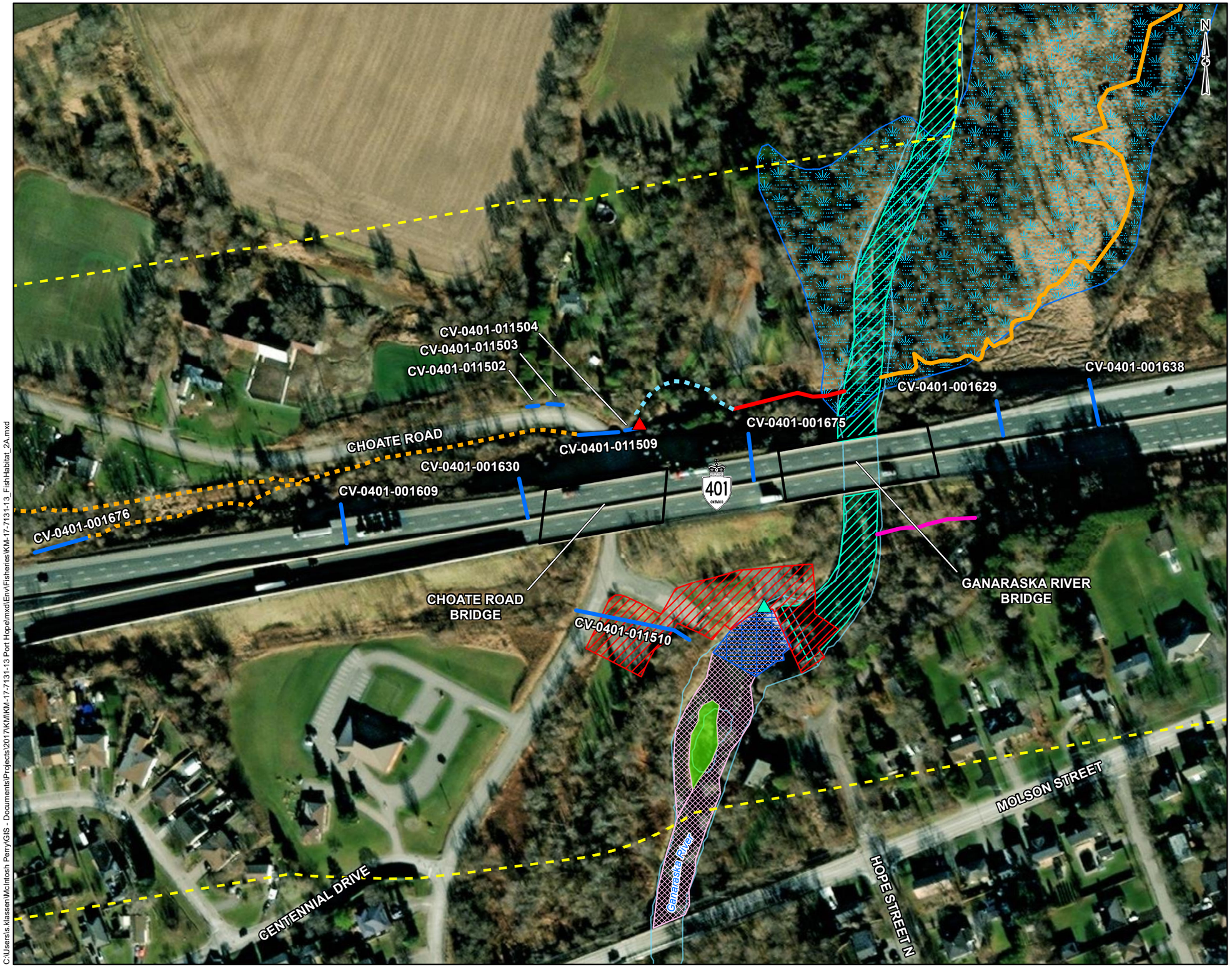
Identifying existing conditions for fish and fish habitat within the study area has been conducted in compliance with the process and procedures outlined in the *MTO/DFO/OMNR Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings – Version 2, 2013 and the most recent version of the Environmental Guide for Fish and Fish Habitat.*

Watercourse conditions within the study area include the Ganaraska River, a cold-water watercourse that originates in the Oak Ridges Moraine in the Municipality of Clarington and flows south through the Town of Port Hope, terminating at Lake Ontario **(Figure 3).** The Ganaraska River flows underneath the Ganaraska River bridge, approximately 85m west of the Choate Road crossing.

The Ganaraska River represents a major tributary of Lake Ontario with a high anthropological importance. The river is utilized heavily for commercial and recreational fishing during seasonal migrations of several species of salmonids. A major barrier to fish migration is present at the Corbett's Dam approximately 90 m downstream of Highway 401. A fish ladder was constructed in 1973 on the west side of the dam to allow passage upstream for migrating fish to access the upper reaches of the Ganaraska River for spawning.

The Ganaraska River contains important fish habitat near the Highway 401 crossing including high quality spawning habitat for Pacific salmonids (Chinook Salmon, Coho Salmon, Pink Salmon, Rainbow Trout), Atlantic salmonids (Atlantic Salmon, Brown Trout), char (Brook Trout), and warm and cool water baitfish (Creek Chub, Blacknose Dace, Longnose Dace, Mottled/Slimy Sculpin). It is unlikely that any aquatic Species At Risk (SAR) recorded in Lake Ontario such as the American Eel and Lake Sturgeon would be able to reach this area of the watercourse above the dam in the vicinity of the Highway 401 crossing. There are no other areas of fish habitat within the Highway 401 future footprint corridor.

For more information regarding fish and fish habitat existing conditions within the study area, the *Fish and Fish Habitat Existing Conditions Report, McIntosh Perry, 2022* can be found under separate cover, as listed in **Appendix I.**



LEGEND

- Fish Ladder
- Upwelling
- Study Area
- Bridge
- Culvert Within 30m of Fish Habitat
- Potential Fish Habitat
- Surface Water
- Tributary (not fish-bearing)
- Tributary/Baitfish Spawning and Nursery Habitat
- Tributary/Spawning Habitat for Warm and Cool Sport and Baitfish
- Corbett's Dam Area
- Pool / Potential Lake Sturgeon Spawning Habitat
- Migratory Habitat for Pacific salmonids, Atlantic salmonids/Spawning Habitat for Warm and Cool Water Baitfish
- Spawning Habitat for Pacific salmonids, Atlantic Salmonds, Char, and Warm and Cold Water Baitfish/Fish Sanctuary
- Island
- Waterbody
- Manitoba Maple Mineral Deciduous Swamp (SWDM3-4)

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2022.

60 30 0 60

Scale 1:2,003 Metres

CLIENT: MINISTRY OF TRANSPORTATION EASTERN REGION

PROJECT: GANARASKA RIVER BRIDGE FISH HABITAT OPPORTUNITIES/CONSTRAINTS

TITLE: FISH AND FISH HABITAT EXISTING CONDITIONS REPORT

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

PROJECT NO:	KM-17-7131-13
Date	Mar., 29, 2022
GIS	EU
Checked By	EP

FIGURE: 3

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4.11.2 Physiography and Soils

The study area is located within the Lake Simcoe-Rideau Ecoregion (6E) of the Mixedwood Plains Ecozone within the Great Lakes-St. Lawrence Forest Region. The Lake Simcoe-Rideau Ecoregion is located in Central Ontario and extends from Lake Huron in the western portion of the region to the Ottawa River valley in the east. This ecoregion is dominated by croplands including pasture and abandoned fields, deciduous forest, coniferous forest, and mixed forest. Within this region, the underlying bedrock is Paleozoic dolomite and limestone except for a zone of mixed bedrock types in the Frontenac Axis which is an arch of rock between Algonquin Park and the Adirondacks (Crins et al., 2009). Most of Ontario's alvars are found in this ecoregion, however, there are no alvars within the study area. The surface is gently undulating to rolling terrain; the rugged landscapes, numerous lakes and high hills provide scenic views.

4.11.3 Designated Areas

Designated areas are defined by resource agencies, municipalities, the government, and/or the public, and through legislation, policies, or approved management plans, to have a special or unique value. These areas may have a variety of ecological, recreational, or aesthetic features and functions that are highly valued. Designated areas include but are not limited to: Areas of Natural and Scientific Interest (ANSI), Provincially Significant Wetlands (PSW), heritage rivers and national and provincial parks.

Few designated areas are located within the vicinity of the Highway 401 study area. Deer Winter Habitat (Stratum 2) is located approximately 3.8 km from the study area. No ANSIs are located within or adjacent (within 1 km) to the study area, however after consulting with the Ministry of Northern Development, Mines, Natural Resources and Forestry (MNDMNRF), they have recommended that an unevaluated Manitoba maple mineral deciduous swamp created by a tributary of the Ganaraska River (located on the east bank of the river upstream of the Ganaraska River bridge) should be treated as a Provincially Significant Wetland (PSW) due to the significant fish and fish habitat it provides **(Figure 3).**

In addition, several properties managed by the Ganaraska Region Conservation Authority (GRCA) are located within the study area under the *Conservation Authorities Act* (1990). According to the GRCA's *Terrestrial Natural Heritage Strategy* (2013), the following Conservation Areas are located within the vicinity of the study area:

- The Port Hope Conservation Area and Ganaraska Millennium Conservation Area are located adjacent to the study area, Northeast of the Ganaraska River Bridge **(Figure 6B)**.

The stretch of the Ganaraska River between Corbett's Dam downstream to the Molson Street bridge is also designated by the MNDMNRF as a fish sanctuary in which commercial and recreational fishing is prohibited **(Figure 3).** No other designated areas are known to occur within the general study area based on available background information.

4.11.4 Vegetation Communities

The study area is located in the Lake Simcoe-Rideau Ecoregion (6E). This extends from Lake Huron in the west to the Ottawa River in the east. It includes various shores on Lake Ontario and continues through to the Ontario portion of the St. Lawrence River Valley (Crins et al., 2009). This ecoregion is dominated by croplands (57%), followed by pasture lands (44.4%), and abandoned fields (12.8%). The Lake Simcoe-Rideau Ecoregion is primarily deciduous forest (16.0%) with the addition of coniferous and mixed forests. These forests contain characteristic species of green ash (*Fraxinus pennsylvanica*), silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), eastern white cedar (*Thuja occidentalis*), yellow birch (*Betula alleghaniensis*), balsam fir (*Abies balsamea*), black ash (Fraxinus nigra), black spruce (*Picea mariana*) and tamarack (*Larix laricina*) (Crins et al., 2009).

Ecologically distinct areas were mapped according to the ELC framework (**Figure 4A-4D**). Vegetation communities present within the study area included dry-fresh graminoid meadow (MEGM3), dry-fresh coniferous regeneration thicket

(THDM1), sumac deciduous shrub thicket (THDM2-1), dry-fresh deciduous regeneration thicket (THDM4), dry-fresh white pine coniferous woodland (WOCM1-3), mixed woodland (WOM), deciduous woodland (WOD), fresh-moist Manitoba maple deciduous woodland (WODM5-1), Manitoba maple mineral deciduous swamp (SWDM3-4), island, agricultural fields (AG), and graminoid mineral meadow marsh (MAMM1), and maintained (mown) areas .

Naturally vegetated areas within the study area are found primarily on the north side of Highway 401 and include agricultural lands, pasture lands, meadows and White Pine Coniferous Woodlands, which is considered a Significant Woodland as per the Port Hope Official Plan Schedule B – Development Constraints **(Figure 4A).** The lands adjacent to the Ganaraska River within the Port Hope Conservation Area include a large stretch of Manitoba Maple Deciduous Woodlands, another Significant Woodland as per Schedule B of the Port Hope Official Plan adjacent to the Ganaraska River **(Figure 4C)** as well as meadows, thickets and marshlands. The south side of Highway 401 is characterized predominantly by residential neighborhoods with manicured lawns.

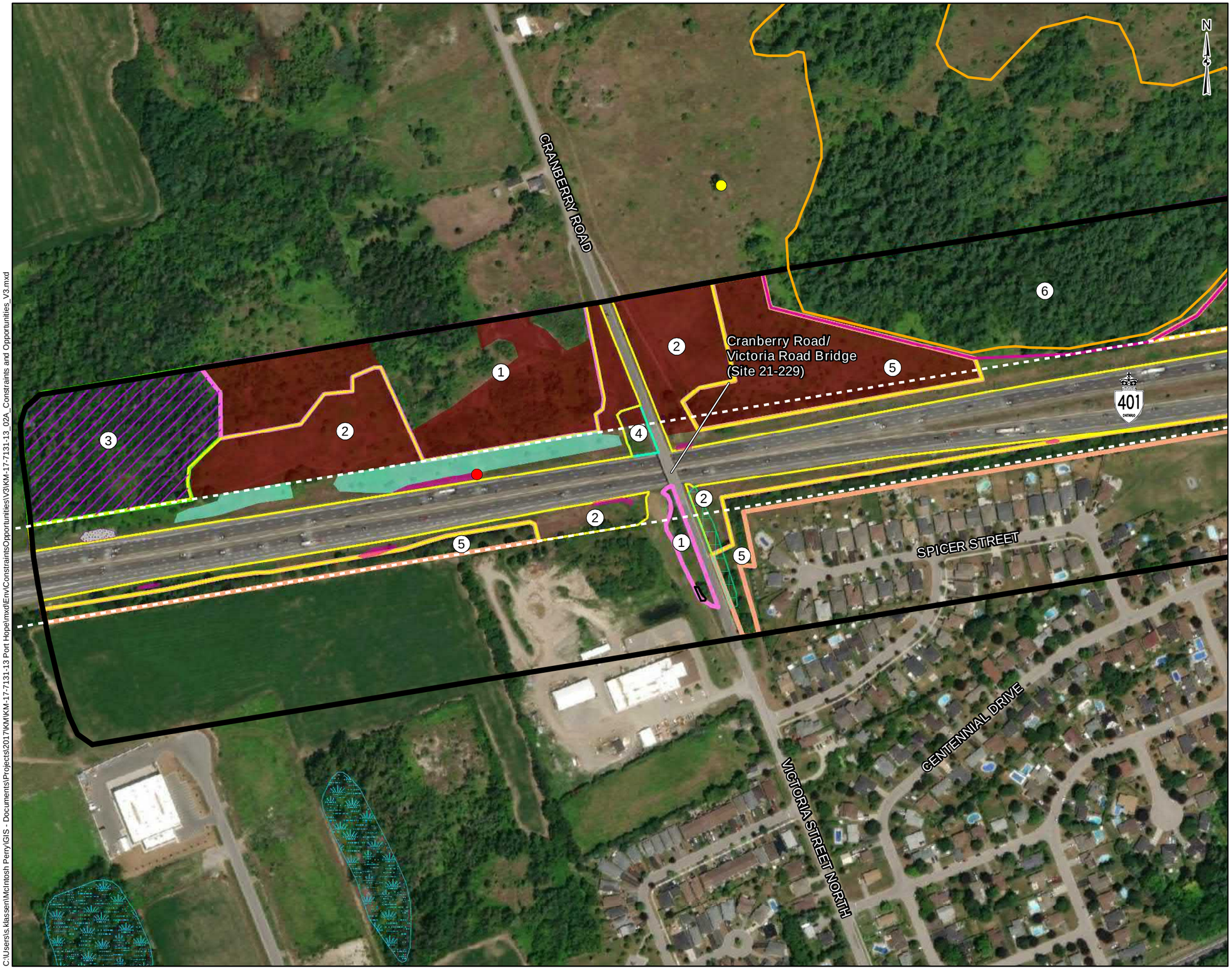
Two Butternut were observed within or adjacent to the Highway 401 study area during the 2020 field investigations, both located approximately 40 m southeast of the Ganaraska River bridge. One individual was confirmed to be a hybrid (*Juglans x bixbyi*), while the other requires further inspection during the detail design phase of the project, as the age of the tree at the time of field investigations prohibited crews from recording all identifying features. During past field investigations conducted in 2018, three (3) additional Butternut hybrids were observed within the fresh-moist Manitoba maple deciduous woodland in the southern portion of the study area (**Figure 4D**). Butternuts are listed as 'Endangered' under the *Endangered Species Act* (ESA) (2007) and the *Species at Risk Act* (SARA) (2002) and receive general habitat protection. Refer to Section 5.1.7.1 for more information regarding SAR plants.

4.11.4.1 Invasive Species

Invasive species listed as *'restricted'* under the *Invasive Species Act, 2015* were observed within the study area during the 2020 field investigations and include phragmites and dog-strangling vine. Invasive species classified as '*noxious weeds*' under the *Weed Control Act*, 1990 were observed within the study area during the 2020 field investigations and include the following:

- bull thistle;
- Canada thistle;
- coltsfoot;
- common ragweed;
- common sow-thistle;
- dog-strangling vine;
- field sow-thistle;
- poison ivy;
- spiny-leaved sow-thistle, and
- wild parsnip.

Phragmites occurs in large stands along the edge of roadways east of the Ganaraska River bridge (**Figure 4A - 4C**) and sporadically west of the Ganaraska River bridge to Cranberry Road. Invasive species within, or adjacent to, the Highway 401 ROW were generally restricted to anthropogenically disturbed areas, but Phragmites and Purple Loosestrife were also found in wetland areas. The remaining invasive/noxious species do not exist in large numbers within the study area (i.e., no stands of the species but sporadic occurrence of individuals within the larger study area).



LEGEND

- Study Area
- R-O-W
- Unevaluated Wetland
- Significant Woodland - Port Hope Official Plan

Species at Risk

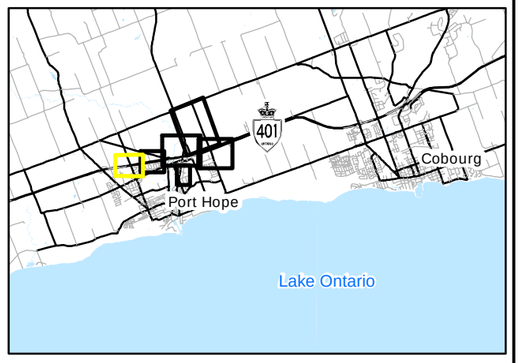
- Eastern Meadowlark Observartion (2020)
- Monarch
- Eastern Meadowlark Habitat
- Potential Bat Habitat

ELC Communities

1. Dry-Fresh Deciduous Regeneration Thicket (THDM4)
2. Dry-Fresh Graminoid Meadow (MEGM3)
3. Fresh-Moist Manitoba Maple Deciduous Woodland (WODM5-1)
4. Sumac Deciudous Shrub Thicket (THDM2-1)
5. Dry-Fresh Coniferous Regeneration Thicket (THDM1)
6. Dry-Fresh White Pine Coniferous Woodland

Invasive Species

- Dog-strangling Vine/Garlic Mustard/Common Buckthorn/Manitoba Maple/Tatarian Honeysuckle
- Common Buckthorn
- Phragmites
- Garlic Mustard
- Dog-strangling Vine



REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2022.

100 50 0 100

Scale 1:3,500 Metres

CLIENT: MINISTRY OF TRANSPORTATION EASTERN REGION

PROJECT: PRELIMINARY DESIGN FOR HIGHWAY 401 FROM CRANBERRY ROAD TO HAMILTON ROAD, PORT HOPE

TITLE: CONSTRAINTS AND OPPORTUNITES AND ELC COMMUNITIES

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A1L0
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www.mcintoshperry.com

PROJECT NO:KM-17-7131-13		FIGURE:
Date	Feb., 23, 2022	4A
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Checked By	EJ	

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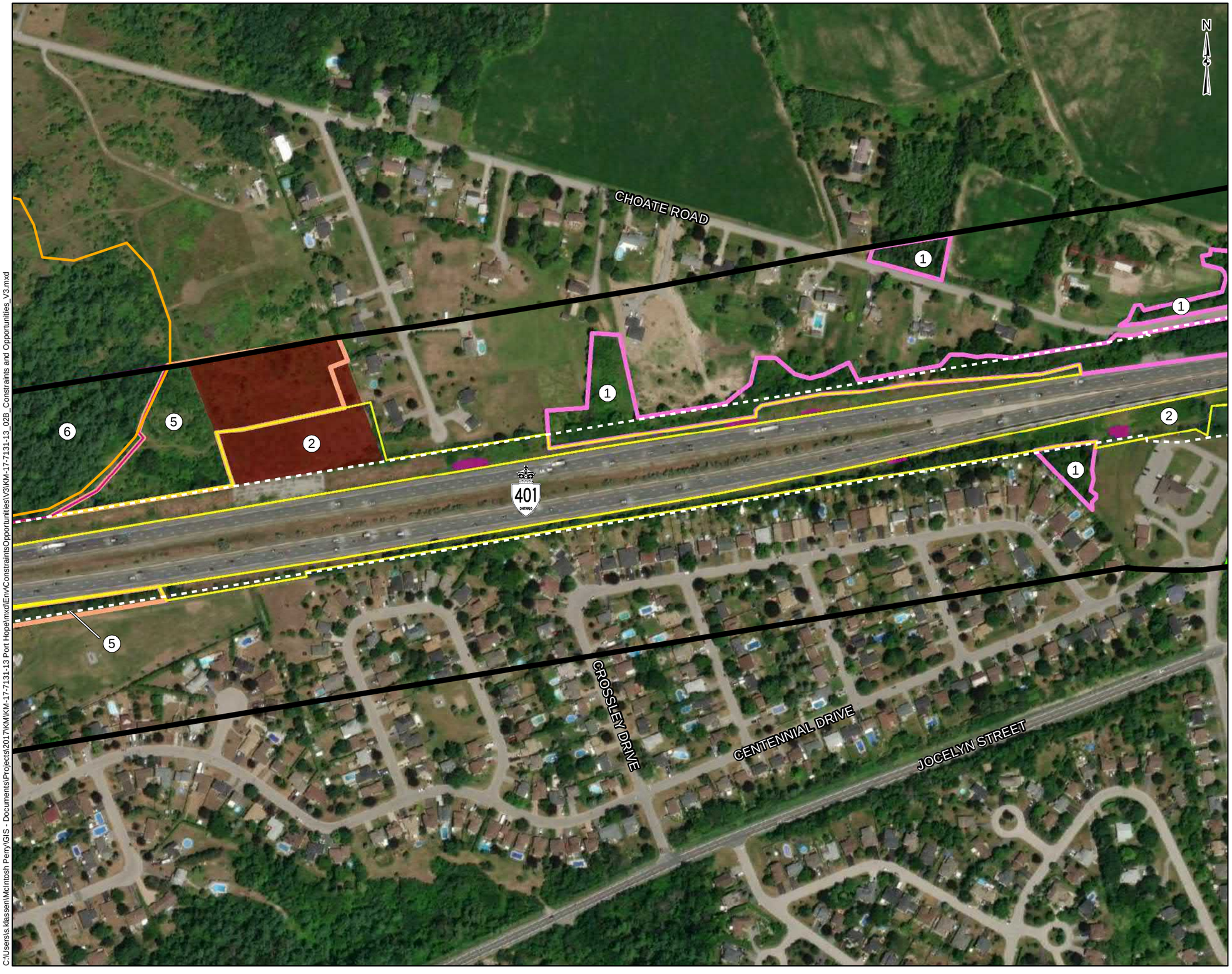


LEGEND

- Study Area
- R-O-W
- Significant Woodland - Port Hope Official Plan

Species at Risk

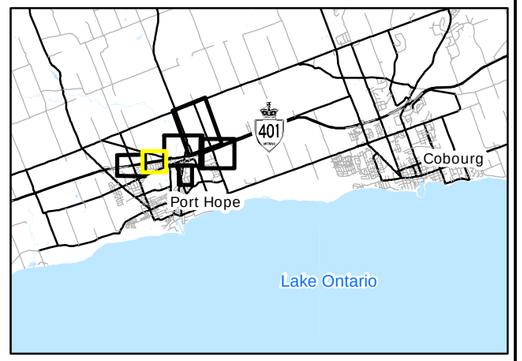
- Eastern Meadowlark Habitat

ELC Communities

- 1 Dry-Fresh Deciduous Regeneration Thicket (THDM4)
- 2 Dry-Fresh Graminoid Meadow (MEGM3)
- 5 Dry-Fresh Graminoid Meadow (MEGM3)
- 6 Dry-Fresh White Pine Coniferous Woodland

Invasive Species

- Phragmites



REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2022.

100 50 0 100

Scale 1:3,500 Metres

CLIENT: MINISTRY OF TRANSPORTATION EASTERN REGION

PROJECT: PRELIMINARY DESIGN FOR HIGHWAY 401 FROM CRANBERRY ROAD TO HAMILTON ROAD, PORT HOPE

TITLE: CONSTRAINTS AND OPPORTUNITES AND ELC COMMUNITIES

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PROJECT NO:KM-17-7131-13		FIGURE:
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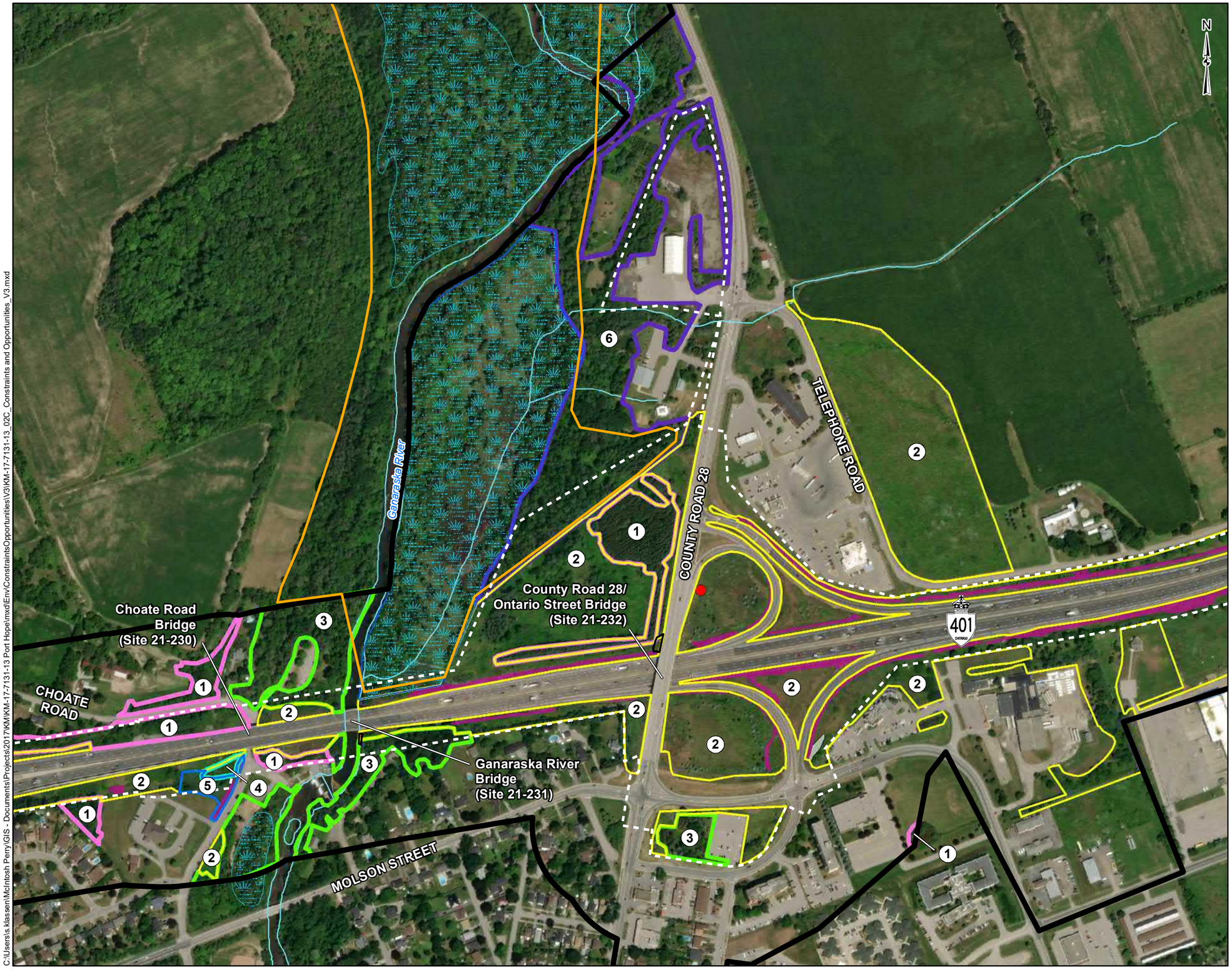


LEGEND

- Study Area
- R-O-W
- Waterbody
- Wetland
- Watercourse
- Significant Woodland - Port Hope Official Plan

Species at Risk

- Monarch

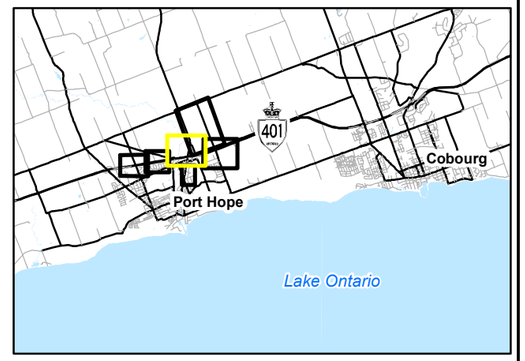
Invasive Species

- Phragmites
- Garlic Mustard
- Poison-ivy

ELC Communities

1. Dry-Fresh Deciduous Regeneration Thicket (THDM4)
2. Dry-Fresh Graminoid Meadow (MEGM3)
3. Fresh-Moist Manitoba Maple Deciduous Woodland (WODM5-1)
4. Sumac Deciudous Shrub Thicket (THDM2-1)
5. Forb Mineral Meadow Marsh (MAMM2)
6. Mixed Woodland (WOM)
- Manitoba Maple Mineral Deciduous Swamp (SWDM3-4) (Unevalutated Wetland)

Notes:
*Please refer to the Figure 2F for Species at Risk - Choate Road Bridge.



REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2022.

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Scale 1:5,000 Metres

CLIENT: MINISTRY OF TRANSPORTATION EASTERN REGION

PROJECT: PRELIMINARY DESIGN FOR HIGHWAY 401 FROM CRANBERRY ROAD TO HAMILTON ROAD, PORT HOPE

TITLE: CONSTRAINTS AND OPPORTUNITES AND ELC COMMUNITIES

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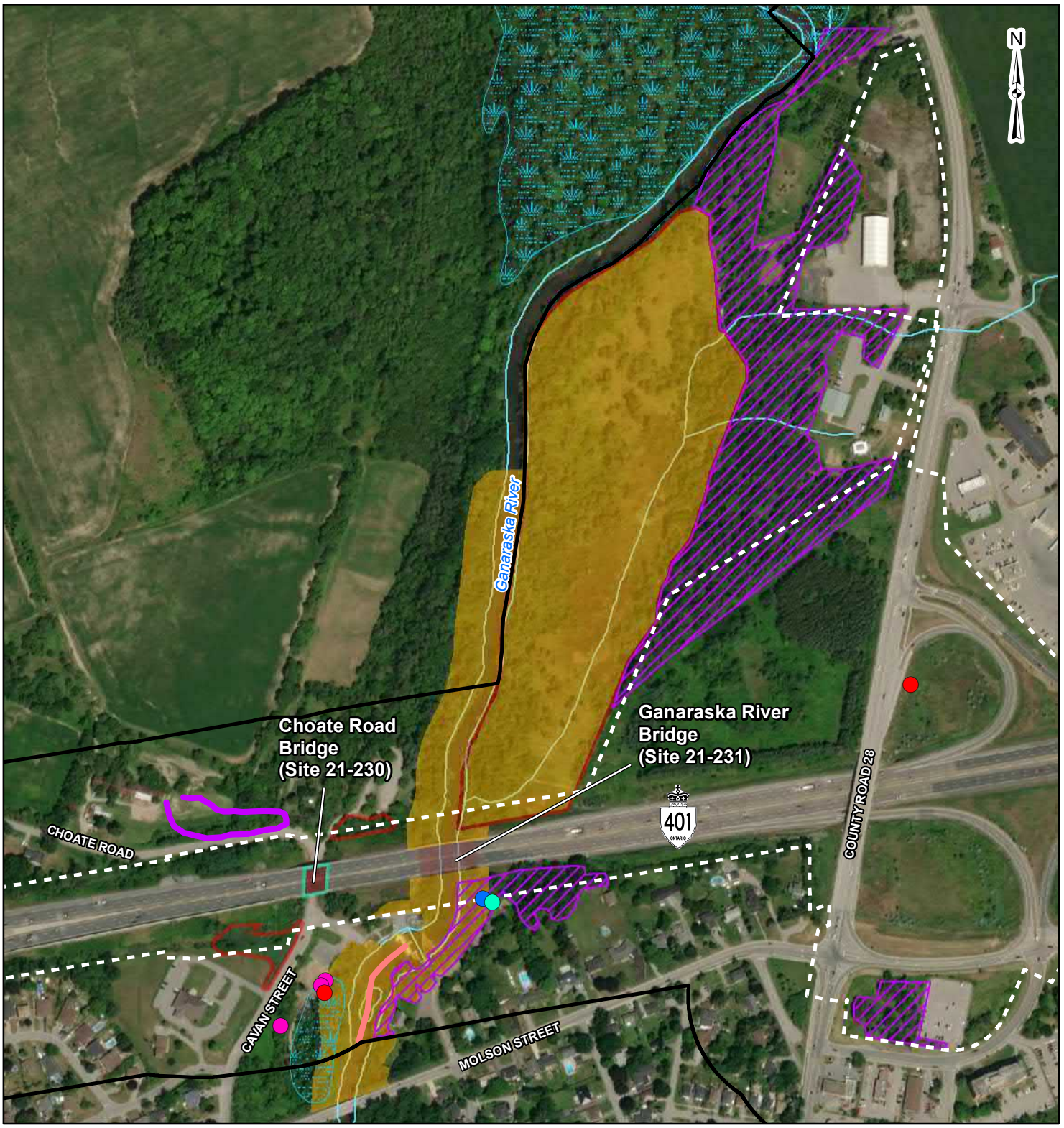
PROJECT NO:KM-17-7131-13		FIGURE: 4C
Date	Feb., 23, 2022	
GIS	EU	
Checked By	EJ	



LEGEND

- Study Area
- R-O-W
- Unevaluated Wetland
- Waterbody
- Watercourse

Species at Risk

- Monarch (2018 Observation)
- Hybrid Butternut (2020 Observation)
- Hybrid Butternut (2018 Observation)
- Butternut (to be confirmed)

- Barn Swallow and Chimney Swift (observed aerially foraging in 2018)
- Barn Swallows (observed aerially foraging in 2018)
- American Robin Nest
- American Robin/Rock Pigeon Nests
- Potential Western Chorus Frog Habitat
- Potential Category 2 Blanding's Turtle Habitat
- Potential Bat Habitat

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2021.

200 100 0 200

Scale 1:5,500 Metres

CLIENT: MINISTRY OF TRANSPORTATION EASTERN REGION

PROJECT: PRELIMINARY DESIGN FOR HIGHWAY 401 FROM CRANBERRY ROAD TO HAMILTON ROAD, PORT HOPE

TITLE: CONSTRAINTS AND OPPORTUNITES CHOATE ROAD BRIDGE

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PROJECT NO:	KM-17-7131-13
Date	Jan., 07, 2021
GIS	EU
Checked By	JC

FIGURE: 4D

4.11.5 Wetland Habitat

A total of two (2) wetland communities have been identified within 120 m of the Highway 401 study area based on data from Land Information Ontario (LIO). Both wetlands are located adjacent to the Ganaraska River and neither has been evaluated per the Ontario Wetland Evaluation System (OWES) (MNDMNRF, 2013). The nearest wetlands evaluated as Provincially Significant are the Sculthorpe Marsh and Peter's Rock No. 2, which are respectively 2.2 km and 3.1 km away from the study area. No other evaluated or provincially significant wetlands (PSW) were identified within or adjacent to the study area.

4.11.6 Wildlife

Characteristic wildlife of the Lake Simcoe-Rideau Ecoregion (6E) includes American bullfrog (*Lithobates catesbeianus*), eastern gartersnake (*Thamnophis sirtalis*), groundhog (*Marmota monax*), northern leopard frog (*Lithobates pipiens*), northern watersnake (*Nerodia sipedon*), raccoon (*Procyon lotor*), red-spotted newt (*Notophthalmus viridescens*), Snapping Turtle (*Chelydra serpentina*), spring peeper (*Pseudacris crucifer*), striped skunk (*Mephitis mephitis*), and white-tailed deer (*Odocoileus virginianus*). Representative bird species include the Great Blue Heron (*Ardea herodias*), Hairy Woodpecker (*Leuconotopicus villosus*), Rose-breasted Grosbeak (*Pheucticus ludovicianus*), Scarlet Tanager (*Piranga olivacea*), Wilson's Snipe (*Gallinago delicata*), Wood Duck (*Aix sponsa*), and Wood Thrush (*Hylocichla mustelina*) (Crins et al., 2009).

Wildlife species were identified in the field through observation and evidence of presence from tracks, vocalization, burrows, and scat. 2020 field observations include nesting of migratory birds (American Robin and Rock Pigeon) at the Choate Road and Ganaraska bridges, as well as one (1) Eastern Meadowlark, a SAR grassland bird, identified by call northeast of the Cranberry Road bridge in a graminoid meadow. There is also suitable habitat for SAR bats adjacent to the north side of Highway 401 near the Cranberry Road bridge. During field observations, other SAR observed within the study area near the Ganaraska River/Choate Road bridges include the Monarch butterfly, and possible Butternut trees, as well as the Barn Swallow and Chimney Swift. Potential SAR habitat in this location includes bats, Western Chorus Frog and Category 2 Blanding's Turtle **(Figure 4E).** Refer to Section 5.1.7 for more information regarding SAR within the study area.

The Ganaraska River provides suitable habitat for aquatic and semi-aquatic mammals such as the North American beaver *(Castor canadensis)* and muskrat *(Ondatra zibethicus)* to utilize as localized means of passing under Highway 401. Suitable habitat for turtles can be found along the length of the Ganaraska River, adjacent wetlands, and a small island located downstream of the Ganaraska River Bridge. Semi-aquatic mammals and turtles may use the Ganaraska River as a significant travel corridor under Highway 401.

Legislative protection for each species is noted where applicable which includes legislations such as the *Endangered Species Act* (2007) (ESA), *Species at Risk Act* (2002) (SARA), *Migratory Birds Convention Act* (1994) (MBCA), and *Fish and Wildlife Conservation Act* (1997) (FWCA).

For more information regarding terrestrial ecosystems existing conditions within the study area, the *Terrestrial Ecosystem Existing Conditions Report, McIntosh Perry 2022,* can be found under separate cover, as listed in **Appendix I.**

4.11.7 Species at Risk

Terrestrial and aquatic field surveys, including targeted species-specific surveys, were undertaken in 2018, 2019, and 2020 and background information was gathered on potential Species at Risk (SAR) that may be present within the study area:

4.11.7.1 SAR Plants

Two Butternut were observed within or adjacent to the Highway 401 study area during the 2020 field investigations, both located approximately 40 m southeast of the Ganaraska River bridge. One individual was confirmed to be a hybrid (*Juglans x bixbyi*), while the other requires further inspection during the detail design phase of the project, as the age of the tree at the time of field investigations prohibited crews from recording all identifying features. During the 2018 field investigations, three (3) Butternut hybrids were observed within the fresh-moist Manitoba maple deciduous woodland in the southern portion of the study area (**Figure 4D**). Butternuts are listed as 'Endangered' under the *Endangered Species Act* (ESA) (2007) and the *Species at Risk Act* (SARA) (2002) and receive general habitat protection.

4.11.7.2 SAR Insects

Monarchs were observed during the field investigations at several sites within the Highway 401 study area during both the 2018 and 2020 field investigations. This species was encountered within open vegetated habitats (i.e. cultural meadow, meadow marsh, graminoid meadow) along the Highway 401 ROW in association with Common Milkweed, which serves as a host plant for this species (**Figure 4D**). Monarchs are listed as 'Special Concern' under the *ESA* (2007) and the *SARA* (2002) and do not receive habitat protection.

4.11.7.3 SAR Amphibians

There is potential to encounter Western Chorus Frogs in the Manitoba maple mineral deciduous swamp, located northeast of the Ganaraska River Bridge. Meadow marsh areas within the study area may be utilized as temporary ponds for breeding. Adjacent wooded areas such as the fresh-moist Manitoba maple deciduous woodland may provide suitable hibernation habitat under leaf litter, rocks, or logs (**Figure 4D**). The Western Chorus Frog is listed as 'Threatened' under the *SARA* (2002) and receive general habitat protection. No observations of this species were made during field investigations.

4.11.7.4 SAR Snakes

There is potential to encounter the Eastern Milksnake and Eastern Ribbonsnake within the Highway 401 study area. The Eastern Milksnake may be present in a wide variety of habitats within the study for foraging , breeding and overwintering, area due to the general habitat requirements of this species. The Eastern Ribbonsnake is most likely to be encountered adjacent to watercourses and surface drainage areas within the study area. No observations of either species were made during field investigations.

4.11.7.5 SAR Turtles

The wetlands, watercourses, and waterbodies associated with the Highway 401 study area may be suitable habitat for Eastern Musk Turtles, Snapping Turtles and Blanding's Turtles. Category 2 Habitat for Blanding's Turtle is available in any connected wetland and waterbody complex (all suitable wetlands or waterbodies within 500 m of each other) extending up to 2 km from Blanding's Turtle occurrences as well as 30 m around these suitable wetlands/waterbodies. Snapping Turtles, Eastern Musk Turtle and Blanding's Turtle may also be present in the Ganaraska River upstream of Corbett's Dam due to the slower waters and softer substrates. The Ganaraska River may provide suitable habitat for Northern Map Turtles, although data from the Ontario Reptile and Amphibian Atlas (ORAA) indicates no occurrence in the immediate study area. There is potential to encounter SAR turtles nesting within the study area, including Highway 401 gravel shoulder areas adjacent to wetland habitat. The Ministry of Northern Development, Mines, Natural Resources and

Forestry (MNDMNRF) LIO Geodatabase records indicate no occurrences of Blanding's Turtles, Eastern Musk Turtles, Northern Map Turtles, or Snapping Turtles within 2 km of the study area. Though wetland habitat within and adjacent to the Highway 401 study area provides suitable aquatic habitat for SAR turtles (**Figure 4D**), no individuals or evidence of nesting activity (i.e., predated nests, etc.) was observed within the study area limits during field investigations.

4.11.7.6 SAR Birds

Several SAR birds including Barn Swallow, Bobolink, Chimney Swift, Eastern Meadowlark, Eastern Wood-Pewee, Grasshopper Sparrow, Red-headed Woodpecker, and Wood Thrush may be encountered within the Highway 401 study area and adjacent lands.

Suitable breeding habitat for Bobolink, Eastern Meadowlark, and Grasshopper Sparrow is present within the study area along the north side of Highway 401, east and west of Cranberry Road. These areas consist of graminoid meadows, graminoid crop fields, and open grassed thickets in which these bird species may utilize for breeding. The majority of the agricultural fields within the study area consist of corn or soy crops which are not suitable for breeding activity of SAR grassland birds. One (1) Eastern Meadowlark was identified via audio call during the 2020 field investigations, northeast of the Cranberry Road bridge in the graminoid meadow (**Figure 4D**).

There is suitable forested habitat present for the Eastern Wood-Pewee, Red-headed Woodpecker, and Wood Thrush within the general study area (restricted to the adjacent lands outside of the Highway 401 ROW). However, no observations of these species were made during the three (3) targeted bird surveys that were conducted during the 2020 field investigations.

Habitat within and adjacent to the Highway 401 study area appears suitable for foraging (aerial) by Barn Swallows. However, no evidence of suitable habitat for Barn Swallow nesting activities was observed within the study area during the 2020 field investigations and no Barn Swallow nests were observed on the existing structures. Barn Swallows were observed aerially foraging in 2018 circling over Choate Road and returning over the agricultural land northwest of the study area (**Figure 4D**). Both Barn Swallows and Chimney Swifts were observed during the 2019 investigations aerially foraging in the areas surrounding the Ganaraska River Bridge (**Figure 4D**).

4.11.7.7 SAR Mammals

There is potential to encounter Eastern Small-footed Myotis, Little Brown Myotis, Northern Myotis, and/or Tri-colored Bat adjacent to the Highway 401 study area. These species may utilize forested habitat adjacent to the highway ROW and may use individual trees as maternity colony sites (i.e., snags, cavity trees, etc.). Targeted SAR bat surveys conducted in the spring and summer of 2019 did not indicate any evidence of SAR bats utilizing the lands adjacent to the Choate Road bridge. However, due to the current scope of the proposed work, potential habitat for SAR bats is present on the west end of the study area near the Cranberry Road bridge, and on the east side of the Ganaraska River **(Figure 4A and Figure 4D).** No evidence of usage of the study area structures (i.e., culverts, bridges, etc.) by bats was observed during the 2018, 2019, or 2020 field investigations (i.e., suitable crevices, droppings, etc.).

4.11.7.8 Aquatic SAR

The Department of Fisheries and Oceans (DFO) Aquatic SAR Mapping (2019) did not identify any aquatic SAR within the Ganaraska River in the vicinity of the study area. The GRCA was also consulted and did not identify any aquatic SAR within the vicinity of the study area. However, the American Eel, Atlantic Salmon and Lake Sturgeon are all historically known species within Lake Ontario and it is possible they may be present in the vicinity of Corbett's dam. Due to the fish migration barrier at the dam, migration of the American Eel and Lake Sturgeon into the study area at the Ganaraska River bridge crossing would be permanently obstructed, and while the Atlantic Salmon could pass through the fishway at the dam, this species is considered extirpated in Ontario due to overfishing and habitat destruction and has lost its status as a SAR. It is

therefore not likely that these species are present within the study area at the Ganaraska River crossing.

4.12 Surface Water, Drainage and Hydrology

There is an unevaluated wetland (recommended by the MNDMNRF to be considered as a PSW) associated with a tributary of the Ganaraska River that is located on the east bank of the river, upstream of Corbett's Dam. This tributary originates as an agricultural drain north of Highway 401 between Hamilton Road and County Road 28. It flows westward through agricultural fields for approximately 400 m and then flows south, parallel with the Ganaraska River for approximately 600 m until it enters the river. The Ganaraska River also flows southward, outside of the study area and drains into Lake Ontario.

The study area is located within the MNDMNRF Peterborough District and is within the Ganaraska River watershed, which is managed by the Ganaraska Region Conservation Authority (GRCA). Within the study area, runoff flows from the bridges and Highway 401 in a west to east direction and enters the Ganaraska River via smaller tributaries to the north and south of Highway 401.

Cranberry Road Drainage

At Cranberry Road, Highway 401 consists of a rural cross section with a median concrete barrier wall and median storm sewers/catch basins in the immediate vicinity of the bridge. There is a transition to a grassed median approximately 150 m east of the structure. Ditches along Highway 401 to the east and west convey flow away from the Cranberry Road bridge. No Highway 401 centreline culverts were identified within 500 m of the structure. Median catch basins to the west of the structure outlet to the north approximately 580 m west of the Cranberry Road bridge. Median catch basins to the east of the structure outlet to the north approximately 1,250 m east of the Cranberry Road bridge. No abutment culverts were noted in the vicinity of the bridge as flow patterns drain away from the bridge.

The bridge deck does not convey any external drainage areas outside of the roadway itself and based on observations of the site, there are no deck drains on the structure. There are currently two catch basins south of the bridge, one in the northbound lane and one in the southbound lane, each catch basin has an associated culvert that drains out into the ditch on either side of the roadway.

No centreline or entrance culverts were noted within the vicinity of the bridge. Ditch drainage patterns, south of the Highway 401, along Cranberry Road appear to drain to the south. Ditch drainage to the north of Highway 401 in the east quadrant also direct flow south and appear to outlet into the Highway 401 ditchline. Runoff in the northwest quadrant appears to drain west with no defined ditch.

Choate Road and Ganaraska River Drainage

At the Choate Road bridge and Ganaraska River bridge, Highway 401 consists of an urban cross section with a median concrete barrier wall and median storm sewers/catch basins. Exterior curbs are drained via catch basins and outlet pipes to their respective side of the roadway or via curb outlets. In this location there is a large section of median storm sewer outlets in the north ditchline just west of Choate Road, which picks up flows from up to the Cranberry Road bridge.

There are Highway 401 ditches to the east and west of the Ganaraska River bridge that convey flows towards the river. The Highway 401 ditchline to the west of the Choate Road bridge also flows east under Choate Road and towards the river. No Highway 401 centreline culverts were identified within 500 m of the structures; however, several catch basin outlets are located within the vicinity of the bridges.

The Choate Road bridge deck does not convey any external drainage area flows outside of the roadway itself and based on observations of the site, there are no deck drains on the structure. Several storm sewer outlets are noted to be near the Choate Road bridge. Flows are carried across Choate Road via two ditch inlets, one approximately 60 m south of the

bridge and one approximately 40 m north of the bridge. These ditch inlets carry significant flows from the eastbound and westbound Highway 401 ditches towards the Ganaraska River.

The Ganaraska River bridge deck does not convey any external drainage area flows, outside of the roadway itself. Surface flows from the Ganaraska River bridge deck outlet via curb outlets approximately 50 m past the bridge for both the eastbound and westbound lanes. Several storm sewer outlets are within the vicinity of the bridge with catch basins in the median and at exterior shoulders. Catch basins and associated outlets are also noted between the Ganaraska River bridge and the Choate Road bridge.

Highway 401 Drainage

Highway 401 consists of a mostly rural cross section with a median concrete barrier wall and median storm sewer system between Cranberry Road to Highway 28. There is a transition to a grassed median approximately 150 m east of Cranberry Road to 350 m west of Choate Road; it should be noted that the barrier wall still runs along the EBL interior shoulder due to the grade difference of the westbound highway platform. Within the direct vicinity of the Choate Road Bridge and Ganaraska River Bridge, Highway 401 consists of an urban cross section with exterior curbs. Exterior curbs are drained via catch basins and outlet pipes to their respective side of the roadway or via curb outlets.

Highway 401 carries 3 lanes eastbound and westbound within the study area, along with on and off tapers for the Highway 28 Interchange Ramps. No centerline culverts were observed between 500m east of Cranberry Road Bridge to 500 m west of Highway 28 Bridge, however, there are a few centreline culverts east of the limits which drain the north side of Highway 401 to the south and eventually into the Ganaraska River.

Within the study area, the Highway 401 roadside ditches on either side of the Ganaraska River Bridge convey flow towards the river. The Highway 401 ditchline to the east of Ganaraska River flows from the Highway 28 interchange. The Highway 401 ditchline to the west of the Choate Road Bridge, up to Cranberry Road, carries flow eastward under Choate Road and towards the river.

There is a major section of median storm sewer that outlets in the north ditchline 280 m west of Choate Road/420 m west of Ganaraska River, which carries flows from the grassed median up to the Cranberry Road Underpass. This section of sewer also picks up external drainage, via ditch inlets, from south of the Highway 401 eastbound lanes near Cranberry Road. A trunk sewer with multiple ditch inlets is located within the ditchline north of Highway 401 between Cranberry Road and Choate Road, this system ties into the outlet for the grassed median sewer. Median catch basins to the west of Cranberry Road outlet to the north approximately 580 m west of the bridge, outside of the project limits. There are also several smaller sections of median sewer, within the project limits, that outlet to the north side of Highway 401.

4.13 Groundwater

The study area lies within the source protection area of the *Ganaraska Source Protection Region.* The MECP's Source Protection Information Atlas has identified that portions of the study area from Cranberry Road to the Ganaraska River lie within the Port Hope Intake Protection Zone 2 (IPZ-2). IPZ-2 is defined as the area within and around surface water that could contribute water to the intake within 2 hours of a contamination event. The Ganaraska River within the study area is also within an event-based area for pipeline fuel and/or oil spills, as fuel pipelines run across the Ganaraska Region Source Protection Area north of Highway 401.

Schedule B-3 of the Port Hope Official Plan also identifies the lands immediately surrounding the Cranberry Road bridge as a Significant Groundwater Recharge Area – Medium and the lands further north of the bridge as a Significant Groundwater Recharge Area – High. This area is also considered as a Highly Vulnerable Aquifer **(Figure 5).**

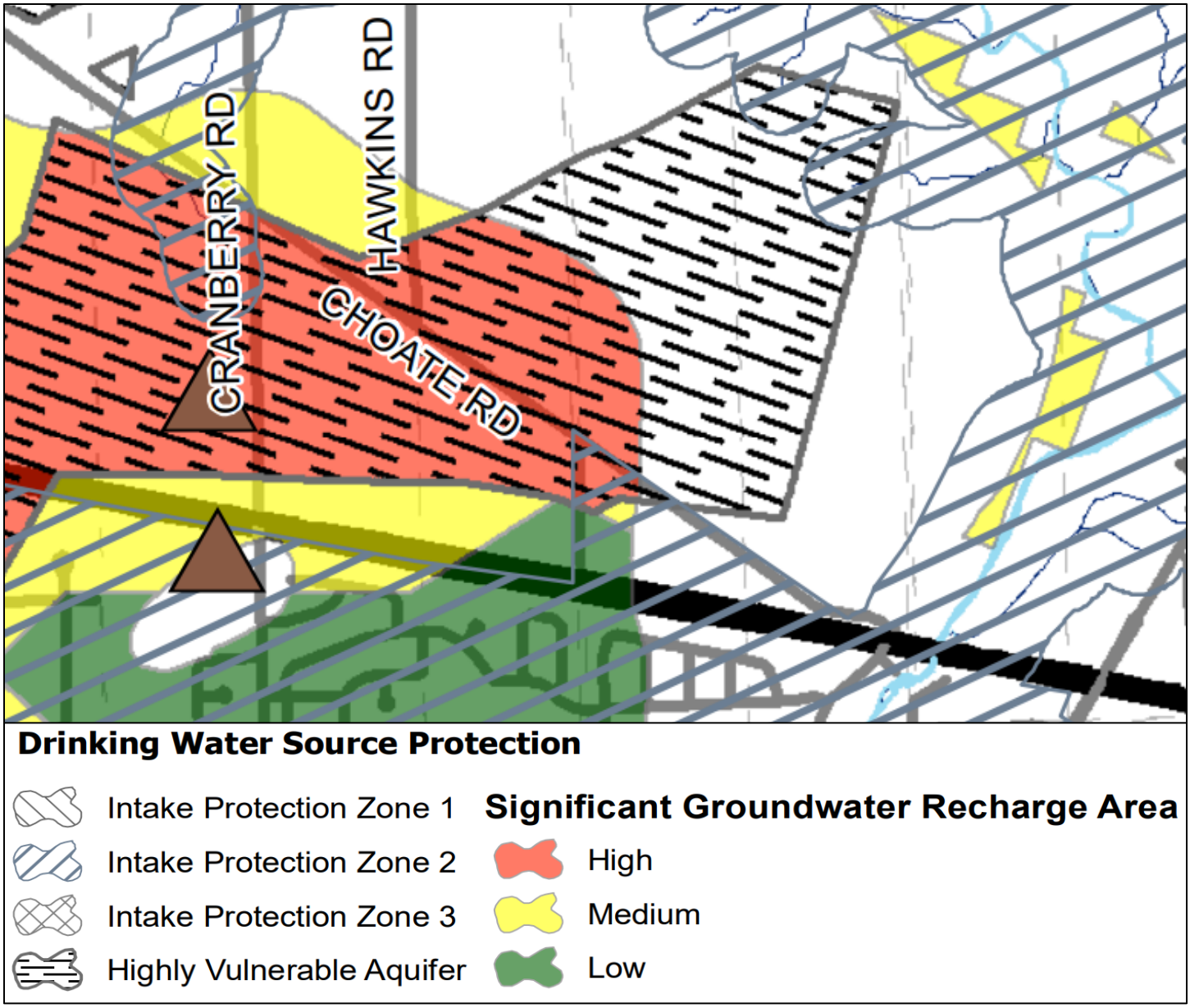

Figure 5: Port Hope Official Plan Schedule B3 – Drinking Water Source Protection Vulnerable Areas

The Ganaraska Region Source Protection Area's Source Protection Plan was developed to protect existing and future drinking water sources by reducing or eliminating significant threats to the source of municipal drinking. It is designed to protect the water quality of the lakes, rivers and sources of underground water that supply municipal drinking water system. The plan was developed by local municipal and community partners and came into effect on January 1, 2015.

The source protection policies under the plan are a multi-barrier approach to protect sources of municipal drinking water from contamination and overuse and to ensure all activities with the potential to cause contamination to municipal wellheads and water intakes are managed safely. The Source Protection Plan contains policies to address significant drinking water threats in a vulnerable area around a municipal well or a vulnerable area upstream of a municipal water treatment intake pipe.

In 2019 WSP completed a Groundwater Assessment Report (GAR) from 1.4 km west of Toronto Road to 1.5 km east of Hamilton Road in Port Hope. The report indicated that water-well records were obtained from the MECP well record maps

(MECP, 2019). A current review of water-well records found within this study area identified a total of 161 water well records within 500 m of the study area. The water well uses included:

- 42 abandoned well records;
- 6 commercial water supply well records;
- 75 domestic water supply well records;
- 5 livestock/domestic water supply well records;
- 1 livestock water supply well record;
- 23 monitoring well records;
- 2 public water supply well records;
- 5 unknown water supply record; and
- 1 water supply record.

Well depths range from 2.3 m to 80.16 m below ground surface. During the 2020 field investigation, no indications of groundwater upwelling/seepage were observed within the study area, however, there is a buried drain pipe that extends from Highway 401 to underneath Choate Road that has caused a seepage of water that upwells at the entrance to the Port Hope Conservation Area.

For more details on groundwater within the study area, the *Port Hope Highway 401 Improvements 1.4km West of Toronto Road to 1.5km East of Hamilton Road Groundwater Assessment Report, WSP 2019* can be found under separate cover, as listed in **Appendix I.**

4.14 Geotechnical Investigations

Thurber Engineering Ltd. (Thurber) was retained by McIntosh Perry to provide preliminary foundation engineering services for select structures along Highway 401 in Port Hope including the Cranberry Road bridge, Choate Road bridge and Ganaraska River bridge that were to be assessed for replacement. During preliminary design, the footprint for the future Highway 401 at the structure sites was to be established.

Cranberry Road

A foundation investigation report for the existing Cranberry Road bridge was obtained from the online GEOCRES library. The investigation included four unsampled dynamic cone penetration tests (DCPT); two at each abutment. Based on the report it was stated that the terrain is a moraine hill, spotted with loose gravel and boulder at surface. The depth to DCPT refusals (at the time of the investigation) ranged from approximately 6 ft (1.8 m) at the north abutment to approximately 15 feet (4.6 m) below the ground surface at the south abutment.

During the 2020 preliminary design study, two boreholes were advanced: one behind each abutment. The depths of the boreholes ranged from 14.1 to 22.9 m below ground surface (elev. 144.8 to 137.3 m). The encountered stratigraphy consisted of 6.6 to 7.1 m of granular embankment fill over a thin layer (0.9 to 1.3 m) of clayey silty sand over a deep deposit of compact to very dense glacial till. The glacial till consisted of a heterogeneous mixture of silt, clay, sand, gravel and cobbles. The boreholes were terminated within the glacial till deposit; bedrock was not encountered within the depth of investigation.

Choate Road

In 2016, Thurber carried out a preliminary foundation investigation for replacement of the Choate Road structure. The report included a desktop review of previous investigations and a limited field investigation.

The investigations included six boreholes for the structure and four for the approach embankments. Three of the structure boreholes were advanced approximately 3.0 m into the limestone bedrock while all approaches boreholes were advanced

to refusal on inferred bedrock. The stratigraphy in the area of the bridge was generally described as loose to compact silty sand to sandy silt, over clayey silt at the east abutment and firm to stiff silty clay overlying a compact fine sand at the west abutment.

The 2016 site investigation and field-testing program included advancing four (4) boreholes: one behind each abutment in both the EB and WB lanes. The boreholes were advanced to depths ranging from 15.4 to 21.5 m (elev. 93.0 to 87.7 m). Two of the boreholes were extended 3 m into bedrock by coring. The encountered stratigraphy consisted of 12.5 to 14.8 m of fill over clay and/or sandy silt over a thin layer of glacial till over limestone bedrock.

In 2019, Thurber carried out a detailed design investigation for the replacement of the Choate Road structure. The site investigation and field-testing program included advancing thirteen (13) boreholes. The boreholes were advanced to depths ranging from 8.0 to 14.7 m; all boreholes were advanced into the limestone bedrock. The encountered stratigraphy consisted of a variable thickness of fill over native clay and silty sand to silt, over glacial till over limestone bedrock.

No additional boreholes were advanced at the Choate Road structure as part of the current preliminary design study; however, boreholes were advanced along the north side of Highway 401 for the proposed high fill and/or retaining walls. The investigation included three boreholes between Choate Road and Ganaraska River and two boreholes west of Choate Road. The boreholes were advanced to depths ranging from 7.5 to 13.6 m below ground surface. All boreholes were advanced into bedrock using coring techniques. The encountered stratigraphy east of Choate Road consisted of soft organic silt over a layer ranging from clay to silty sand to sandy silt over glacial till over limestone bedrock. West of Choate Road, the encountered stratigraphy consisted of about 5 to 7 m of clayey silt over sandy silt to silty sand over glacial till over bedrock.

Ganaraska River

In 2016, Thurber carried out a preliminary foundation investigation for rehabilitation of the Ganaraska River Bridge. The report included a desktop review of previous investigations and a limited field investigation.

The investigation included six boreholes for the structure. A supplemental approach embankment investigation was also carried out that included three short boreholes to refusal and five auger probe holes. Two of the structure boreholes were advanced approximately 3.0 m into the limestone bedrock while all approach boreholes were advanced to refusal on inferred bedrock. Prior to construction of the bridge and Highway 401, the stratigraphy in the area of the bridge was generally described as surficial deposits of organic silt, overlying a thin deposit of very dense silty coarse sand. The overburden soil at the site is underlain by sound limestone bedrock based on rock coring. The Borehole Logs indicated the bedrock surface at around elevation 295 to 297 feet (89.9 to 90.5 m).

The 2016 site investigation and field-testing program included advancing four (4) boreholes: one behind each abutment in both the EB and WB lanes. The boreholes were advanced to depths ranging from 14.6 to 19.8 m (elev. 91.4 to 83.5 m). Two of the boreholes were extended 3 m into bedrock by coring. The encountered stratigraphy consisted of 9.6 to 12.5 m of fill over organic silt over sandy glacial till over limestone bedrock.

No additional boreholes were advanced at the Ganaraska River Bridge as part of the current preliminary design study, however, boreholes were advanced along the north side of Highway 401 for proposed high fill and/or retaining walls. The investigation included three boreholes between Choate Rd and Ganaraska River and two boreholes east of Ganaraska River. The boreholes were advanced to depths ranging from 6.7 to 7.8 m below ground surface. All boreholes were advanced to refusal on inferred bedrock and the boreholes west of Ganaraska River were advanced into the limestone bedrock using coring techniques. The encountered stratigraphy consisted of soft organic silt over a layer ranging from clay to silty sand to sandy silt over glacial till over limestone bedrock.

For more details of the geotechnical studies performed, the *Cranberry Road Foundations Investigation and Design Report*, *Choate Road Foundations Investigation Design Report* and the *Highway 401 Future Footprint Foundations Investigation Design Report* completed by Thurber in 2020 can be found under separate cover, as listed in **Appendix I.**

4.15 Contaminated Property and Waste Management

There are currently eleven (11) designated substances identified by Ontario Regulation 490/09, under the *Occupational Health and Safety Act* (OHSA) in Ontario. These include Acrylonitrile, Benzene, Isocyanates, Silica, Arsenic, Coke Oven Emissions, Lead, Vinyl Chloride, Asbestos, Ethylene Oxide and Mercury.

Of the above, it is understood that silica, lead, asbestos, and potentially arsenic were widely used in highway and bridge/culvert construction in the past and may be present within the project limits. Additionally, benzene may also be present in coating material or as a result of a spill or from contamination from an adjacent property. Acrylonitrile and vinyl chloride are constituents of acrylonitrile butadiene styrene (ABS) and polyvinyl chloride (PVC) materials; however, once polymerized these two substances are no longer considered designated substances. The remaining designated substances (coke oven emissions, ethylene oxide, isocyanates, and mercury) are not likely to be encountered in typical construction or maintenance activities of MTO infrastructure.

A Designated Substance Survey for the Choate Road and Ganaraska River bridges was conducted by MMM Group in 2016. All concrete samples submitted for asbestos testing returned no detections. Paint samples collected from the Ganaraska River bridge was below the *Canada Consumer Product Safety Act guideline* for lead (<0.0010% vs. 0.0009%) and is not considered lead-containing paint. No paint was visually identified at the Choate Road bridge. Electrical conduits were not identified at the bridges however if materials that support the suspicion of ACM are encountered, samples should be taken at that time to confirm the presence/absence of designated substances.

For more details on designated substances within the study area, the *Designated Substance Survey Report* prepared by MMM Group in June 2016 can be found under separate cover, as listed in **Appendix I.**

Port Hope also has a well known historic nuclear industry that has left the area with a large amount of low-level radioactive waste (LLRW) within the soil and fill material. The Port Hope Area Initiative (PHAI) is currently underway to oversee the cleanup, transportation, and storage for 1.2 million cubic metres of waste in Port Hope. As part of the initiative, LLRW will be stored for safe and long-term management at an engineered site south of Highway 401 near Baulch Road in the Municipality of Port Hope.

4.16 Socio-Economic Environment

4.16.1 Land Use

The study area is within the Municipality of Port Hope, County of Northumberland and is located along the northern shores of Lake Ontario. Based on the 2016 Statistics Canada Census data, the Municipality of Port Hope has a population of 16,753. It is located approximately 160 km west of Kingston and 105 km east of Toronto. The County of Northumberland has a total population of 85,598 and consists of seven municipalities including Port Hope.

Highway 401 is one of the busiest highways in North America and is utilized as a major commercial, commuter and long-distance travel corridor. Highway 401 extends through the study area, travelling parallel to the north shore of Lake Ontario with on and off-ramps to the east at County Road 28 and to the west at County Road 2. Cranberry Road, Choate Road and County Road 28 are municipal roadways that cross over/under Highway 401 within the study area, providing access across the highway for rural farms and residences.

The north side of Highway 401 within the study area is predominantly rural with agricultural and low-density residential land uses. These lands are designated as Rural under the Port Hope Official Plan (2017). The south side of Highway 401 within the study area is considered an urban area with medium density residential neighborhoods south of Highway 401. These lands are designated as Residential under the Official Plan. The Port Hope Conservation Area and the Corbett's Dam Public Area are also located within the study area, and these lands are designated as Natural Environment and Open Space respectively **(Figure 6A and 6B).**

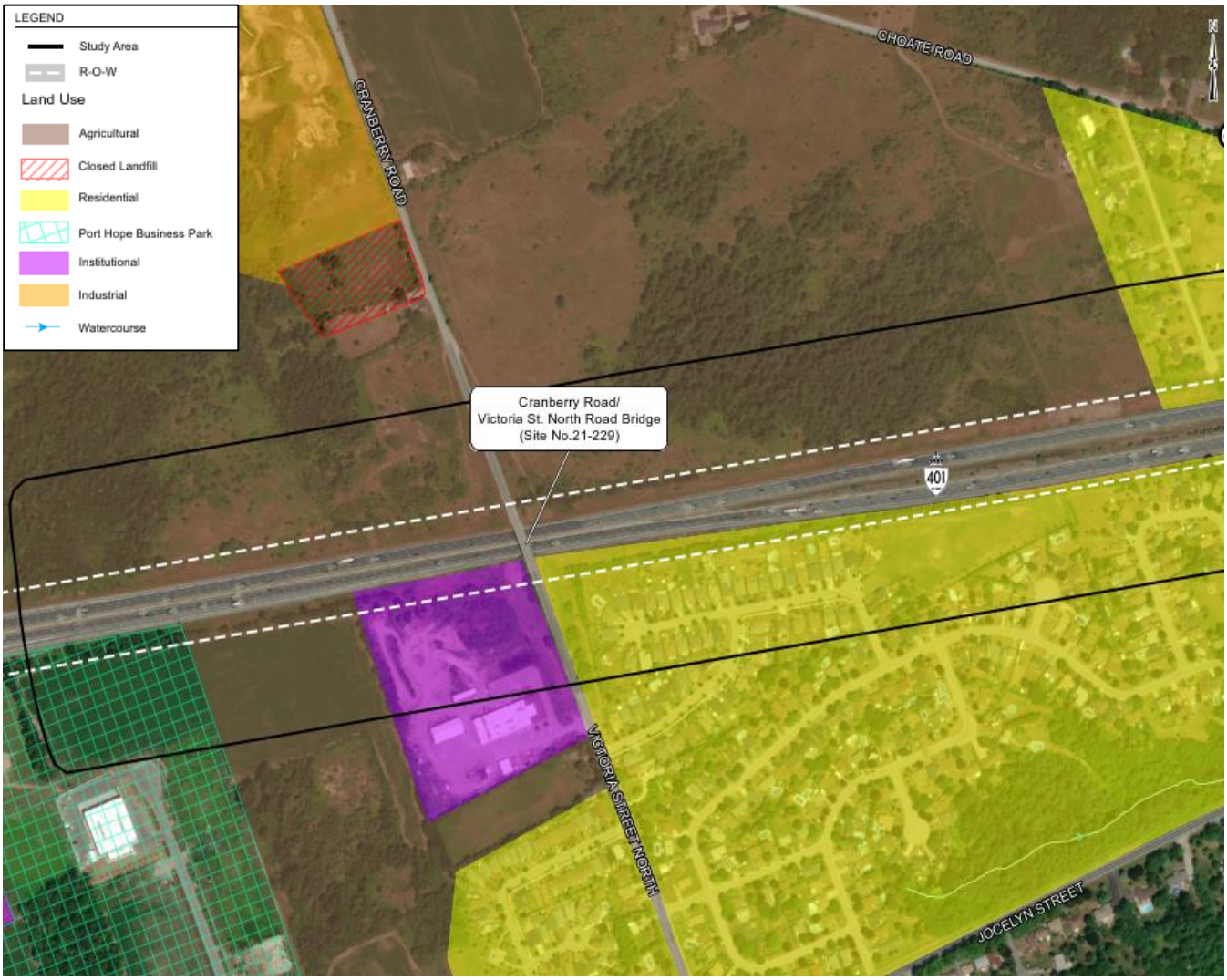

Figure 6A: Land Use Map

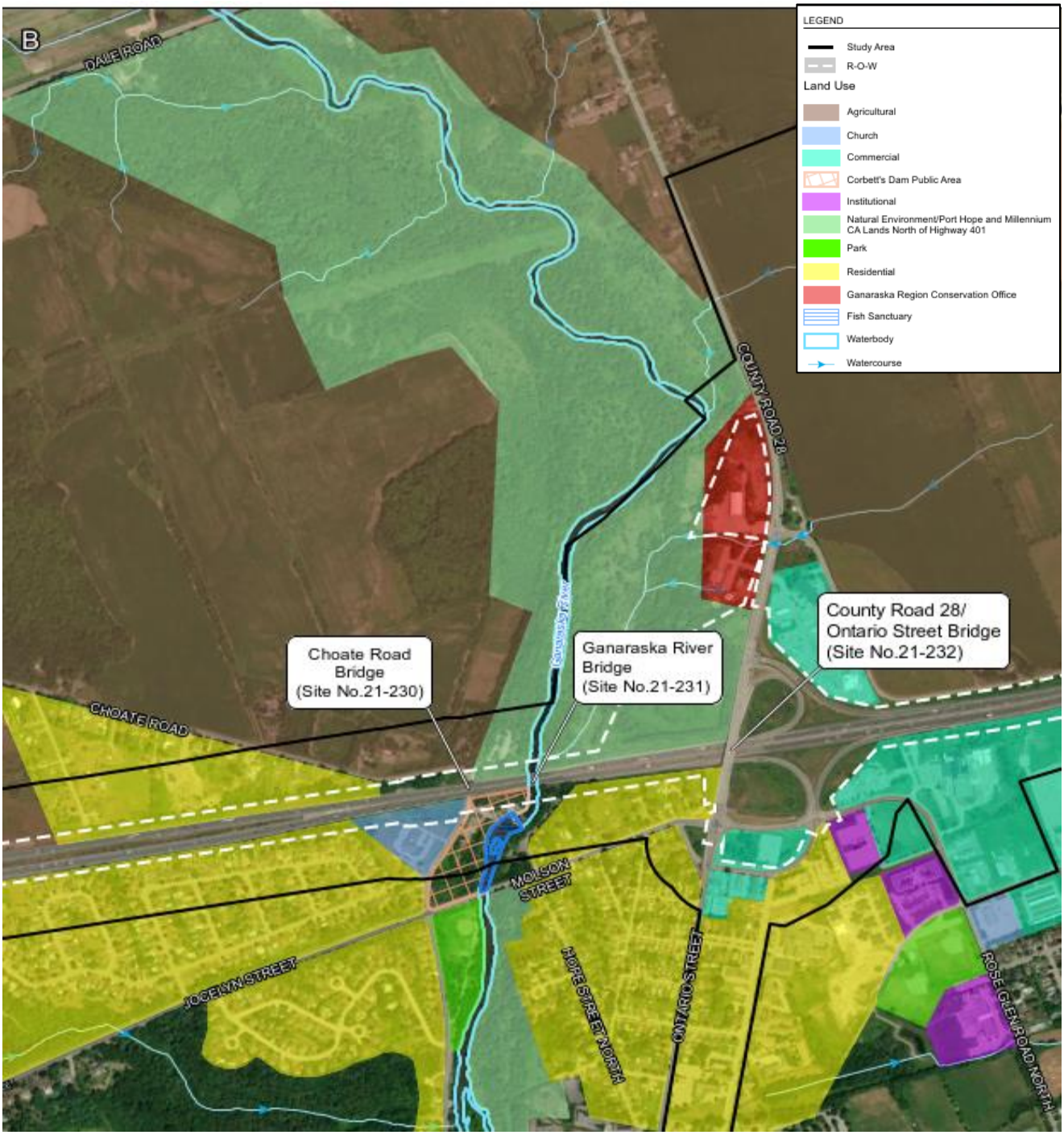

Figure 6B: Land Use Map

4.16.2 Recreation and Tourism

Recreation and tourism opportunities include fishing, canoeing / kayaking, hiking, and historical attractions. Recreational angling (fishing) is a well-known attraction in Port Hope due to the annual Chinook Salmon and Rainbow Trout migrations up Ganaraska River from Lake Ontario. At the MNDMNRF managed Ganaraska Fishway, more commonly known as the Fish Ladder at Corbett's Dam, many tourists and spectators come to visit from mid-August to early October to see the

salmon and trout jump the fish ladder to migrate upstream. The GRCA has also constructed hiking trails with the Port Hope Conservation Area that are located adjacent to the Fishway and are easily accessible from this location.

There is also a number of public parks within proximity to the study area including Wladyka Park off Rose Glen Road and Optimist Park just south of Corbett's Dam public area.

4.16.3 Student Transportation and Emergency Services

The study area is located within two district school boards: The Kawartha Pine Ridge District School Board and the Peterborough, Victoria, Northumberland and Clarington Catholic District School Board. The Student Transportation Services of Central Ontario (STSCO) provides student transportation services for both school boards and all schools in and surrounding the study area.

Emergency services are comprised of police, fire, and paramedic service providers. The following is a summary of emergency services within the study area:

Police service in the study area is provided by the Ontario Provincial Police (OPP) Northumberland detachment and the Port Hope Police Service.

Fire Services are provided by the Municipality of Port Hope, and there are two stations located within proximity to the city, one on the north side of Highway 401 in Newtonville and one on the south on Ontario Street. The Township of Hamilton Fire Department is also located northeast of the study area.

Northumberland County manages the ambulance and paramedic services within the county and is located east of the study area in neighboring Cobourg. They provide emergency coverage to the residents in the community and maintain six ambulance stations throughout the county. The closest paramedic station to the study area is in Port Hope off of Rose Glen Road. **Table 6** summarizes the EMS providers' contact information.

Table 6: Emergency Services for Study Area

Service	Location	Address
Police (OPP Northumberland Detachment)	Cobourg	1165 Division St, Cobourg, ON K9A 0V5
Police (Port Hope)	Port Hope	55 Fox Road Port Hope, ON L1A 3V5
Fire Services (Township of Hamilton and Municipality of Port Hope)	Baltimore	2598 Van Luven Road Baltimore, ON K0K 1C0
	Port Hope	245 Ontario Street Port Hope, ON L1A 2V9
	Newtonville	4366 County Road 2 Newtonville, ON L0A 1J0
Paramedic Services (Northumberland County)	Port Hope	423 Croft Street Port Hope, Ontario L1A 4H1

4.16.4 Aggregate and Mining

According to the Port Hope Official Plan Schedule C (2016), there is an extractive industrial area less than 500 m north of Highway 401 on Victoria Street North (Cranberry Road). This location is owned by a ready-mix concrete supplier. No other aggregate extraction or active mines or mining claims are located within the immediate vicinity of the study area.

4.16.1 Commercial

Commercial infrastructure is interspersed throughout the study area and is currently most developed at the Highway 401 and County Road 28 (Ontario Street) interchange. There is a major rest stop on the northeast quadrant of the County Road 28 interchange that includes several restaurants, gas stations and a hotel. On the southeast quadrant of the County Road 28 interchange are also more fast-food restaurants and gas stations as well as automotive shops and other small commercial properties.

On the west end of the study area past the Cranberry Road Underpass, are several new commercial businesses along Fox Road, which are part of the Port Hope Municipal Business Park. The development consists of an array of one acre plus lots for sale that are zoned for general/service employment land uses. This area is designated as a Major Intensification Area per Schedule A-1 of the Port Hope Official Plan, with the purpose of bringing increased employment and economic growth opportunities to the area.

4.16.2 Institutional

Institutional land uses typically include lands occupied by public buildings. Along the Highway 401 corridor is the Municipality of Port Hope's Joint Operations Centre near the Cranberry Road underpass, and the Port Hope Police Department is located off Fox Road approximately 250 m south of Highway 401. Extendicare Port Hope, the Haliburton Kawartha Pine Ridge (HKPR) District Health Unit – Maebrook and the Northumberland Health Care Corporation are all located south of the County Road 28 interchange along Phillips Road and Rose Glen Road.

4.16.3 Agricultural

Agricultural property is located throughout the study area corridor, predominantly on the north side of Highway 401. The lands surrounding the Cranberry Road bridge to the north are heavily characterized by agricultural uses. These land uses extend east from Cranberry Road to the Port Hope Conservation Area and Ganaraska River. Consultation with the Northumberland Federation of Agriculture identified Cranberry Road as a transportation route utilized by tractors and other large farming equipment.

4.17 Noise

There are multiple MTO and developer constructed noise barriers located along the study area to mitigate highway noise adjacent to the south side of Highway 401 (**Figure 7**).

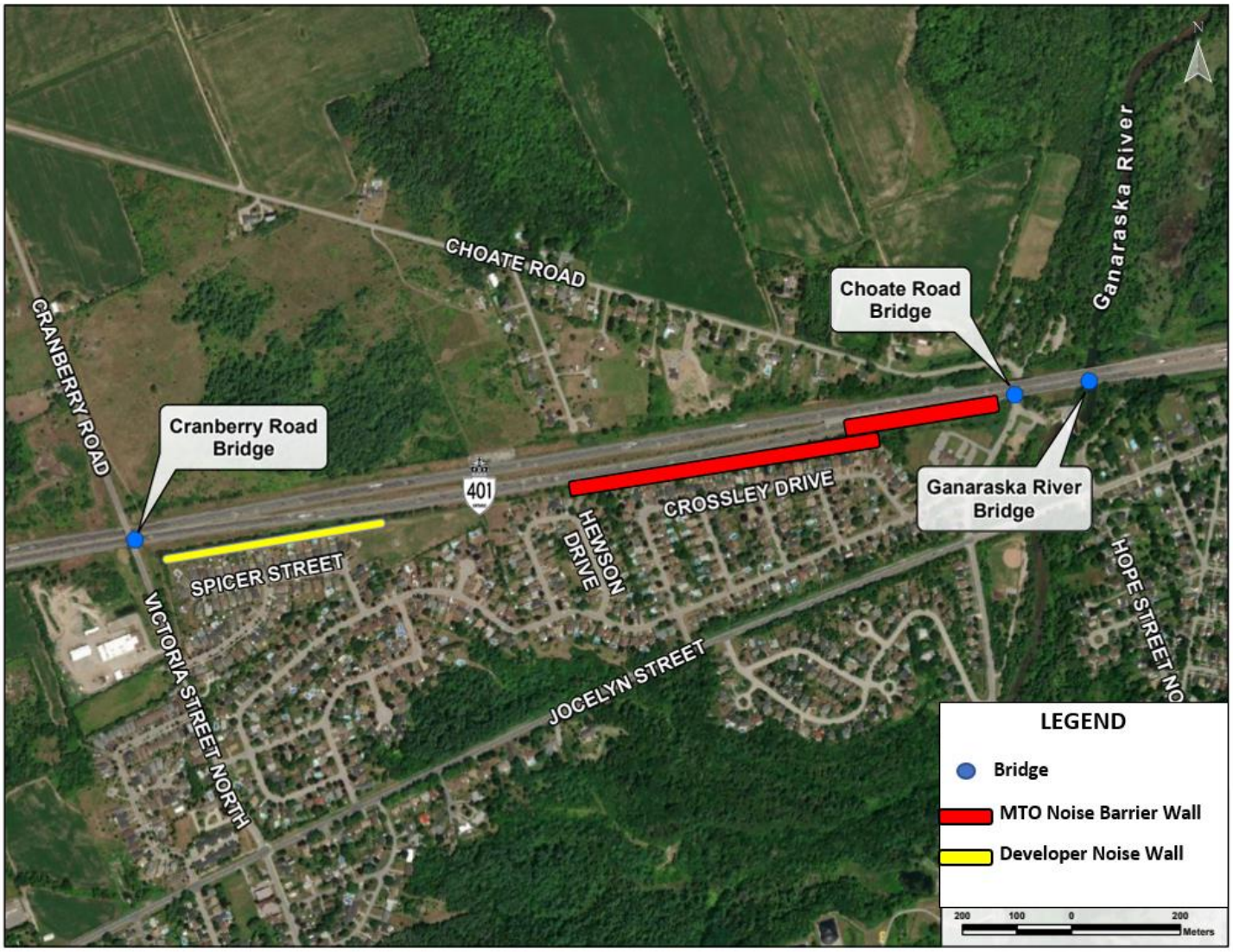

Figure 7 – Existing Noise Barriers Within the Study Limits

The Ministry of Transportation (MTO) considers the installation of noise barriers in two ways:

1. The Retrofit Noise Barrier Candidate List, that assesses noise impacts caused by existing freeways to homes constructed before 1977, and

2. Through the Environmental Assessment (EA) process which assesses noise impacts caused to any home by construction of any new highway or by a significant change to the footprint of an existing highway.

The existing MTO constructed barriers along this stretch of highway were constructed based on the retrofit candidate list.

4.18 Air Quality

Air quality emissions from the Cranberry Road, Choate Road, and Ganaraska River bridges can be addressed in two scenarios; short term (impacts to the airshed due to infrastructure construction) and long-term (impacts to the airshed associated with infrastructure use).

4.19 Climate Change

Together with the MECP's code of practices, the guide for the *Consideration of Climate Change in Environmental Assessments in Ontario* (2017) sets out the MECP's expectations for the consideration of climate change in the preparation, execution, and documentation of environmental assessment studies and processes.

4.20 Cultural Environment

4.20.1 Built Heritage and Cultural Heritage Landscape

A Cultural Heritage Resource Assessment Report (CHRAR) was completed by WSP in 2019 *(Cultural Heritage Resource Assessment Report, Pre-Engineering Study for Highway 401 Port Hope From Toronto Road to Hamilton Road)* to determine the cultural heritage value or interest of properties and structures within the study area. The CHRAR indicated that in 2018, MTO conducted an in-house screening of the Cranberry Road, Choate Road, and Ganaraska River structures. It was recommended that a Cultural Heritage Evaluation Report (CHER) was completed for the Choate Road Overpass. The CHRAR also identified eight (8) Cultural Heritage Landscapes (CHL) and seven (7) other Built Heritage Resources (BHL) within or adjacent to the study area. These resources included farms, dwellings, building remains, a cemetery, the Molson Mill and the Corbett's Dam.

The Cultural Heritage Evaluation Report for the Choate Road bridge was prepared by Unterman McPhail Associates (2019) to evaluate any culturally significant features associated with the Choate Road bridge. It was concluded that the structure does not meet requirements to be considered provincially important or culturally significant.

For more details on cultural heritage within the study area, the *Cultural Heritage Resource Assessment Report, Pre-Engineering Study for Highway 401 Port Hope from Toronto Road to Hamilton Road, WSP 2019* and the *Cultural Heritage Evaluation Report: Highway 401 at Choate Road Overpass MTO Site No. 21-230, Municipality of Port Hope, Unterman McPhail Associates, 2019* can be found under separate cover, as listed in **Appendix I.**

4.20.2 Cultural Heritage – Archaeology

Prior to this Preliminary Design, A Stage 1 Archaeological Assessment was carried out in 2019 by WSP in accordance with the provisions of the Ontario Heritage Act (1990) and the Standards and Guidelines for Archaeological Assessments (2011) provided by the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI). The Stage 1 Archeological Assessment Report was submitted to MHSTCI and was entered into the *Ontario Public Register of Archaeological Reports*.

The purpose of the Stage 1 investigation was to evaluate the archaeological potential of the study area and present recommendations for the mitigation of any significant known or potential archaeological resources. Historical, geographical, environmental, and archaeological background research was conducted as well as the current land condition of the study area to determine archaeological potential.

The Stage 1 Archaeological Assessment identified the majority of lands within the study area are considered to be disturbed or previously assessed and do not require further archaeological assessment. The report identified lands adjacent to Highway 401 near Cranberry Road, Choate Road and the County Road 28 interchange that will require a Stage

2 assessment through test pit survey if they are to be impacted by the proposed design, as these lands do not appear to have been previously disturbed **(Figure 8A).**

A Stage 2 Archaeological Assessment was also completed for the Choate Road Overpass in 2019, prior to this Preliminary Design study. This assessment was confined to the land directly adjacent to the Choate Road Overpass and represents a small section of the overall study area. The Stage 2 assessment was conducted on December 21, 2018, by means of a shovel test pit survey. No archaeological resources were found within the study area directly adjacent to the Choate Road bridge.

During the preliminary design it was determined that the lands on the northwest quadrant of the Highway 401 and County Road 28 intersection would be impacted by the proposed works, as a staging area is required in this location to access the Ganaraska River bridge during construction. As a result, a Stage 2 Assessment was initiated in 2021 by Past Recovery to determine the archaeological potential of these lands through test pit survey. Lands southwest of the County Road 28 intersection are also anticipated to be impacted by the Choate Road and Ganaraska River bridge construction however it was determined during the Stage 2 Assessment that these lands do not contain archaeological potential.

It was determined that parts of the study area exhibit potential for the presence of archaeological resources associated with pre- and post-Contact Indigenous settlement and/or land uses. At least four distinct Indigenous groups are known to have lived in what is now central Ontario in the final decades prior to the arrival of Europeans. Iroquoian people (proto-Huron) were present to the east of the study region, Anishinaabeg groups occupied the areas surrounding the Great Lakes and Rice Lake which lies to the north of the study area, Haudenosaunee were more recently present to east and southwest of the study area, though their original hunting grounds extended into southeastern Ontario and Quebec, and the St. Lawrence Iroquoians occupied the upper St. Lawrence River valley. The study area lies on a plateau to the east of the Ganaraska River, a former source of potable water and food resources and a significant transportation corridor, which empties into Lake Ontario 2.5 kilometres to the south. The Ganaraska Millennium Conservation Area serves as the northwestern boundary and is a protected wetland; margins of wetlands were used as winter campsites for nomadic pre-Contact groups. There is also a registered pre-Contact site in the vicinity of the southwestern corner of the study area which dates ostensibly to the Archaic Period.

The study area also exhibits characteristics that indicate the potential for the presence of archaeological resources associated with early Euro-Canadian settlement and/or land uses in the township, dating to as early as 1793. There is a registered historical Euro-Canadian site within 300 m of the study area. There is evidence of first generation or early Euro-Canadian settlement activities within the study area. Apart from the river, the property is adjacent to an early historical land transportation route, as County Road 28 is shown on historical mapping as early as 1861.

A Stage 2 test pit assessment was completed on lands determined to have archeological potential between November and December 2021. During the assessment eight findspots were identified in the southern two-thirds of the study area **(Figure 8B).** Additional intensification test pits and units were completed at each findspot location and analysis of the artifact assemblage combined with the detailed background research determined the level of cultural heritage value or interest and subsequent recommendations for each. Findspots 1, 2, and 4 each consisted of low numbers of pre-Contact lithic material requiring no further assessment. Findspots 5, 6 and 7 each consisted of isolated scatters of early twentieth century items also requiring no further assessment.

Findspot 8 consisted of a large concentration of positive shovel test pits over a length of more than 100 metres, mostly associated with an area containing deep fill associated with the construction of Highway 401, as evident in aerial imagery dating to 1959. Given the large scatter, intensification strategically placed mechanical/hand-excavated trenches were placed across the area. The resulting collection consisted of 1,650 late nineteenth to mid-twentieth century items mostly associated with the imported fill and determined to have no further archaeological significance. There were also 23 pre-Contact artifacts, including a piece of Woodland pottery, a Laurentian Archaic projectile point, and lithic flakes. All were

found in a deposit that also contained the material described above, with the pottery, projectile point and most of the lithic flakes confined to the imported fill deposit. For the remaining lithic flakes found in situ in a natural buried topsoil, the spatial distribution and concentrations did not meet MHSTCI standards for Stage 3 assessment, and thus Findspot 8 is considered as having been adequately recorded during the Stage 2 assessment.

Findspot 3 initially consisted of 28 artifacts recovered from Stage 2 test pits including both pottery and lithic material that dated to the late Middle Woodland period, as the pottery was decorated with cord-wrapped stick and dentate impressions. A subsequent Stage 3 assessment determined that the site covered an area of approximately 430m^2, with an additional 142 artifacts recovered including specific rim sherds dating to the Pickering Complex of the late Middle Woodland to early Late Woodland period (900 A.D. to 1400 A.D.). The site, which appears to be undisturbed by subsequent land use apart from the installation of a hydro pole, was registered with MHSTCI as archaeological site AlGn-39. This site is considered to be of significant cultural heritage value or interest.

The combined Stage 2 & 3 Archaeological Assessment reports are currently being finalized and once complete, will be submitted to relevent Indigenous Communities and the MHSTCI for registration. Once it has been determined during detail design whether archaeological site AlGn-39 will be impacted by the proposed works, a Stage 4 Archaeological Assessment will be conducted, if required.

For more details on archaeology within the study area, the *Stage 1 Archaeological Assessment Highway 401, Port Hope From Toronto Road to Hamilton Road, WSP 2019* can be found under separate cover, as listed in **Appendix I.**

wsp

LEGEND

Display

- Image Location
- Study Area

Survey Method

- Disturbed - No Further Work
- Pedestrian Survey at 5m Interval Required
- Test Pit Survey at 5m Interval Required
- Cemetery Investigation Required

TITLE: FIGURE 8B: RESULTS	SCALE: 1:8,500	PROJECT NO: 17M-01712-06	DATE: MARCH 2019
	DRAWN BY: AST	CLIENT: MINISTRY OF TRANSPORTATION	
PROJECT: HIGHWAY 401, PORT HOPE	CREDITS: LAND INFORMATION ONTARIO		

0 195 390 m

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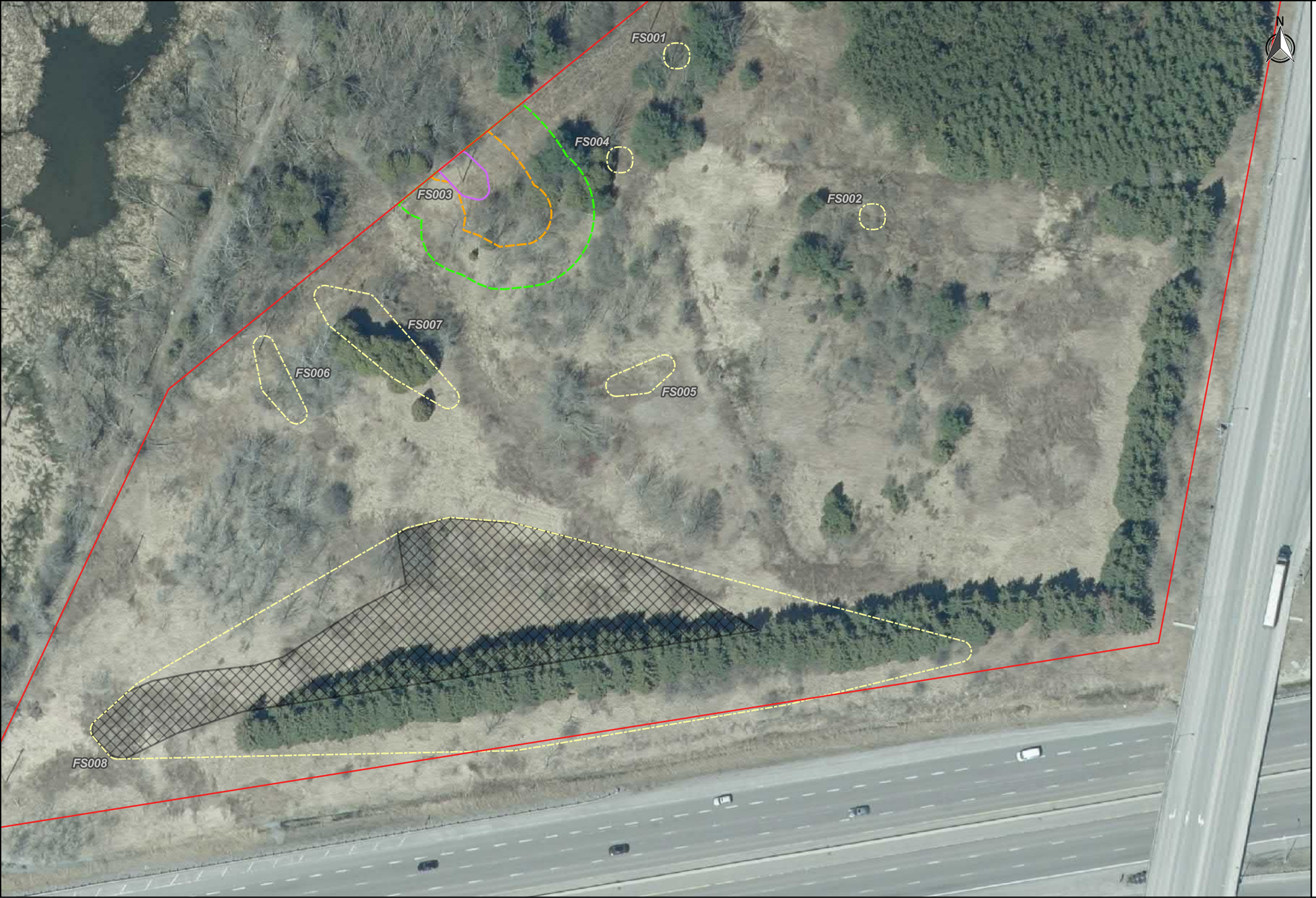
Document Path: C:\Users\Andrew.S.Turner\Projects\17M-01712-06 Port Hope\MapDocuments\Arch\Map 8b Results.mxd



LEGEND

Project Layers

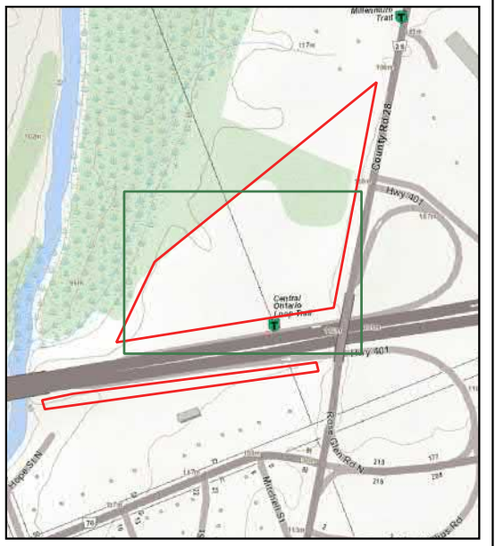
- Study Area

Stage 2 Property Survey

- Limits of Findspots Requiring No Further Work (with ID number)
- Inital Limit of FS003
- Approximate Extent of Deep Fill Deposits over a Buried Topsoil

Stage 3 Site Excavation

- Stage 3 Site Limits (Stage 4 Assessment Required)
- 10m Protective Site Buffer (in accordance with MHSTCI requirements)



Base: South Central Ontario Orthophotography (SCOOP; 2018)
Datum/Grid Zone: NAD83(CSRS)/UTM Zone 17N

5 0 5 10 15 20 m

Hwy 401/CR28 Intersection Improvements
Preliminary Design & Class EA (GWP 4005-17-00)
Part Lots 3 & 4, Concession 2, geo. Hope

Stage 2 and Stage 3 Survey Results

4.21 Transportation Conditions

4.21.1 Provincial/Municipal

The section of Highway 401 within the study area is classified as a rural divided freeway with a posted speed of 100 km/h throughout, and a design speed of 120 km/h. The average annual daily traffic (2016 data) along Highway 401 within the study area is 50,000.

Choate Road is a collector road under the jurisdiction of Port Hope, which extends south from County Road 74 (Dale Road) to McKibbon Street, just south of Highway 401, where it then continues as Cavan Street. It operates with a two-lane configuration, and a posted speed limit of 60 km/h. There are several private entrances and stop-controlled intersections along this roadway. There are no traffic signals. The average daily traffic (collected in June 2020) on Choate Road is 496 vehicles, however this number was adjusted to account for the Covid-19 impact on traffic volumes and subsequently increased to 574 vehicles.

Cranberry Road is a collector road under the jurisdiction of Port Hope, which extends south from County Road 74 (Dale Road) to Highway 401, where it then continues as Victoria Street North. It operates with a two-lane configuration, and a posted speed limit of 50 km/h changing to 80 km/h north of Highway 401. There are several private entrances along this roadway, and two stop-controlled intersections at Choate Road and Dale Road. There are no traffic signals. The average daily traffic (Collected in June 2020) on Cranberry Road is 1,1108 vehicles, however this number was adjusted to account for the Covid-19 impact on traffic volumes and subsequently increased to 1,477 vehicles.

County Road 28/Ontario Street is an arterial road under the jurisdiction of the County of Northumberland, which extends north from Highway 401 as County Road 28; the roadway continues south of Highway 401 as Ontario Street. Both segments operate with a posted speed limit of 50 km/h and a two-lane configuration. Along the length, there are a several stop-controlled intersections and private and commercial driveways. There are a few traffic signals including the Highway 401 north ramp terminal, Molson Street, Telephone Road, and Dale Road.

For more information on traffic conditions within the study area, the *Highway 401 Port Hope - Traffic Operations Report,* prepared by LEA in August 2020 can be found under separate cover, as listed in **Appendix I.**

4.21.2 Railways

There are no railways located within the vicinity of the study area. There is a VIA Railway running parallel to Highway 401 adjacent to Lake Ontario located approximately 2.5 km south of the study area.

4.21.3 Utilities

The existing utility infrastructure within the study area includes:

- Nine Hydro One poles are located within the project limits, as well as seven MTO light standards; and
- On Highway 401, from Cranberry Road to west of Ontario Street, there is utility crossing at only one location. Aerial Elexicon hydro cables cross Highway 401 at 0.6km east of Cranberry Road.

In the proximity of Cranberry Road, Bell, Enbridge, Hydro One and Elexicon facilities are present

- North-south Bell lines are buried at both sides of the structure crossing Highway 401;
- A buried north-south Enbridge gas main is found on the east side of the Cranberry Road structure crossing Highway 401, and crosses Victoria Street North approximately 125 m south of the structure;

- Hydro One has high voltage north-south aerial cables crossing Highway 401 ±15.0 m west of the Cranberry Road bridge; and
- Aerial north-south Elexicon hydro cables are present on the west side of Victoria Street and buried east-west Elexicon cables cross Victoria Street south of Highway 401.

At the Choate Road overpass, Bell, Elexicon and Hydro One facilities are present

- Buried bell cable runs along Choate Road and Cavan Street north and south of Highway 401 and crosses under Highway 401 in north-south direction 0.3 km west of Choate Road;
- Hydro one high voltage aerial cables run along Choate Road parallel to Highway 401 from 0.3km west of Choate Road to the west of Ontario Street; and
- Elexicon underground cabling is present along Cavan Street and McKibbon Road for the streetlighting.

5.0 ANALYSIS AND EVALUATION OF THE CRANBERRY ROAD BRIDGE

5.1 Course Screening of Alternatives

The study began with the collection of information through fieldwork and background research to determine the project requirements and assess existing conditions. The first step in the Preliminary Design process was to determine the broad alternatives for the replacement of the Cranberry Road bridge. A series of bridge replacement alternatives considering various span arrangements, bridge superstructure types, and alignment configurations were developed for the bridge and reviewed for feasibility.

Table 7 identifies the alternatives that were developed using existing site conditions, structural limitations, and traffic requirements as a guide.

Table 7: Alternatives to the Undertaking

Alternative	Description
(1) Rehabilitation of the Existing Bridge	Rehabilitate the existing bridge to provide an additional 25 years of service life.
(2) Replacement on Existing Alignment – Staged Traffic	Provide a one-lane two-way staging operation during construction and permanently shift the horizontal alignment.
(3) Replacement on Existing Alignment - Full Closure	Replacement of the bridge on the existing alignment, a full closure of Cranberry Road during construction with a detour route.
(4a) Replacement on New Alignment to the West	The new bridge would be constructed on a new alignment to the west while traffic is maintained on the existing bridge.
(4b) Replacement on New Alignment to the East	The new bridge would be constructed on a new alignment to the east while traffic is maintained on the existing bridge.
(5) Accelerated Replacement	Replacing the bridge on the existing alignment using accelerated bridge construction techniques
(6) Permanent Closure	Eliminate Cranberry Road and permanently alter the existing municipal road network.

5.1.1 Alternative 1: Rehabilitation of the Existing Bridge

The bridge is currently 61 years old. Rehabilitation of the existing structure would provide an additional 25 years of service life to the bridge, however the rehabilitation would likely not be triggered until 2030 and the existing span opening does not accommodate the proposed Future Footprint of Highway 401 to an 8-lane configuration.

5.1.2 Alternative 2: Replacement on the Existing Alignment – Staged Traffic

This alternative considers the replacement of the existing structure maintaining the existing alignment with staged traffic.

The existing structure consists of three boxes, to accommodate staged construction and maintain traffic over the structure, two box girders shall be maintained during Stage 1 of construction. It is noted that the 2008 rehabilitation

provided one-lane two-way staging with temporary traffic signals. This alternative would allow for construction to be carried out in two construction seasons if required for coordination with the renewal of the adjacent structures (including Choate Road and Ganaraska River bridges). Throughout construction, it is anticipated that one-lane two-way traffic operation with signals would be provided.

Due to the extensive cost and low traffic volumes, staging options requiring a temporary modular bridge (TMB) were not carried forward.

A grade raise on Cranberry Road is required to accommodate the clearance requirements on Highway 401. Due to the profile increase, the new toe of slope of the embankment would impact the existing ditches and utility poles/anchors. One utility pole on the northwest quadrant would require relocation to accommodate the larger embankment and ditches. Additionally, a "Municipality of Port Hope" sign can be found at the southwest quadrant and northeast quadrant. Relocation of such signs is anticipated. Temporary limited interest (TLI) or permanent property acquisition would be required for grading. The existing entrances on both approaches would require regrading and TLI to accommodate the larger embankment.

5.1.3 Alternative 3: Replacement on the Existing Alignment – Full Closure

A full closure of Cranberry Road would require a detour length of approximately 7.5 km along Dale Road, County Road 2 (Toronto Road) and Jocelyn Street. It is anticipated that one construction season would be required for this alternative, however, depending on the number of other construction projects on going at the same time it may require multiple seasons. Partial accelerated replacement strategies could be implemented to reduce the duration of construction impacts and limit construction to a single season. These strategies could include the use of partial depth precast deck panels, full depth precast deck panels and or precast substructure components.

A grade raise on Cranberry Road would be required to meet the clearance requirements on Highway 401. Due to the profile increase, the new toe of slope of the embankment would impact the existing ditches and utility poles/anchors. One utility pole on the northwest quadrant would require relocation to accommodate the larger embankment and ditches. Additionally, a "Municipality of Port Hope" sign can be found at the southwest quadrant and northeast quadrant. Relocation of such signs is anticipated.

5.1.4 Alternative 4: Replacement on a New Alignment

To allow two lanes of traffic to be maintained on Cranberry Road during construction, the new bridge would be constructed on a new alignment 16.6m to the east or west while traffic is maintained on the existing bridge.

4A –Replacement on New Alignment to West: The new alignment would require property acquisition in the northwest and southwest quadrant. The residential/agricultural property in the northwest quadrant and the Municipal Public Works building would be impacted and acquisition would be necessary to accommodate this option. The utility pole at the northwest quadrant and the "Municipality of Port Hope" sign at southwest quadrant would require to be relocated.

4B–Replacement on New Alignment to East: The new alignment would require property acquisition in the northeast quadrant. A residential subdivision is located southeast of the structure, and TLI would be required for grading.

5.1.5 Alternative 5: Accelerated Replacement on Existing Alignment – Full Closure

Alternatives to reduce the duration of construction impacts by replacing the bridge using accelerated bridge construction techniques (such as the use of cranes) would result in an approximately 16-week full road closure of Cranberry Road as well as single night and a weekend closure of Highway 401. This alternative would consist of the installation of super module precast concrete substructure elements. The new structure would be constructed on temporary supports in a

laydown/staging area. Possible laydown/staging areas can be found in the northwest and southwest quadrants of the structure, as well as in the Highway 401 median (may require use of shoulders).

Once the existing bridge is removed and the new substructure and superstructure are completed, the new superstructure would be installed on to the new substructure on the original structure's alignment.

As described in Alternative 3, a full closure would require a detour length of approximately 7.5 km along Dale Road, County Road 2 and Jocelyn Street.

5.1.6 Alternative 6: Permanent Closure

Eliminating Cranberry Road would impact the existing municipal road network and would result in a permanent 7.5 km detour route along Dale Road, County Road 2 and Jocelyn Street.

5.2 Screening of Alternatives: "Long List" to "Short List"

The project team, with experts in Structural Engineering, Highway Design, Traffic, Project Management, and the Environment, refined the "long list". The team developed a consensus assessment of the advantages and disadvantages and identified critical flaws in the alternatives to recommend a "short list" of alternatives.

The long list alternatives were assessed and screened based on a reasoned argument approach for several factors including:

- Impacts to property outside the right-of-way;
- Impacts to the surrounding environment;
- Ability to provide vehicular access during construction;
- Construction work zone safety;
- Construction cost;
- Construction duration;
- Construction complexity; and
- Impacts on utilities.

For more information on the long list of alternatives for Cranberry Road, the *Cranberry Road Long List Evaluation Report, MP-LEA Joint Venture, 2020* can be found under separate cover, as listed in **Appendix I.**

The advantages and disadvantages of the six long listed alternatives are summarized in **Table 8.**

Table 8: Evaluation of the Long-Listed Alternatives				
Alternative	**Advantage**	**Disadvantage**	**Carry Forward/Set Aside**	
(1) Rehabilitation of Existing Bridge	• Simpler construction complexity • Low impact to residents and businesses in the vicinity of the structure • Short construction duration	• High throw away construction costs – will become functionally obsolete in the future • Once rehabilitated, the structure will require replacement to accommodate the Highway 401 Future Footprint	X	Does not accommodate the 8-lane Future Footprint of Highway 401. Additional throw-away costs associated with rehabilitating the structure again are not desired. NOT CARRIED FORWARD
(2) Replacement on Existing Alignment – Staged Traffic	• Low impacts to residents and businesses in the vicinity of the structure • Lower construction costs associated with embankment reconstruction • Maintains one-lane two-way operation. • New bridge spans will accommodate the future footprint of the highway	• Throw away and additional construction costs associate with staging • Longer construction duration • Higher construction complexity	✓	Maintains traffic at the structure during construction and has a lower impact to residents and businesses in the vicinity of the structure and new spans will accommodate the Future Footprint of Highway 401 CARRIED FORWARD
(3) Replacement on Existing Alignment – Full Closure	• Shorter construction duration • Low construction cost associated with staging • Lower construction costs associated with embankment reconstruction.	• No throw away construction cost associated with staging • Limited impact to utilities around the structure • Reduces embankment reconstruction requirements compared to realignment options.	✓	Lower cost, shorter construction duration, and simplifies staging to increase worker safety. CARRIED FORWARD
(4A) Replacement on New Horizontal Alignment to the West	• Maintains two lanes of traffic during construction	• Larger permanent property acquisition required • Throw away construction cost associated with new alignment. • Significant impact to utilities • Significant impact to natural environment due to new footprint from realignment • Permanent property acquisition required • Higher construction complexity	X	Significant property acquisition, environmental and utility impacts resulting in high costs NOT CARRIED FORWARD
(4B) Replacement on New Horizontal Alignment to the East	• Maintains two lanes of traffic during construction	• Larger permanent property acquisition required • Throw away construction cost associated with new alignment. • Significant impact to utilities • Significant impact to natural environment due to new footprint from realignment • Permanent property acquisition required • Higher construction complexity	X	Significant property acquisition, environmental and utility impacts resulting in high costs NOT CARRIED FORWARD
(5) Accelerated Replacement on Existing Alignment, Full Closure	• Minimal impacts to residents and motorists • Reduces construction duration • Minimizes property and entrance impacts	• TLI required for staging area • High capital cost and high throw away construction cost • Weekend closure of Highway 401 required • High construction complexity	X	Low traffic volumes on Cranberry Road does not warrant the high cost associated with this alternative. NOT CARRIED FORWARD
(6) Closure of Cranberry Road	• Minimal capital cost • No permanent property acquisition required	• Eliminates crossing for local traffic • Major impacts to local road network • Increase travel time for residents.	X	Cranberry Road is important to the local road network NOT CARRIED FORWARD

5.3 Short List Alternatives

The two short listed alternatives that were carried forward from the long list stage (Alternatives 2 and 3) were reviewed in greater detail considering the impacts of each option. As shown above, an evaluation of alternatives for the Highway 401 Future Footprint was also conducted to determine the location of the future lanes when the need arises. The evaluation resulted in the Recommended Plan for Section 3 of Highway 401, which includes the Cranberry Road bridge, being to split the extension for each direction of Highway 401. As such, both options reviewed for the replacement of the Cranberry Road bridge considered establishing the future footprint equally on both the north and south sides of Highway 401.

Alternative 2 involves replacing the Cranberry Road bridge on the existing alignment using staged traffic. Alternative 3 involves the full replacement of the bridge in the same location as alternative two with a full closure for the duration of construction.

Table 9 summarizes the results of the refined long list evaluation and the following alternatives being carried forward to the short list stage:

Table 9: Short List Alternatives for Cranberry Road Bridge Replacement

ID	Description of Alternative	Comment
2	Full replacement on the existing alignment using staged traffic	Maintains traffic at the structure during construction and has a lower impact to residents and businesses in the vicinity of the structure and new spans will accommodate the Future Footprint of Highway 401
3	Full replacement on the existing alignment using a full closure	Lower cost, shorter construction duration, and simplifies staging to increase worker safety. Results in a 7.5 km detour route.

The conceptual plan for Alternative 2 (replacement using staged traffic) is depicted below in **Figure 9**. The conceptual plan for Alternative 3 (replacement using full closure) is depicted in **Figure 10**.

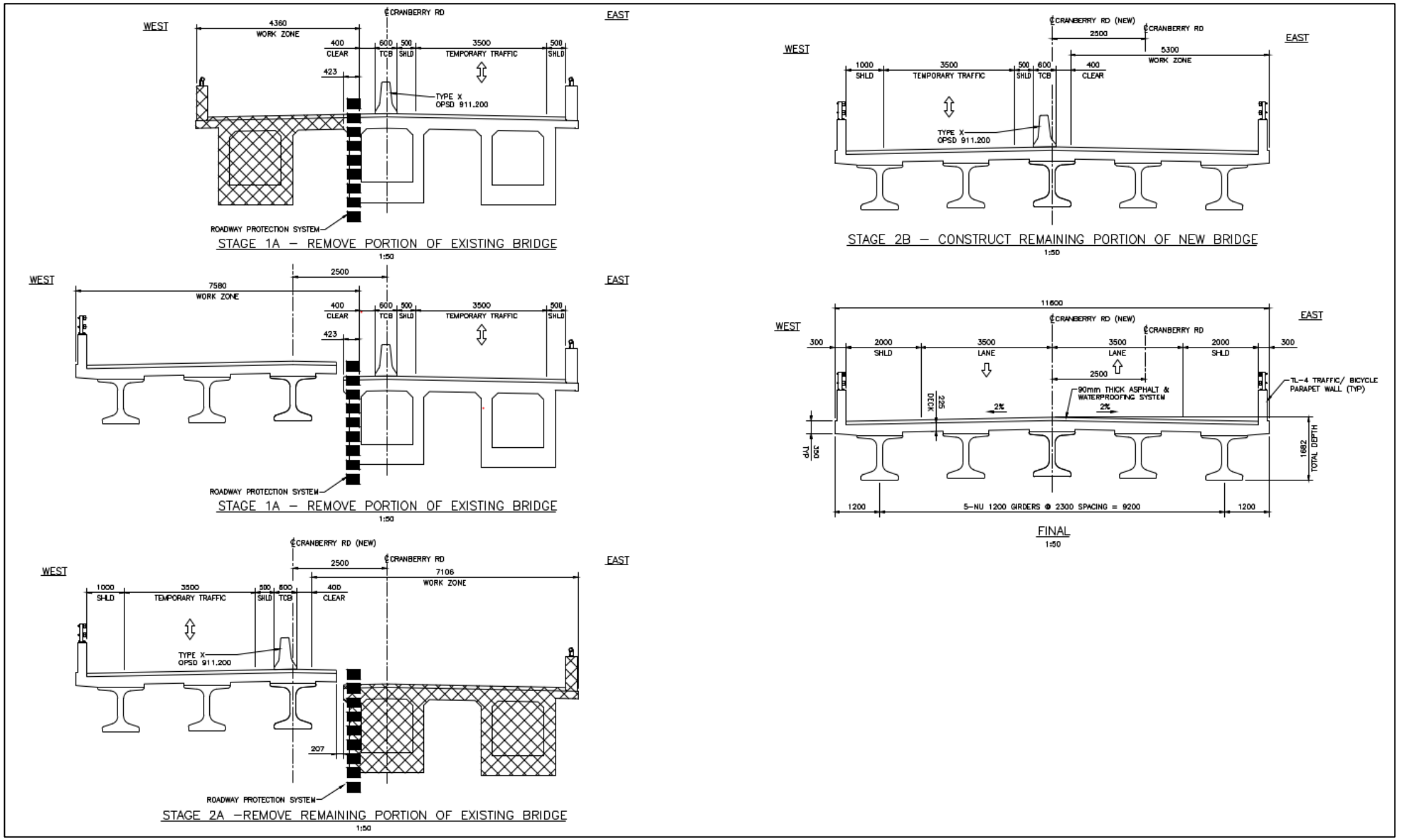


Figure 9: Cranberry Road replacement using staged traffic

Figure 10: Cranberry Road replacement using full closure

5.4 Evaluation of Short List Alternatives

The "Short List" of Preliminary Design alternatives was evaluated using the "Weighted Additive Method", described as the Multi-Attribute Trade-off System (MATS).

The evaluation process was undertaken quantitatively to identify the magnitude of adverse effects associated with the construction impacts of each alternative based on the following components:

- Environment (natural, socio-economic and cultural factors);
- Transportation (short-term and long-term impacts);
- Constructability (traffic staging and construction); and
- Cost (capital).

The component categories allowed the generation of evaluation criteria relative to study-specific engineering and environmental concerns. The component categories were classified into two further sub-levels. These sub-levels included the factors (as noted above) and subfactor groups.

The final step was to measure for identifiable impacts relative to the subfactors. The result was a set of measurable criteria/indicators for each subfactor identified under the respective factor group. The relative measured effect of each criterion/indicator was defined to ensure the significance was recognized in the evaluation process.

Factors that have no recognizable measures or no measurable difference between the design alternatives were not considered during the evaluation process.

Table 10 identifies the criteria/indicators for the evaluation of short list alternatives.

Table 10: Short List Evaluation Criteria		
Factors/Sub-Factors	**Criteria/Indicator**	**Key Measures**
NATURAL ENVIRONMENT		
Wildlife & Vegetation	Impacts to wildlife or wildlife habitat	m^2 of permanent habitat impacted
Floodplain	Permanent loss to floodplain	m^2 of property required
TRANSPORTATION		
Municipal Road Impacts (temporary)	Disruptions to local residents (immediately adjacent to the structure and active transportation)	Distance in km for local traffic (sum of both directions)
Emergency Services Impact	Delays in Emergency Services that use the site during mainline closures	Total delay time (mins)
CONSTRUCTIBILITY		
Construction	Construction duration (1 crew assumed)	Average number of working days
	Complexity of constructions staging	Number of stages
	Conflict with existing utilities	Number of impacts
COST		
Capital Construction Cost	Total Capital Construction Cost	Average cost $ (millions)

5.4.1 Criteria Measurements/Utility Functions/Criteria Scores

Following the selection of the sub-factors and associated criteria/indicators, measurements of the impacts were made using existing conditions reports respecting traffic, environment, and structural conditions. These measurements were made for each alternative.

Scores were derived from numerical calculations and mathematical relationships. The score for each alternative under each of the respective criteria/indicator was based on the measured impacts, referred to as a utility function. Under each criterion/indicator, the alternative received an unweighted rating of 1, 3 or 5 based on these measurements. This function described the attractiveness of each alternative concerning the individual criteria.

The "Weighted Additive Method" of evaluation used to evaluate the alternatives identified the attractiveness, not the offensiveness of the measure. No negative values were considered. All scores were a degree of "positive", from a value of one (the least attractive alternative measure), three (neutral in comparison) and five (the most attractive measure). Most alternatives under consideration used a proportional linear relationship. This was compiled using a score sheet for each criterion/indicator that graphically depicted the two variables, the measure and the corresponding score:

- The first was the raw data or measured/modelled data that the study team had compiled with respect to each alternative. For example, this could represent an area of impact. Typically, this would be represented as the range in values for all alternatives; and
- The second variable was the score, which was the measure of the attractiveness of the alternative depicted as a score of one (the least attractive), three (neutral in comparison) and 5 (the most attractive). This process was a numerical calculation. Though not entirely linear, a range of impacts allowed the criteria to be scored, eliminating some subjectivity of scores for alternatives.

5.4.2 Weighting of Criteria

Applying the "Weighted Additive Method", weights were assigned initially to the components (e.g., Environment), then apportioned further to their corresponding factors (e.g., Wildlife & Vegetation, Property), then subfactors (e.g., impacts to wildlife and vegetation, permanent property requirements). This eliminated the potential for skewing the results with

many subfactors or criteria under one component. The assignment of weights in this fashion defined a hierarchy of importance for the alternatives considered.

The Project Team used for the weighting exercise consisted of ten (10) members from environmental, structural, drainage, traffic, transportation and construction disciplines.

The Project Team completed the weighting exercise by reviewing each independent perspective on the relative importance of categories. Following the review and discussion, the team came to a consensus and assigned weights to the components and subsequently distributed the weights to the corresponding sub-factors and criteria/indicators. The assigned weights within each category were then multiplied against the criteria scores to obtain a weighted score for the criteria/indicators for each alternative. The weighted score for the criteria/indicators was summed for each alternative. This provided the overall weighted score for each alternative to identify the recommended alternative before sensitivity testing. Tables summarizing the weighted scores and recommended alternatives (before sensitivity testing) are included as part of the *Cranberry Road Short List Evaluation Report, MP-LEA Joint Venture 2021,* found under separate cover, as listed in **Appendix I.**

This was the quantitative assessment applied to the evaluation of the short list of design alternatives. The "Weighted Additive Method" focused on the differences between the alternatives, addressed the complexity of the base data collected, and provided a traceable and defensible decision-making process.

The sub-factor assigned weights are illustrated in the graph below **(Figure 11).**

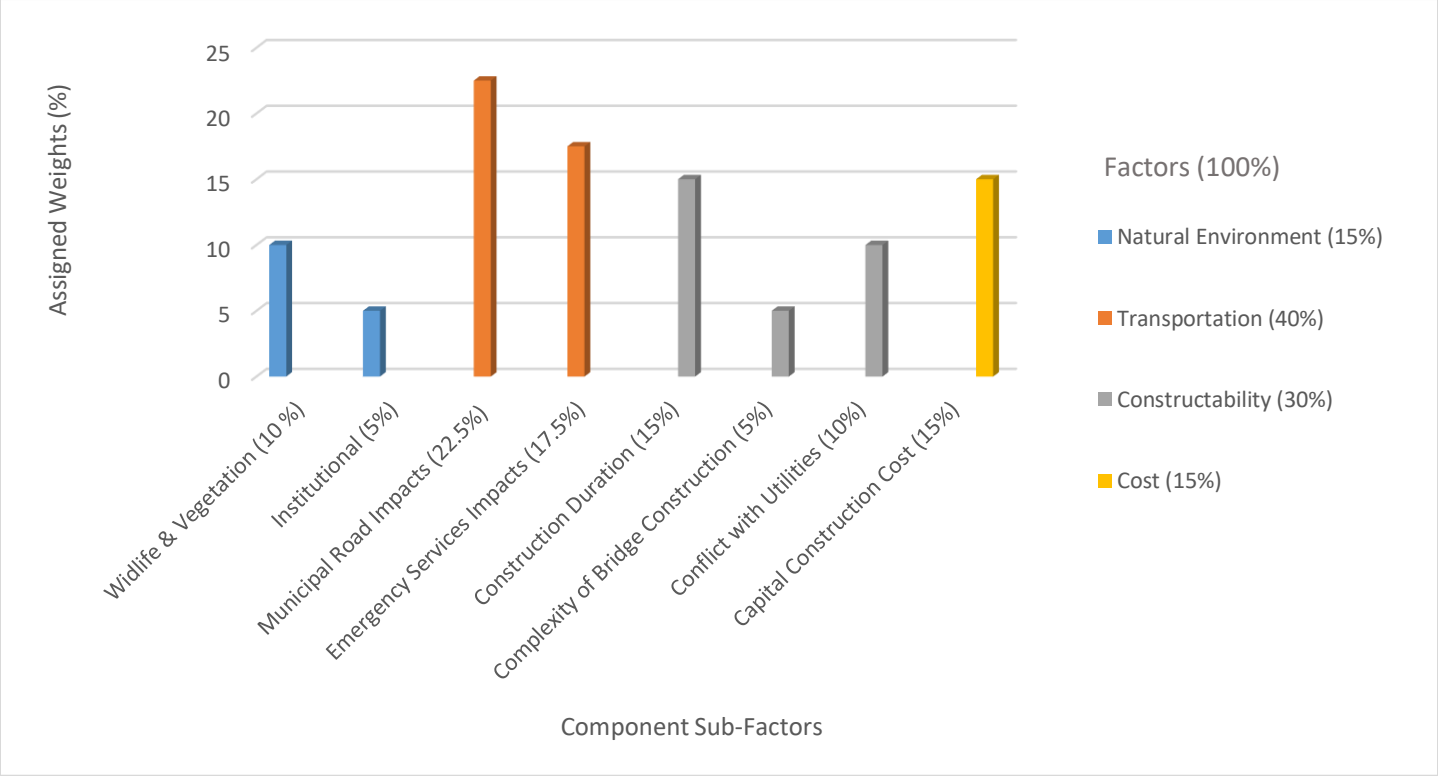


Figure 11: Sub-factor Assigned Weights Cranberry Road Bridge

5.4.3 Sensitivity Testing

The group of evaluators from the Project Team assigned individual weights for the components, factors and sub-factors based on their professional judgment. The question that arises is “would the result have changed if different weights had

been used?" To test how the outcome of the evaluation would have changed with respect to the assigned weights, a "sensitivity test" was undertaken to ensure the outcome was without bias.

To assess how sensitive the outcome was with respect to the weights assigned by the Project Team, the group increased or decreased the assigned component weights to place a greater or lesser emphasis on each component by redistributing the weight to the other factors. This indicates how sensitive the outcome is with respect to each component. It also indicates whether the recommended alternative changes when the weights are varied. A summary of the sensitivity analysis is included as part of the *Cranberry Road Short List Evaluation Report, MP-LEA Joint Venture, 2021* found under separate cover, as listed in **Appendix I.**

5.4.4 Short List Evaluation Results

The results of the weighted and sensitivity evaluation resulted in the preferred Preliminary Design alternative as **Alternative 3: Replacement on the Existing Alignment with Full Closure**. Alternative 3 was chosen over Alternative 2 (replacement on the existing alignment with staged traffic) as it has lower overall costs, a shorter construction duration, and it simplifies the construction staging which will increase worker safety.

The results of the MATS analysis showing the detailed evaluation of the shortlisted alternatives can be found in the *Cranberry Road Short List Evaluation Report, MP-LEA Joint Venture 2021* under separate cover, as listed in **Appendix I.**

6.0 THE RECOMMENDED PLAN

The Preliminary Design study was undertaken to determine the most appropriate strategy for the replacement of the Cranberry Road bridge over Highway 401.

The study concluded with the plan to replace the existing bridge with a 70m two-span (35m, 35m) NU girder bridge on the existing horizonal alignment with a 225 mm reinforced cast-in-place concrete deck slab supported by an integral abutment founded on H-piles. The bridge replacement will require approximately 250-300m of reconstruction on each side of the bridge (Victoria Street North at south side and Cranberry Road at north) to accommodate the profile raise of 0.88 m. The proposed grade raise will require an increase in the approach embankments (approximately 2m on both sides of the bridge) to maintain the platform width at the top and the existing side slope geometry.

During construction, Cranberry Road will be closed at Highway 401 and traffic will be detoured using the municipal road network. It is intended that the demolition of the existing bridge and construction of the new bridge will be completed in a single construction season. **Figure 12** provides a cross section view of the new bridge over Highway 401 and **Figure 13** provides a cross section view of the new bridge under Cranberry Road. Please see **Appendix E** for detailed drawings of the Cranberry Road bridge replacement.

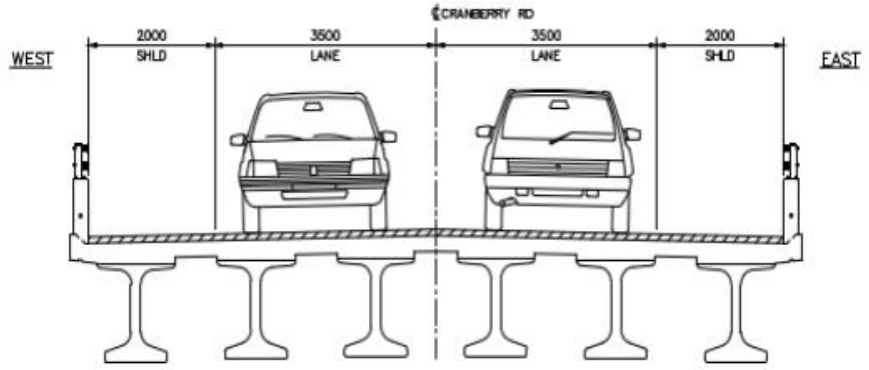


Figure 12: Cranberry Road Cross Section over Highway 401

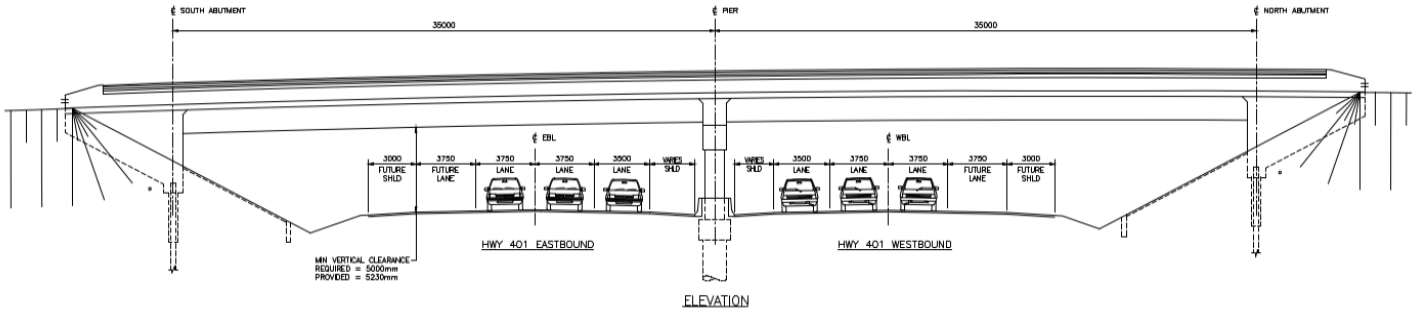


Figure 13: Highway 401 Cross Section under Cranberry Road

The Cranberry Road detour route utilizes Dale Road, County Road 2, and Jocelyn Street. Drivers can expect to travel up to an additional 7.5 km during the construction period. The Cranberry Road detour is shown in **Figure 14**.

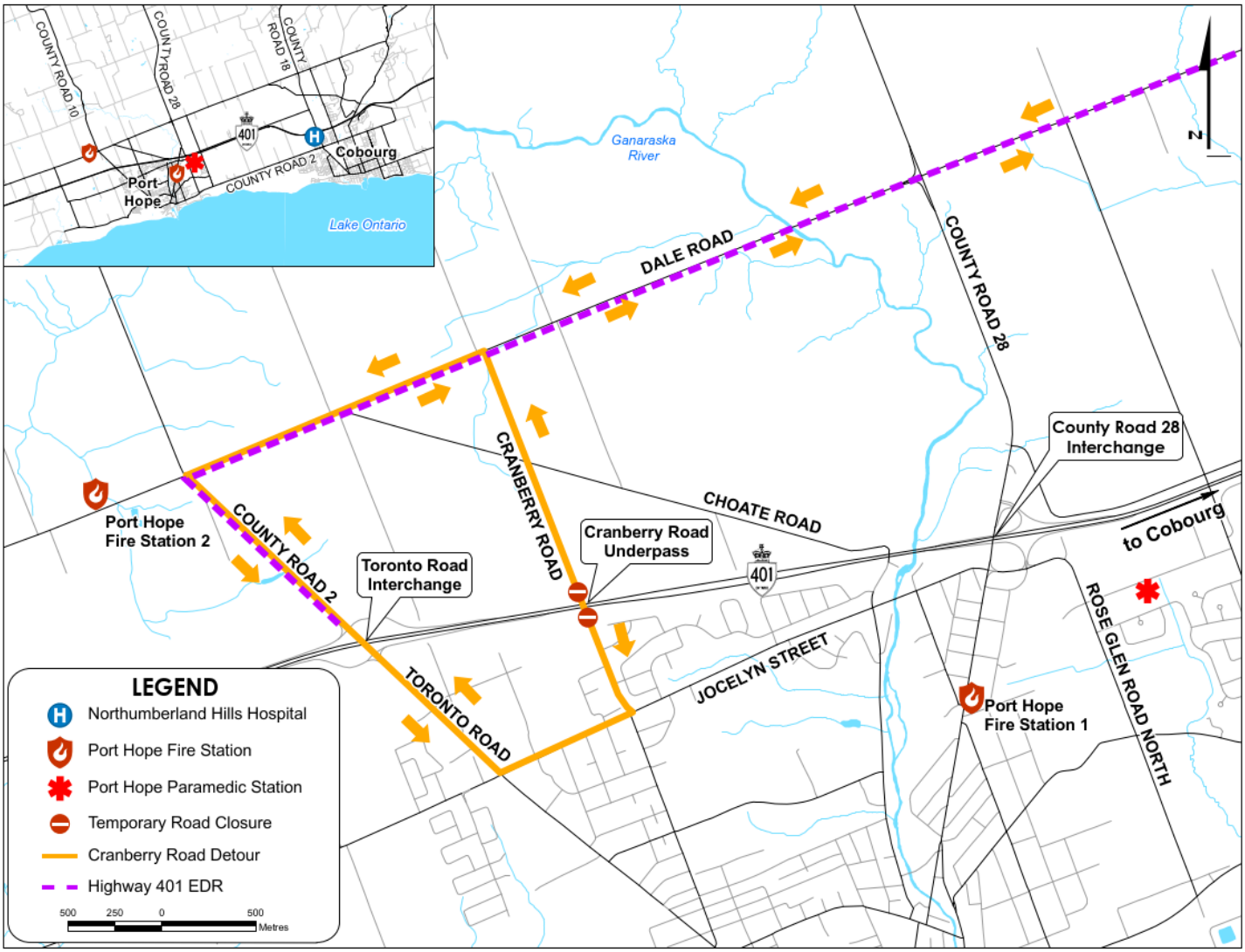


Figure 14: Cranberry Road Detour Route

Highway 401 will require two to three closures on Friday and Saturday nights during the construction of the Cranberry Road bridge. The detour route for the Highway 401 closure for the demolition and installation of the girders will involve three main roads: County Road 2, Dale Road and County Road 28, which redirects traffic onto the Emergency Detour Route (EDR). Drivers can expect to travel an additional 7km during the full closure of Highway 401. The detour route for Highway 401 is shown in **Figure 15**.

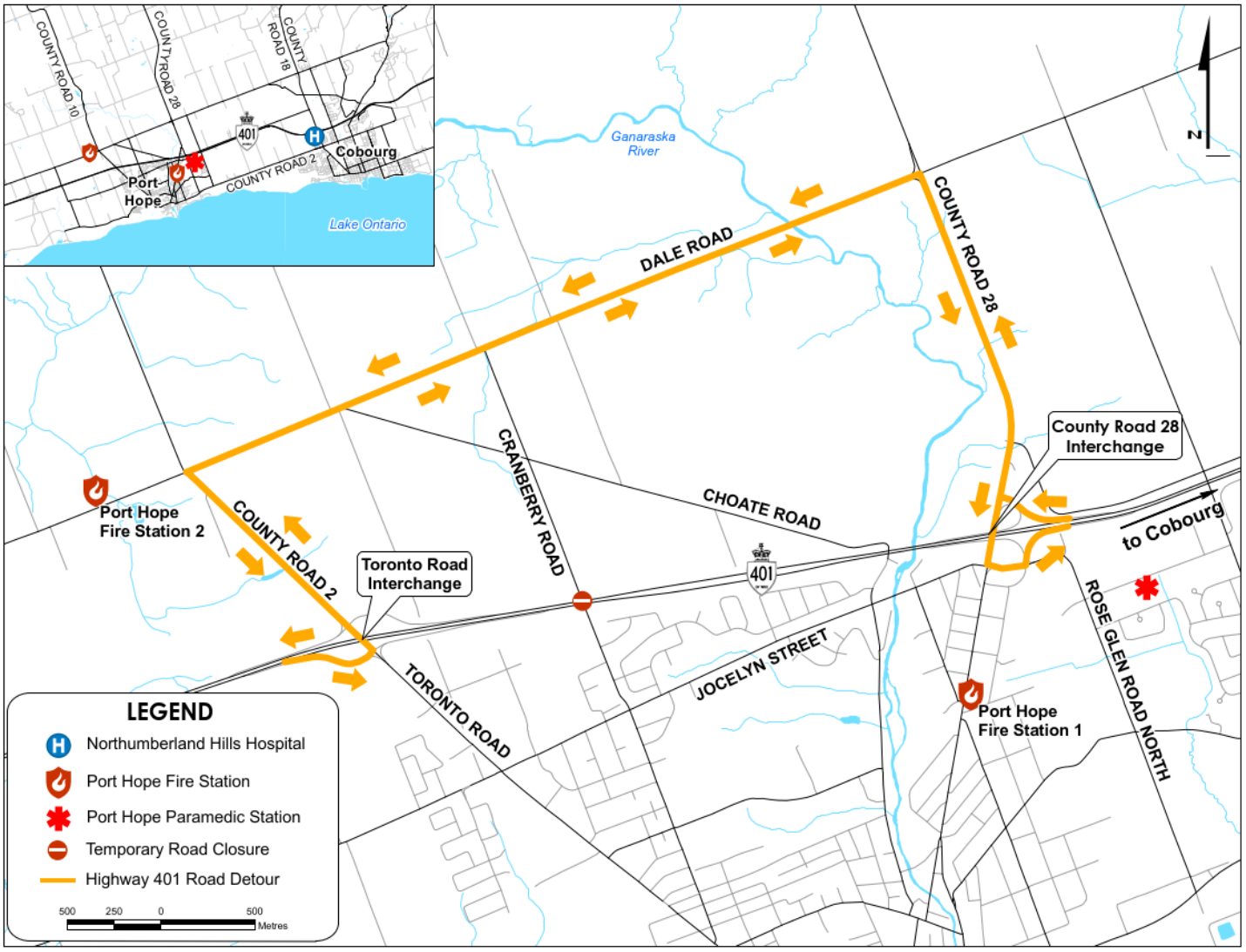


Figure 15: Highway 401 Detour Route

7.0 ANALYSIS AND EVALUATION OF CHOATE ROAD AND GANARASKA RIVER BRIDGE ALTERNATIVES

7.1 Course Screening of Alternatives

The study began with the collection of information through fieldwork and background research to determine the project requirements and assess existing conditions. The first step in the Preliminary Design process was to determine the broad alternatives for the replacement of the Choate Road bridge and Ganaraska River bridge, which were considered together due to their close proximity. A series of bridge replacement alternatives considering various span arrangements, bridge superstructure types, and alignment configurations were developed for the bridges and reviewed for feasibility.

Table 11 identifies the broad alternatives that were developed using existing site conditions, structural limitations, and traffic requirements as a guide.

Table 11: Alternatives to the Undertaking

Alternative	Description
(1) Replacement of Both Bridges	Maintain the existing Choate Road and replace both bridges at the same location. In this alternative, both structures are replaced with a larger configuration to suit traffic staging on Highway 401.
(2) Terminate Choate Road and Replace Ganaraska River bridge	Terminate Choate Road with a cul-de-sac north of Highway 401, remove the Choate Road bridge and constructed Highway 401 embankment, and replace the Ganaraska River Bridge with a longer bridge.
(3A) Realign Choate Road with a Curved Alignment	Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with one R=55m horizontal curve north and south of the crossing with a 40 km/hr design speed.
(3B) Realign Choate Road with a T-Intersection to the North	Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with a T-intersection to the north of the crossing and R=55m horizontal curve to the south.
(3C) Realign Choate Road with a T-Intersection to the South	Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with an R=55m horizontal curve north of the crossing and a T-intersection to the south.
(3D) Realign Choate Road with a Tangent Alignment	Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with two R=20m horizontal curves, one north and one south of the crossing and is perpendicular to the bridge at the crossing.

7.1.1 Alternative 1: Replacement of Both Bridges

Alternative 1 maintains the existing Choate Road Overpass and replace both bridges at the same location. In this alternative, both structures are replaced with a larger configuration to suit traffic staging on Highway 401. A structure would be constructed for Choate Road to accommodate both traffic and active transportation; and the Ganaraska River bridge would be replaced with a similar length bridge either using the existing piers or a new substructure. Alternative 1 is detailed in **Figure 16.**

This option maintains the municipal transportation corridor and active transportation over the long-term. Temporary closure of Choate Road is required to complete the replacement of the Choate Road Overpass. Given the proximity of both structures to each other and the need to access both ends of individual crossings for construction access on Highway 401, one structure would need to be replaced before proceeding with replacing the other structure. This staging constraint will result in a longer construction duration. Retaining walls would be required between both structures to avoid property acquisition from the GRCA lands to the north.

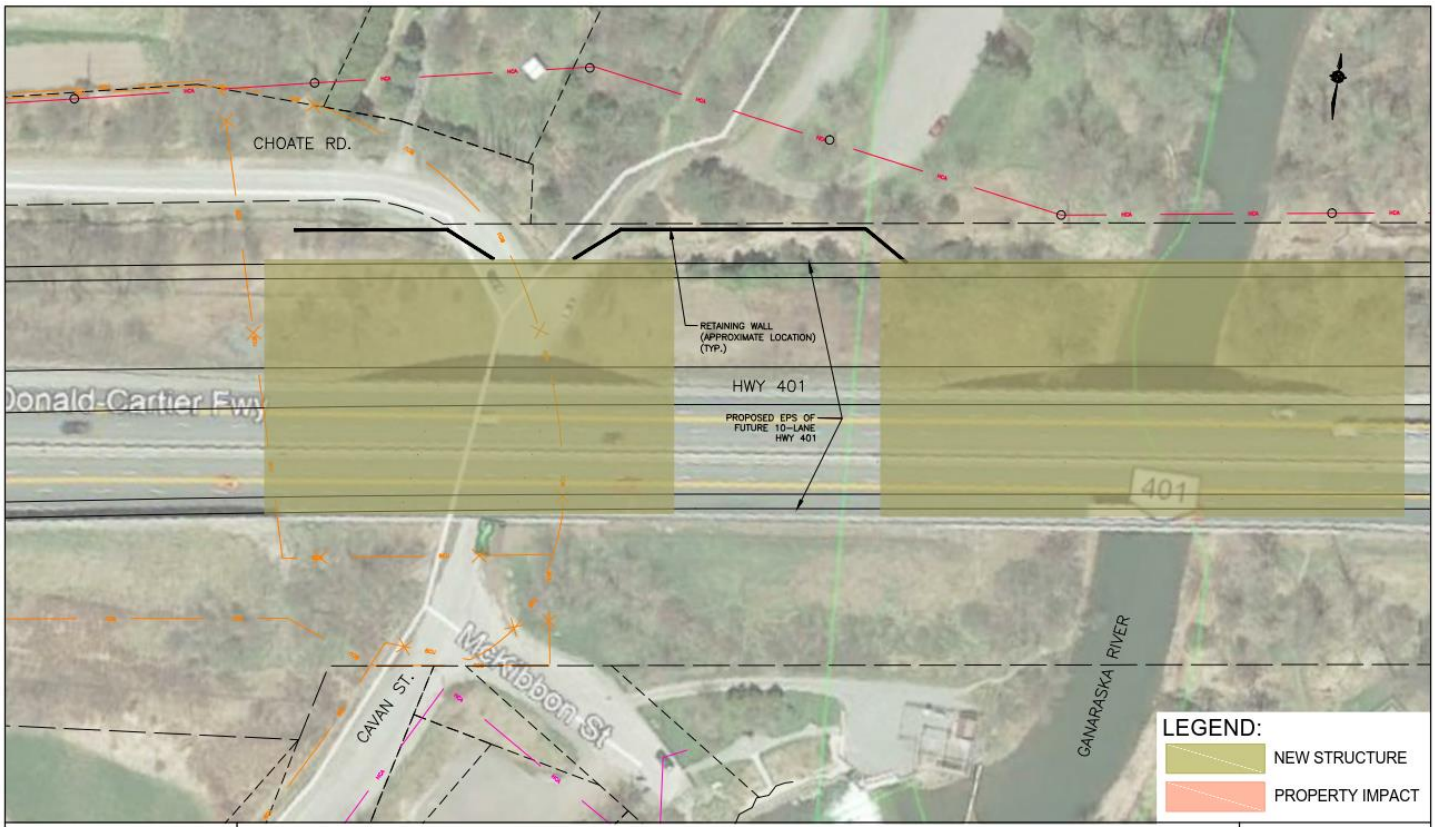


Figure 16: Choate Road and Ganaraska River bridges Alternative 1

7.1.2 Alternative 2: Terminate Choate Road and Replace the Ganaraska River Bridge

Alternative 2 involves terminating Choate Road, removing the Choate Road bridge, and replacing the Ganaraska River Bridge. In this alterative, Choate Road is terminated with a cul-de-sac north of Highway 401 and Cavan Street terminates at McKibbon Street just beside the Corbett's Dam parking lot. The Choate Road Overpass would be removed and a Highway 401 embankment constructed. The Ganaraska River bridge would be replaced with a longer bridge either using the existing piers or a new substructure. Alternative 2 is detailed in **Figure 17.**

This option eliminates the municipal transportation corridor by removing the bridge and in-filling the span with a new highway embankment. Terminating Choate Road at the Cavan Street connection will result in a five (5) minute travel time delay to approximately 40 residents on Choate Road north of Highway 401. A separate active transportation trail would be constructed under the new Ganaraska River bridge and would be maintained by the Municipality of Port Hope. A cul-de-sac would be constructed at the terminal end of Choate Road on GCRA property. A new entrance would be required off the cul-de-sac into the GRCA parking lot. Property will also be required from one private resident along the north part of Choate Road for the road allowance. A retaining wall would be required along the north side of the highway to minimize property impacts.

Construction of the highway embankment through the existing Choate Road overpass will reduce the overall construction duration and alleviate any construction access constraints to access the west side of the Ganaraska River bridge from the highway.

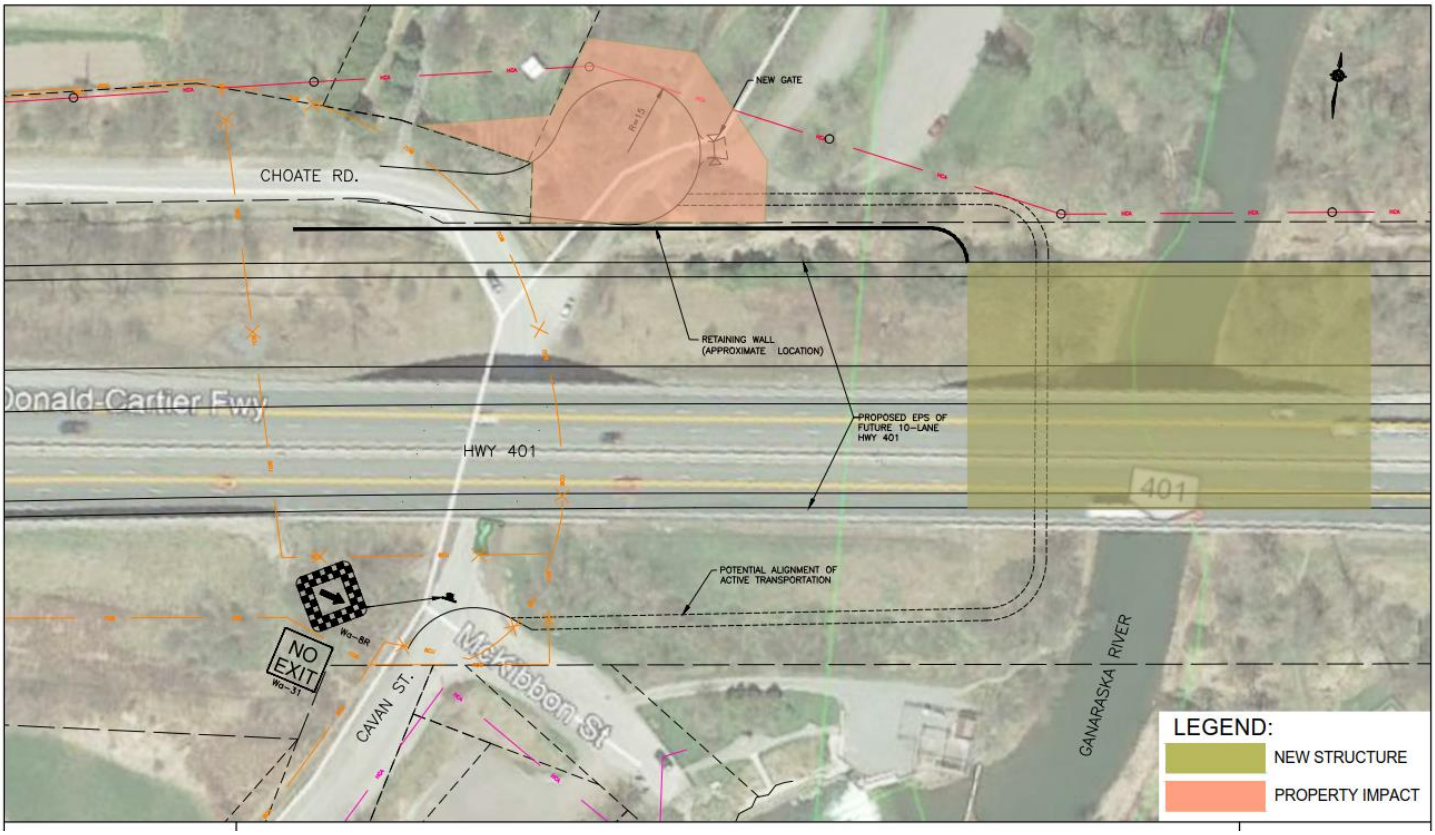


Figure 17: Choate Road and Ganaraska River bridges Alternative 2

7.1.3 Alternative 3A Realign Choate Road under the Ganaraska River Bridge

Alternatives 3A, 3B, 3C and 3D: Realign Choate Road under a new Ganaraska River Bridge. This option involves constructing a longer Ganaraska River bridge to accommodate a realignment of Choate Road under the west span of the structure. The Choate Road Overpass would be removed, and the Highway 401 embankment constructed in its place. Option 3 has four (4) sub-options (3A – D), detailed in **Figures 18 – Figure 21.**

Options 3A – 3D maintain the municipal transportation corridor by keeping Choate Road open, realigning it under the Ganaraska River bridge and in-filling the span with a new highway embankment. Under these options, Choate Road would experience a temporary full closure for the duration of construction.

Alternative 3A - Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with one R=55m horizontal curve north and south of the crossing with a 40 km/hr design speed. This recommended radius exceeds the present Choate Road radius of 31.5 m located just north of the overpass which has no historical operating or safety issues. Property would be required from the GRCA and a resident along the north side and from Crown land into Corbett's Dam along the south side. Retaining walls would be required to contain the highway embankment to preserve the alignment tie-ins to the existing road.

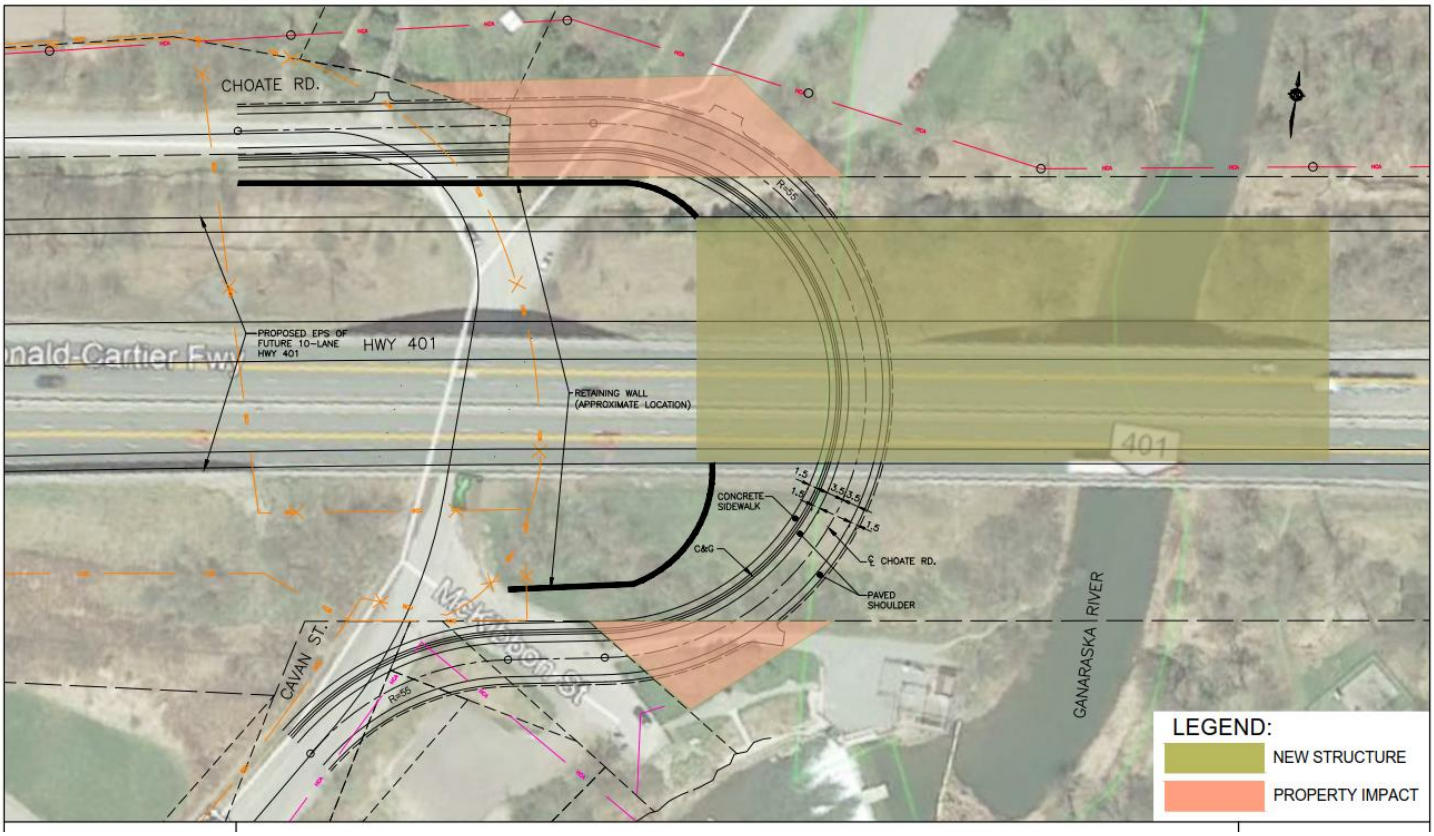


Figure 18: Choate Road and Ganaraska River bridges Alternative 3A

Alternative 3B - Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with a T-intersection to the north of the crossing and R=55m horizontal curve to the south. The recommended radius exceeds the present Choate Road radius and is considered suitable as there are no historical operating issues. Property would be required from the GRCA and resident north of the highway to construct the new alignment of Choate Road. Retaining walls would be required along the north and south sides of the highway ROW to accommodate the road realignment.

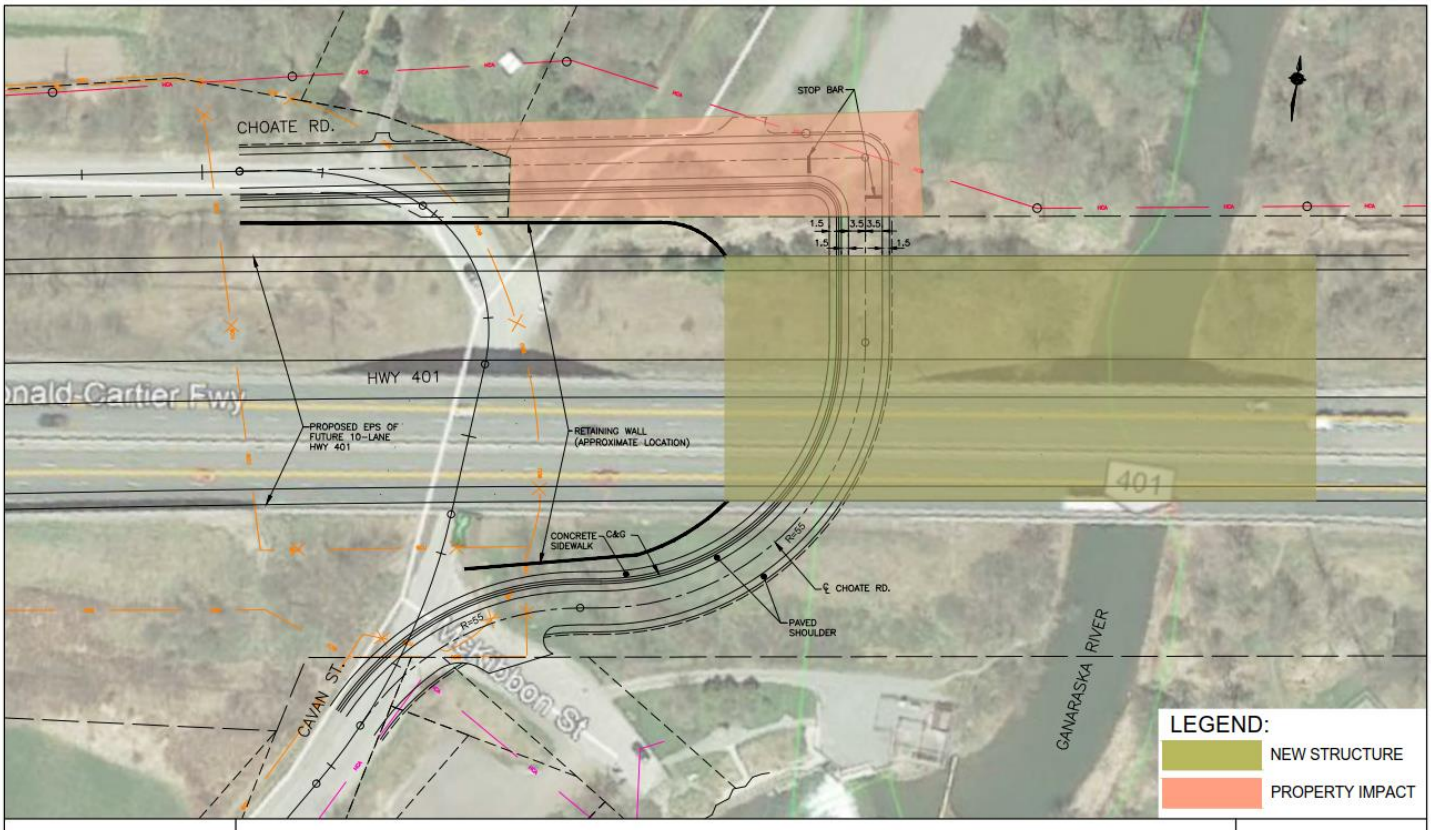


Figure 19: Choate Road and Ganaraska River bridges Alternative 3B

Alternative 3C - Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with an R=55m horizontal curve north of the crossing and a T-intersection to the south. The recommended radius exceeds the present Choate Road radius and is considered suitable as there are no historical operating issues. Property would be required from the GRCA and the resident along the north side of the ROW. Retaining walls would be required along both sides of the ROW to contain the highway embankment to accommodate the road realignment.

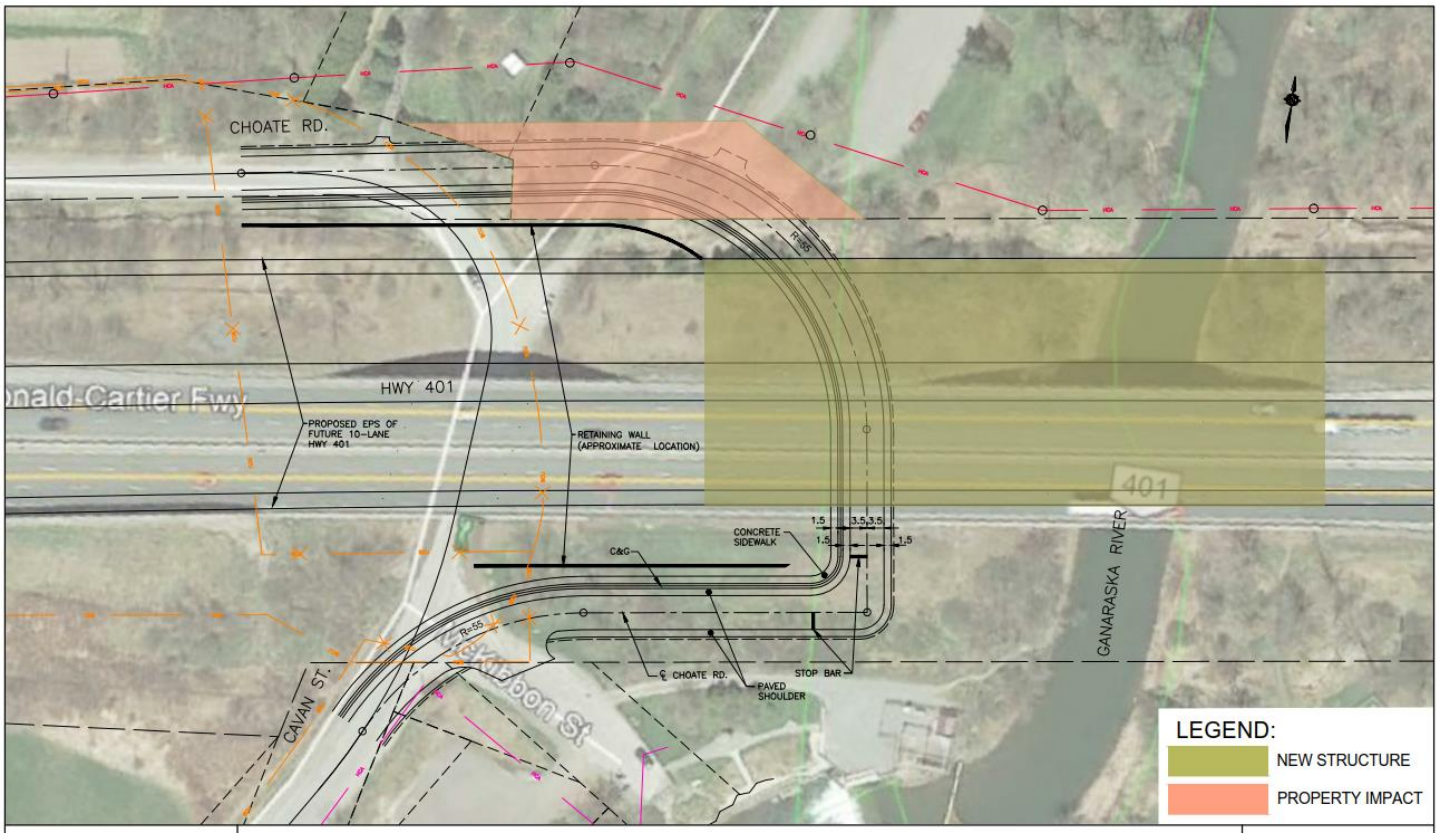


Figure 20: Choate Road and Ganaraska River bridges Alternative 3C

Alternative 3D - Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with two R=20m horizontal curves, one north and one south of the crossing and is perpendicular to the bridge at the crossing. The tighter curves at less than the existing 31.5 m curve located just north of the overpass will operate at a design speed less than 40 km/hr. This sub-option requires the shortest bridge span length due to the reduction in curve radii. Property would be required from the GRCA and the resident along the north side of the ROW. Retaining walls would be required on both sides of the ROW to contain the highway embankment and accommodate the road realignment.

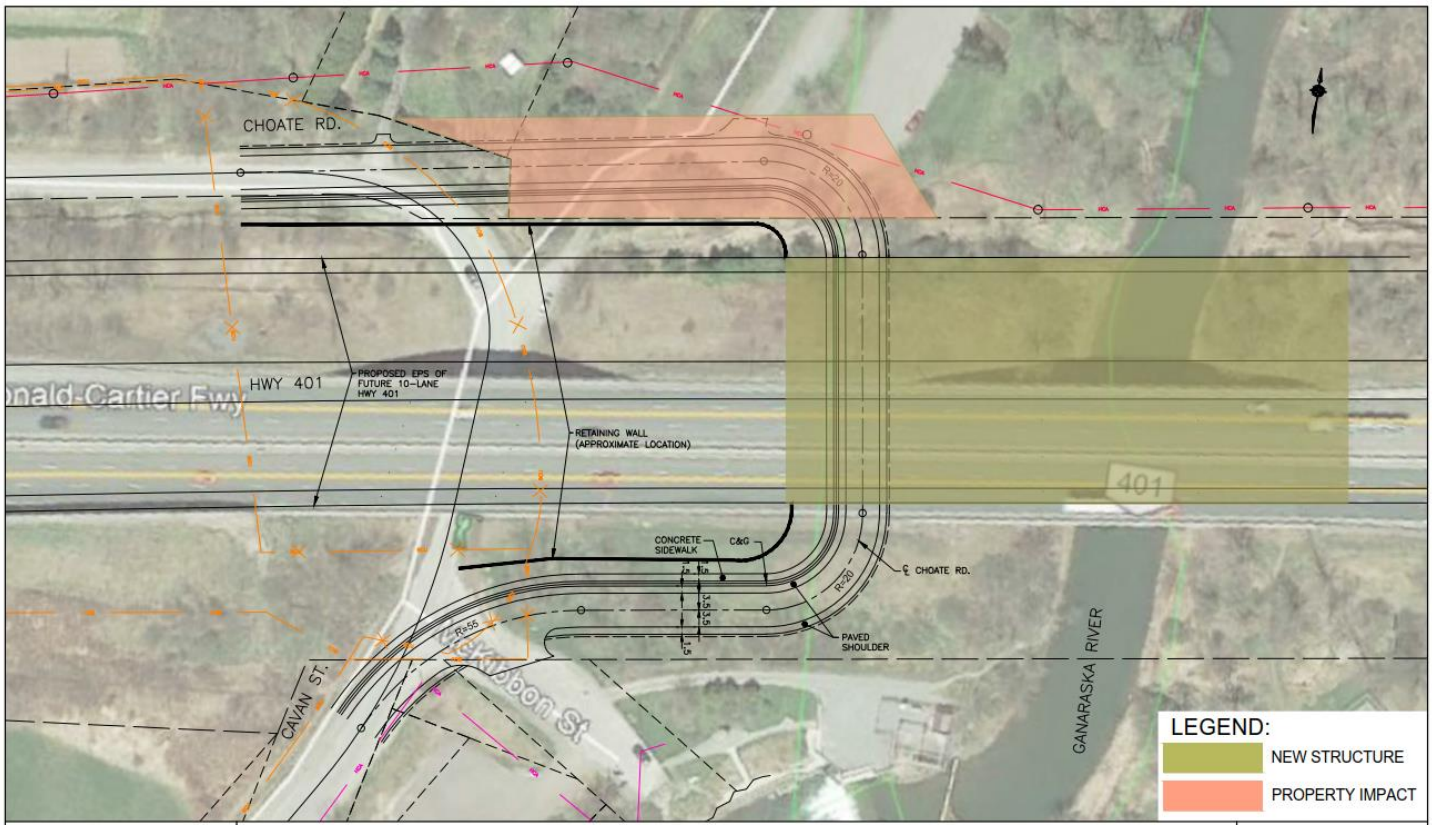


Figure 21: Choate Road and Ganaraska River bridges Alternative 3D

7.2 Screening of Alternatives: "Long List" to "Short List"

The project team, with experts in Structural Engineering, Highway Design, Traffic, Project Management, and the Environment, refined the "long list". The team developed a consensus assessment of the advantages and disadvantages and identified critical flaws in the alternatives to recommend a "short list" of alternatives. The long list alternatives were assessed and screened based on a reasoned argument approach for several factors including:

- Impacts to property outside the right-of-way;
- Impacts to the surrounding environment;
- Ability to provide vehicular access during construction;
- Increased response time for EMS;
- Roadway design speed;
- Construction cost;
- Construction duration;
- Construction complexity; and
- Impacts on utilities.

For more information regarding the long list evaluation alternatives, the *Choate Road and Ganaraska River Long List Evaluation Report, MP-LEA Joint Venture, 2021* can be found under separate cover, as listed in **Appendix I.**

The advantages and disadvantages of the six long listed alternatives are summarized in **Table 12.**

Table 12: Evaluation of the Long-Listed Alternatives				
Alternative	**Advantage**	**Disadvantage**	**Carry Forward/Set Aside**	
(1) Replacement of Both Bridges	• No permanent property requirements • Low impact to existing transportation network • Low impact to flood plain and natural environment	• High complexity construction staging and traffic delays. • High construction and maintenance cost with two (2) bridges.	✓	Maintains existing functional use of existing road network with low impacts to the flood plain and requires no property. CARRIED FORWARD
(2) Terminate Choate Road and Replace Ganaraska River bridge	• Simple construction and shorter construction schedule minimizing delays to public • Reduced construction and maintenance costs as only one structure required. • Low impact to flood plain and natural environment	• Property required from the GRCA and residents. • High impact to existing transportation network. • Impacts to the Cultural Heritage Landscape south of the bridges. • Largest impact to flood plain due to change in existing footprint	✓	Replaces one bridge with simple construction staging that will minimize delays to public on Highway 401 with low impacts to the flood plain. CARRIED FORWARD
(3A – 3D) Realigning Choate Road under the Ganaraska River	• Simple construction staging and minimizes delays to public • Low impact to current transportation network • Replacing 1 bridge only • Low impact to flood plain and natural habitat	• Permanent property required. • Retaining wall required north and south of the right-of-way. • Realignment of municipal road. • Potential impacts to the Cultural Heritage Landscape south of the bridges for access and parking. • Larger change to footprint resulting in higher impact to flood plain and natural environment.	✓	Realignment maintains existing functional use of existing road network with replacing one (1) bridge and requires simple construction staging that will minimize public delays on Highway 401 during construction. CARRIED FORWARD

7.3 Short List Alternatives

All Alternatives (1, 2, and 3A-3D) were carried forward from the long list stage and expanded upon to consider the feasibility of each option in more detail.

As discussed above, an evaluation was also completed for the Future Footprint of Highway 401 to determine the location of the future lanes when the need arises. The evaluation resulted in the Recommended Plan for the section of Highway 401 at the Choate Road and Ganaraska River bridges being shifted to the north. As such, all options reviewed for the replacement of the Choate Road and Ganaraska River bridges considered establishing the additional footprint of the new bridges entirely to the north side of Highway 401.

Table 13 summarizes the results of the refined long list evaluation and the following alternatives being carried forward to the short list stage:

Table 13: Alternatives to the Undertaking

Alternative	Description
(1) Replacement of Both Bridges	Maintain the existing Choate Road and replace both bridges at the same location. In this alternative, both structures are replaced with a larger configuration to suit traffic staging on Highway 401.
(2) Terminate Choate Road and Replace Ganaraska River bridge	Terminate Choate Road with a cul-de-sac north of Highway 401, remove the Choate Road bridge and constructed Highway 401 embankment, and replace the Ganaraska River Bridge with a longer bridge.
(3A) Realign Choate Road with a Curved Alignment	Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with one R=55m horizontal curve north and south of the crossing with a 40 km/hr design speed.
(3B) Realign Choate Road with a T-Intersection to the North	Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with a T-intersection to the north of the crossing and R=55m horizontal curve to the south.
(3C) Realign Choate Road with a T-Intersection to the South	Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with an R=55m horizontal curve north of the crossing and a T-intersection to the south.
(3D) Realign Choate Road with a Tangent Alignment	Choate Road is realigned to cross Highway 401 under Ganaraska River Bridge with two R=20m horizontal curves, one north and one south of the crossing and is perpendicular to the bridge at the crossing.

7.4 Evaluation of Short List Alternatives

The "Short List" of Preliminary Design alternatives was evaluated using the "Weighted Additive Method", described as the Multi-Attribute Trade-off System (MATS).

The evaluation process was undertaken quantitatively to identify the magnitude of adverse effects associated with the construction impacts of each alternative based on the following components:

- Environment (natural, socio-economic and cultural factors);
- Transportation (short-term and long-term impacts);
- Constructability (traffic staging and construction);
- Safety (staging shift and temporary cross-section); and
- Cost (capital).

The component categories allowed the generation of evaluation criteria relative to study-specific engineering and environmental concerns. The component categories were classified into two further sub-levels. These sub-levels included the factors (as noted above) and subfactor groups.

The final step was to measure for identifiable impacts relative to the subfactors. The result was a set of measurable criteria/indicators for each subfactor identified under the respective factor group. The relative measured effect of each criterion/indicator was defined to ensure the significance was recognized in the evaluation process.

Factors that have no recognizable measures or no measurable difference between the design alternatives were not considered during the evaluation process.

Table 14 identifies the criteria/indicators for the evaluation of short list alternatives.

Table 14: Short List Evaluation Criteria		
Factors/Sub-Factors	**Criteria/Indicator**	**Key Measures**
NATURAL ENVIRONMENT		
Wildlife & Vegetation	Impacts to Wildlife or Wildlife Habitat	m^2 of permanent habitat impacted
Floodplain	Permanent Loss to Floodplain	Width of opening
SOCIAL/ECONOMIC ENVIRONMENT		
Property	Permanent property requirements	m^2 of property required (m^2 of private land, recreational land and potential Cultural Heritage Landscape)
	Temporary Property Requirements	m^2 of property required
TRANSPORTATION		
Highway 401 Impacts	Disruptions to mainline Highway 401 Traffic	Vehicle Hours (sum of delay during peak hours for duration of construction)
Municipal Road Impacts (Choate Road Closure/Realignment)	Increased travel time for Paramedics and Fire (due to permanent closure of Choate Road)	Vehicle-hours (sum of total network delay of the a.m. and p.m. peak hours)
	Permanent out of way travel to local resident traffic (due to permanent closure of Choate Road at 401)	Distance in km for local traffic (from north side of 401)
	Temporary disruptions to network traffic due to Choate Road closure during construction (vehicle hours)	Time (km)
Choate Road Design Speed	Choate Road Design Speed	Design Speed
CONSTRUCTIBILITY		
Construction	Construction duration (1 crew assumed)	Average # of working days
	Conflict with existing utilities	# of impacts
	Complexity of Bridge Construction	Intricacy of staging the bridge construction
COST		
Capital Construction Cost	Total capital construction cost	Average cost $ (Millions) includes structural, grading and staging
Life Cycle Costs	Maintenance needs	Superstructure deck area and exposed substructure area (m2)

7.4.1 Criteria Measurements/Utility Functions/Criteria Scores

Following the selection of the sub-factors and associated criteria/indicators, measurements of the impacts were made using existing conditions reports respecting traffic, environment, and structural conditions. These measurements were made for each alternative.

Scores were derived from numerical calculations and mathematical relationships. The score for each alternative under each of the respective criteria/indicator was based on the measured impacts, referred to as a utility function. Under each criterion/indicator, the alternative received an unweighted rating of 1, 3 or 5 based on these measurements. This function described the attractiveness of each alternative concerning the individual criteria.

The "Weighted Additive Method" of evaluation used to evaluate the alternatives identified the attractiveness, not the offensiveness of the measure. No negative values were considered. All scores were a degree of "positive", from a value of one (the least attractive alternative measure), three (neutral in comparison) and five (the most attractive measure). Most alternatives under consideration used a proportional linear relationship. This was compiled using a score sheet for each criterion/indicator that graphically depicted the two variables, the measure, and the corresponding score:

- The first was the raw data or measured/modelled data that the study team had compiled with respect to each alternative. For example, this could represent an area of impact. Typically, this would be represented as the range in values for all alternatives; and

- The second variable was the score, which was the measure of the attractiveness of the alternative depicted as a score of one (the least attractive), three (neutral in comparison) and 5 (the most attractive). This process was a numerical calculation. Though not entirely linear, a range of impacts allowed the criteria to be scored, eliminating some subjectivity of scores for alternatives.

7.4.2 Weighting of Criteria

Applying the "Weighted Additive Method", weights were assigned initially to the components (e.g., Environment), then apportioned further to their corresponding factors (e.g., Wildlife & Vegetation, Property), then subfactors (e.g. impacts to wildlife and vegetation, permanent property requirements). This eliminated the potential for skewing the results with many subfactors or criteria under one component. The assignment of weights in this fashion defined a hierarchy of importance for the alternatives considered.

The Project Team used for the weighting exercise consisted of ten (10) members from environmental, structural, drainage, traffic, transportation, and construction disciplines.

The Project Team completed the weighting exercise by reviewing each independent perspective on the relative importance of categories. Following the review and discussion, the team came to a consensus and assigned weights to the components and subsequently distributed the weights to the corresponding sub-factors and criteria/indicators. The assigned weights within each category were then multiplied against the criteria scores to obtain a weighted score for the criteria/indicators for each alternative. The weighted score for the criteria/indicators was summed for each alternative. This provided the overall weighted score for each alternative to identify the recommended alternative before sensitivity testing. Tables summarizing the weighted scores and recommended alternatives (before sensitivity testing) are included as part of the *Choate Road and Ganaraska River Short List Evaluation Report, MP-LEA Joint Venture, 2021* found under separate cover, as listed in **Appendix I.**

This was the quantitative assessment applied to the evaluation of the short list of design alternatives. The "Weighted Additive Method" focused on the differences between the alternatives, addressed the complexity of the base data collected, and provided a traceable and defensible decision-making process.

The sub-factor assigned weights are illustrated in the graph below **(Figure 22).**

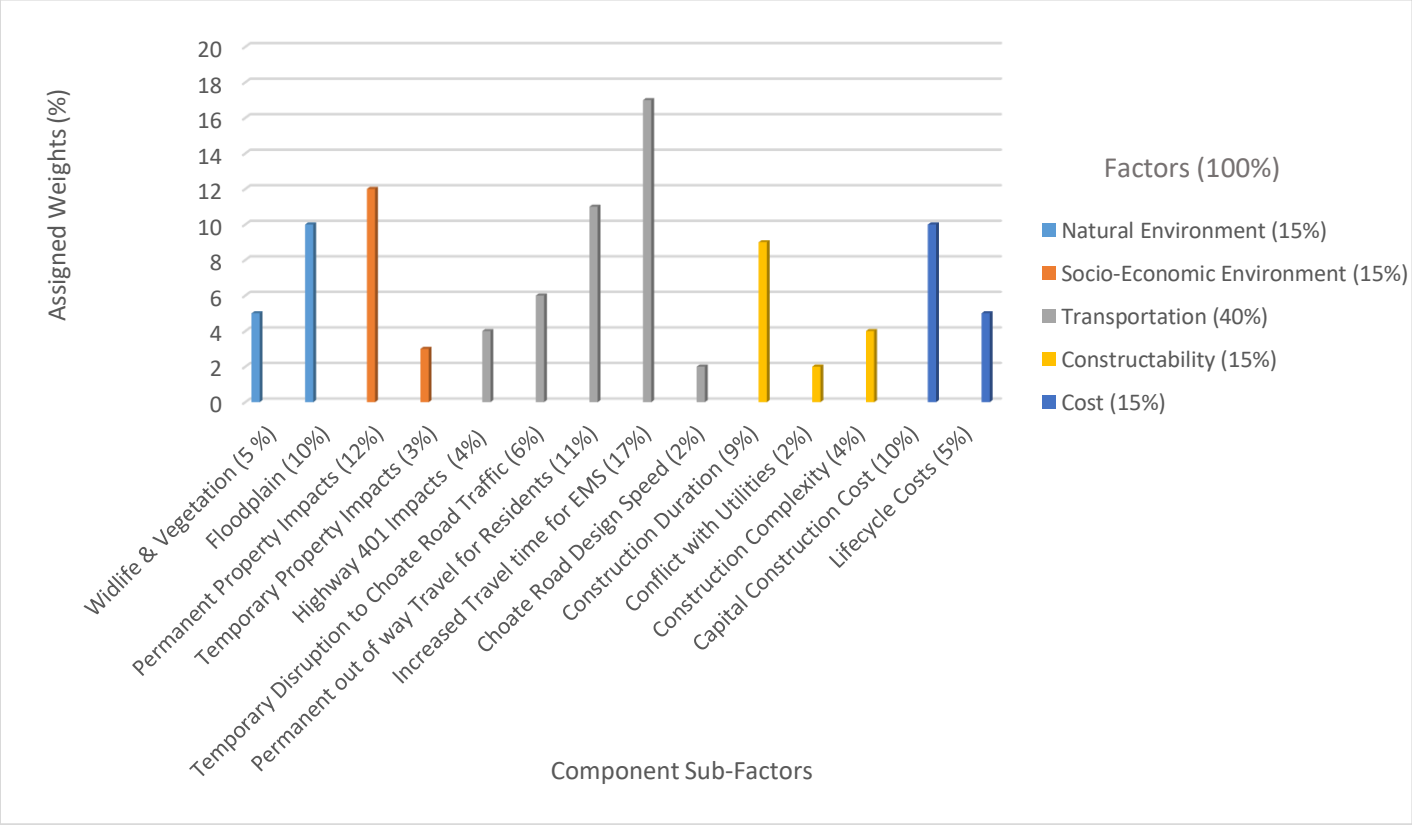


Figure 22: Sub-factor Assigned Weights Choate Road and Ganaraska River Bridge

7.4.3 Sensitivity Testing

The group of evaluators from the Project Team assigned individual weights for the components, factors and sub-factors based on their professional judgment. The question that arises is "would the result have changed if different weights had been used?" To test how the outcome of the evaluation would have changed with respect to the assigned weights, a "sensitivity test" was undertaken to ensure the outcome was without bias.

To assess how sensitive the outcome was with respect to the weights assigned by the Project Team, the group increased or decreased the assigned component weights to place a greater or lesser emphasis on each component by redistributing the weight to the other factors. This indicates how sensitive the outcome is with respect to each component. It also indicates whether the recommended alternative changes when the weights are varied. A summary of the sensitivity analysis is included as part of the *Choate Road and Ganaraska River Short List Evaluation Report, MP-LEA Joint Venture, 2021* found under separate cover, as listed in **Appendix I.**

7.4.4 Short List Evaluation Results

The results of the weighted and sensitivity evaluation resulted in the preferred Preliminary Design alternative as **Alternative 1: Replacement of both bridges**. Alternative 1 was chosen over Alternative 2 (terminate Choate Road and replace the Ganaraska River bridge) and 3A-3D (realign Choate Road under the Ganaraska River Bridge) as it maintains the existing functional use of existing road network with low impacts to the flood plain and requires no property.

The results of the MATS analysis showing the detailed evaluation of the shortlisted alternatives can be found in the *Choate Road and Ganaraska River Short List Evaluation Report*, *MP-LEA Joint Venture, 2021* under separate cover, as listed in **Appendix I.**

8.0 THE RECOMMENDED PLAN

The Preliminary Design study was undertaken to determine the most appropriate strategy for the replacement of the Choate Road and Ganaraska River bridges over Highway 401.The study concluded with the plan to replace both bridges in the same location.

The Choate Road bridge will be replaced with a single span 45m structure consisting of twenty-one (21) precast prestressed NU2000 girders with a 225 mm composite deck slab supported by semi-integral abutments founded on H-piles. The new bridge will be long enough to accommodate the larger cross-section of Choate Road underneath the structure, which will include a new 2.0m multi-use pathway, and wide enough to accommodate the future 8-10 laning of Highway 401. **Figure 23** provides a cross section view of the new bridge under Highway 401 and **Figure 24** provides a cross section view of the new bridge over Choate Road. See **Appendix F** for detailed drawings of the Choate Road bridge replacement.

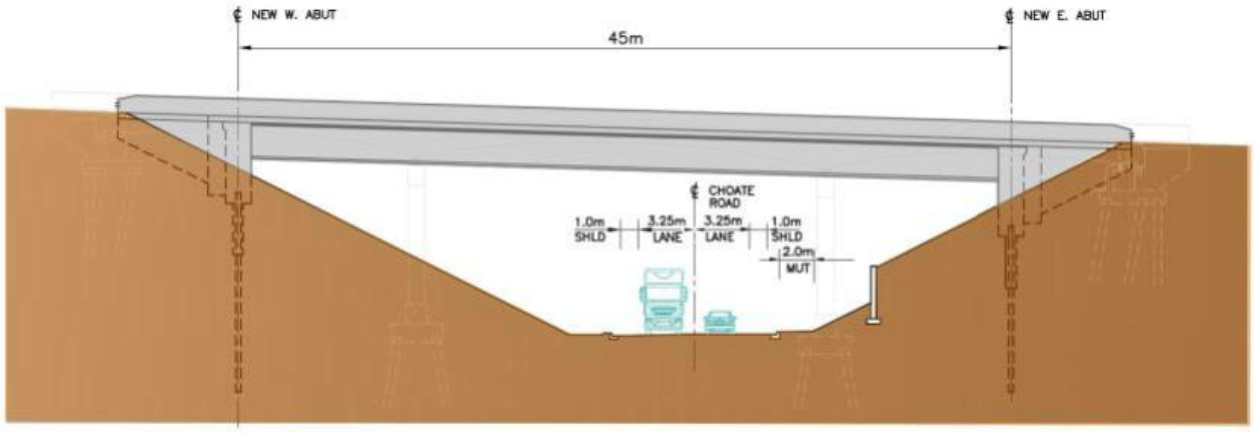


Figure 23: Highway 401 Cross Section under Highway 401

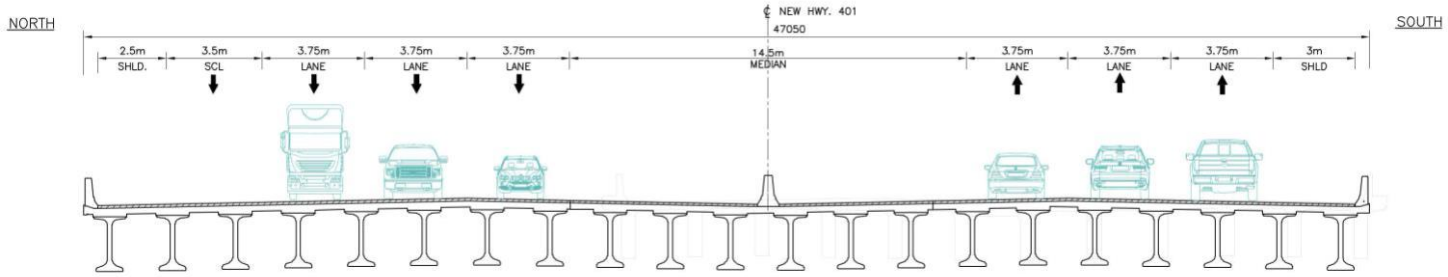


Figure 24: Highway 401 Cross Section over Choate Road

The Ganaraska River bridge will be replaced with a three span 85m structure with span 1 and 3 being 22m long and span 2 being 41m long. The new structure will consist of fifteen (15) structural steel plate I-girders with a 225mm composite deck slab supported by integral abutments founded on H-Piles and pier on caisson piles. The new bridge will be built wide enough to accommodate the future 8-10 laning of Highway 401. **Figure 25** provides a cross section view of the Ganaraska River under Highway 401 and **Figure 26** provides a cross section view of the new bridge over the Ganaraska River. See **Appendix G** for detailed drawings of the Ganaraska River bridge replacement.

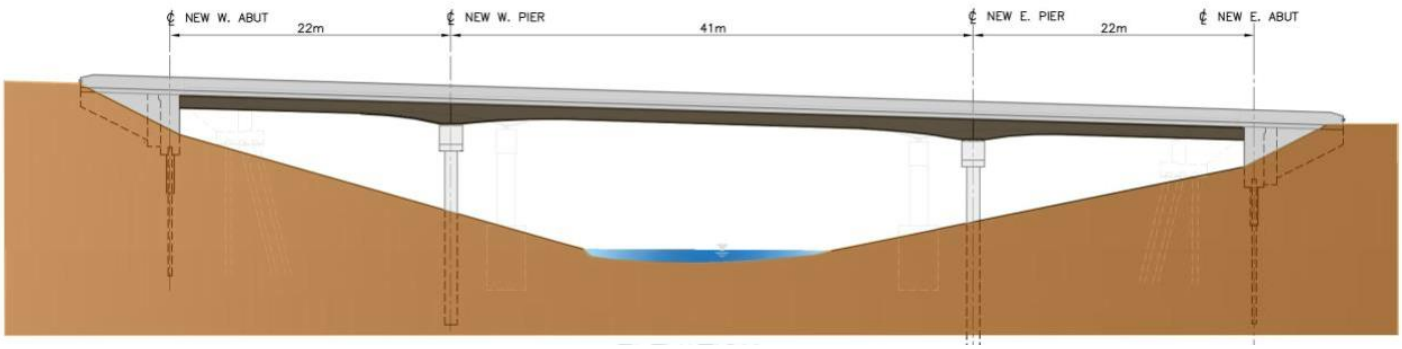


Figure 25: Ganaraska River Cross Section under Highway 401

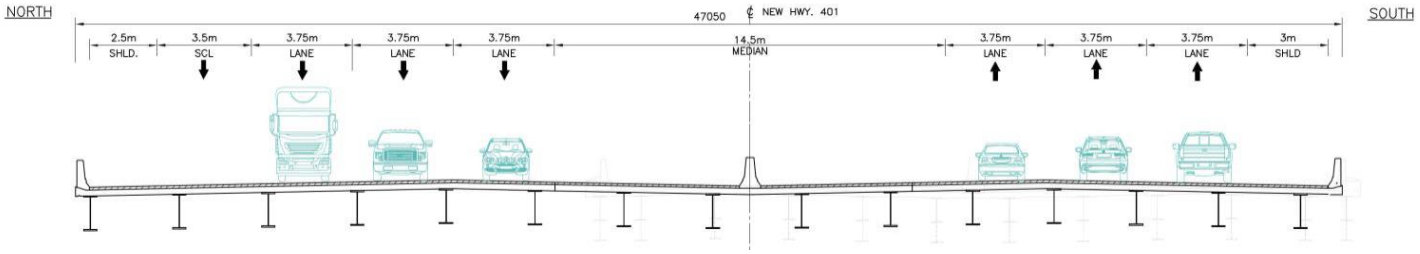


Figure 26: Highway 401 Cross Section over Ganaraska River

The installation of retaining walls is required to facilitate the design of both bridges to reduce the bridge span width. There will be a retaining wall that is approximately 2.8m high and 65m long required adjacent the bridges on the north side of the westbound lanes of Highway 401 which curves underneath the Choate Road bridge on the east side and terminates approximately 7m beyond the south edge of the Choate Road bridge. Another 200m long and approximately 6.0m high retaining wall is required west of the Choate Road bridge running parallel to Highway 401 westbound. This retaining wall curves underneath the Choate Road bridge and terminates approximately halfway under the bridge. A third 100m long retaining wall that is approximately 3.0m high is also required east of the Ganaraska River. **Figure 27** illustrates the retaining wall locations required at the Choate Road and Ganaraska River bridges.

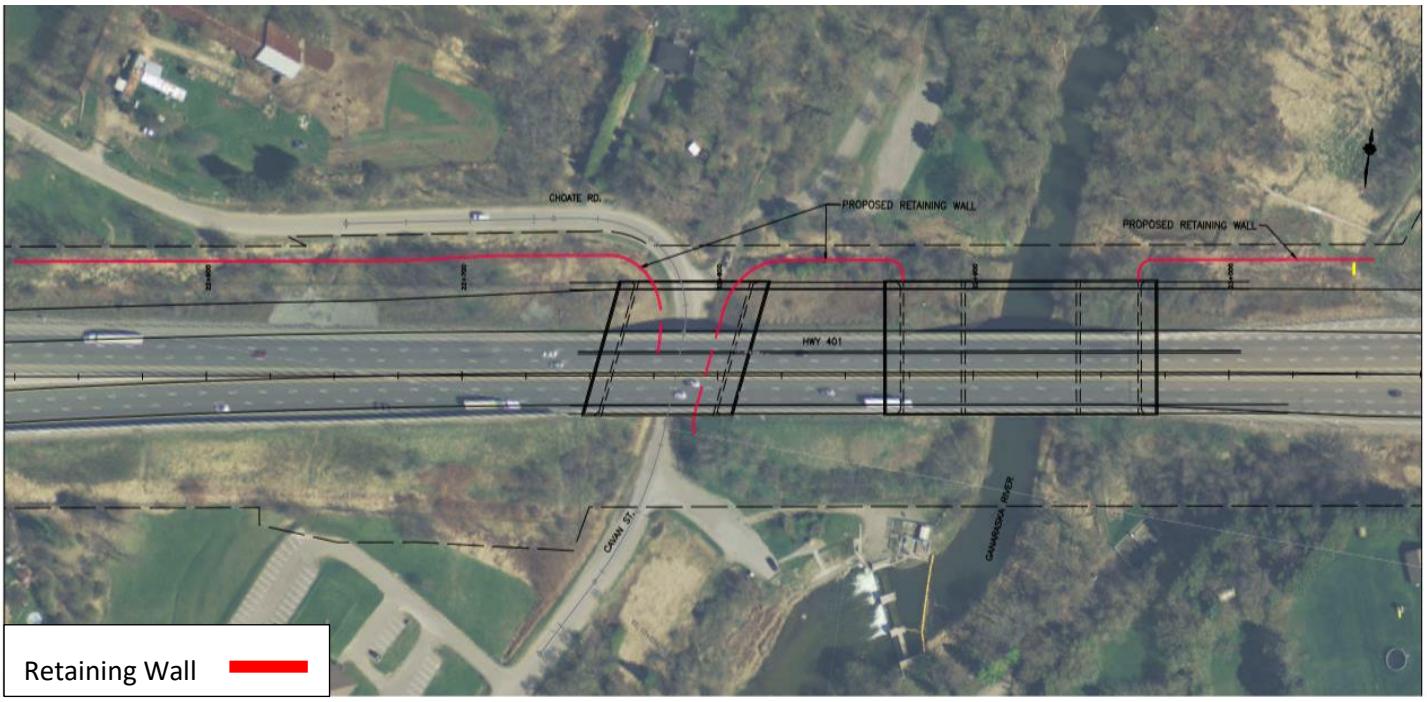


Figure 27: Retaining Walls at Choate Road and Ganaraska River Bridges

During construction, the westbound lanes of Highway 401 will be shifted to the north in a three-stage approach that will facilitate the construction staging of the bridge replacements. In the first stage, shifting to the north at both structures is to be completed simultaneously while all lanes of traffic are maintained on the existing bridges. Cranes for erecting the girder will be accessed through Choate Road below and located on the embankment that would enable both structures to be constructed simultaneously. The second stage will involve shifting the westbound lanes to the new section, and having the existing north portions removed and the new middle portions constructed. During this stage, the construction of the two bridges would need to be sequenced one after the other to provide construction access to the area between the two bridges. For the third stage, eastbound traffic would be shifted onto the new middle portions, and replacement of the remaining south portion could be carried out simultaneously at both structures, like Stage 1, as shown in **Figure 28.** This will allow three lanes of eastbound traffic and three lanes of westbound traffic to be maintained on Highway 401 throughout construction, with temporary, short duration single lane closures on either westbound or eastbound lanes required to unload the bridge girders. Due to the proximity of the bridges and the anticipated constraints regarding construction timing and access, the work on the structures, except for the Stage 1 work, will be completed non-concurrently. Detailed drawings of the three-stage construction staging approach for the Choate Road and Ganaraska River bridge replacements can be found in **Appendix F.**

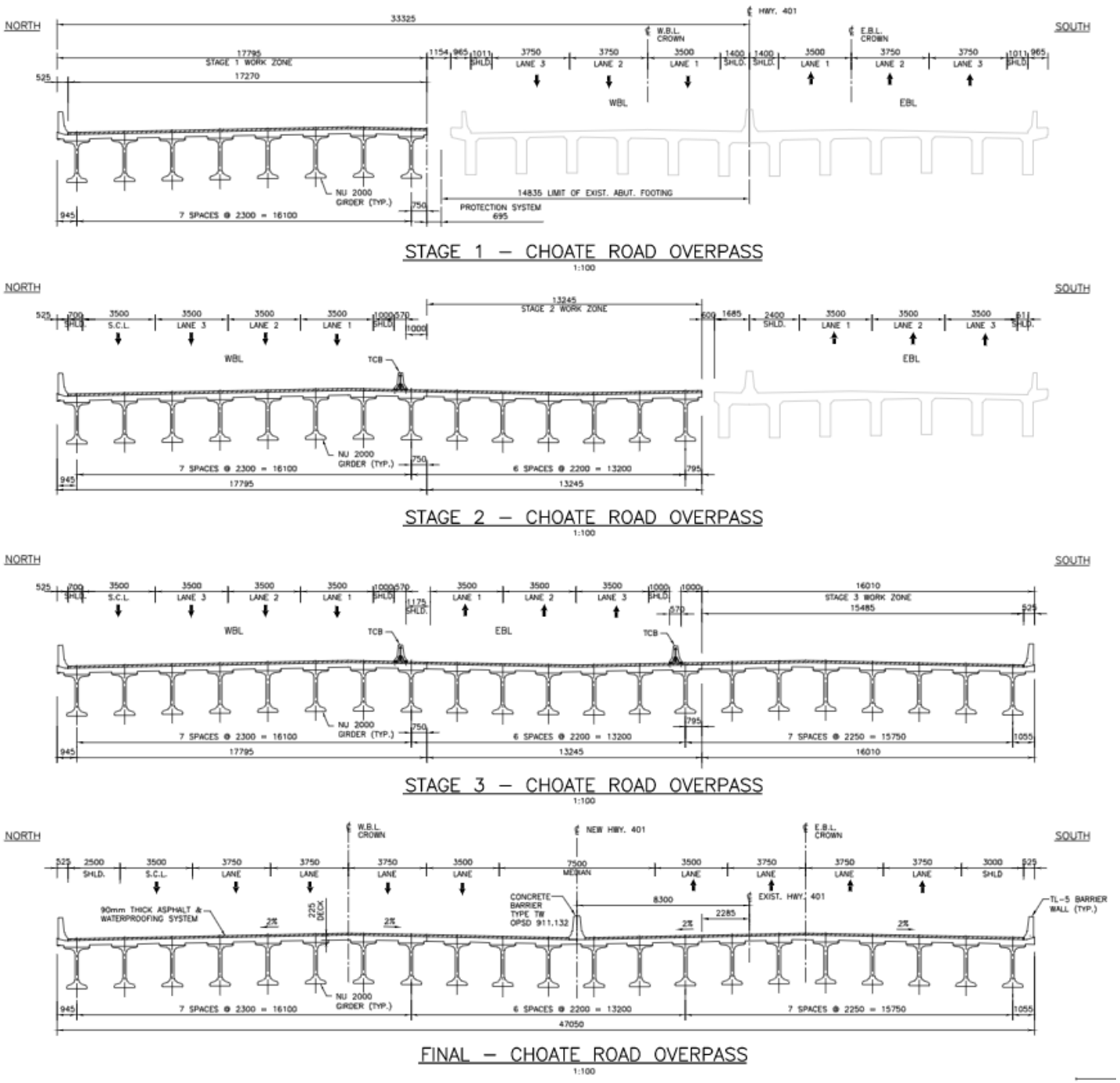


Figure 28: Three Stage Construction Staging Approach

To facilitate the lane shifts, relocation of the westbound on-ramp at the County Road 28 interchange to the north span of the County Road 28 bridge is required. A drawing of the relocation is shown in **Figure 29**. Additionally, private property will be required to facilitate the lane shifts on properties north of Highway 401 along Choate Road and Sleeman Drive. A rendering of the property required to facilitate the lane shifts is shown is **Figure 30.**

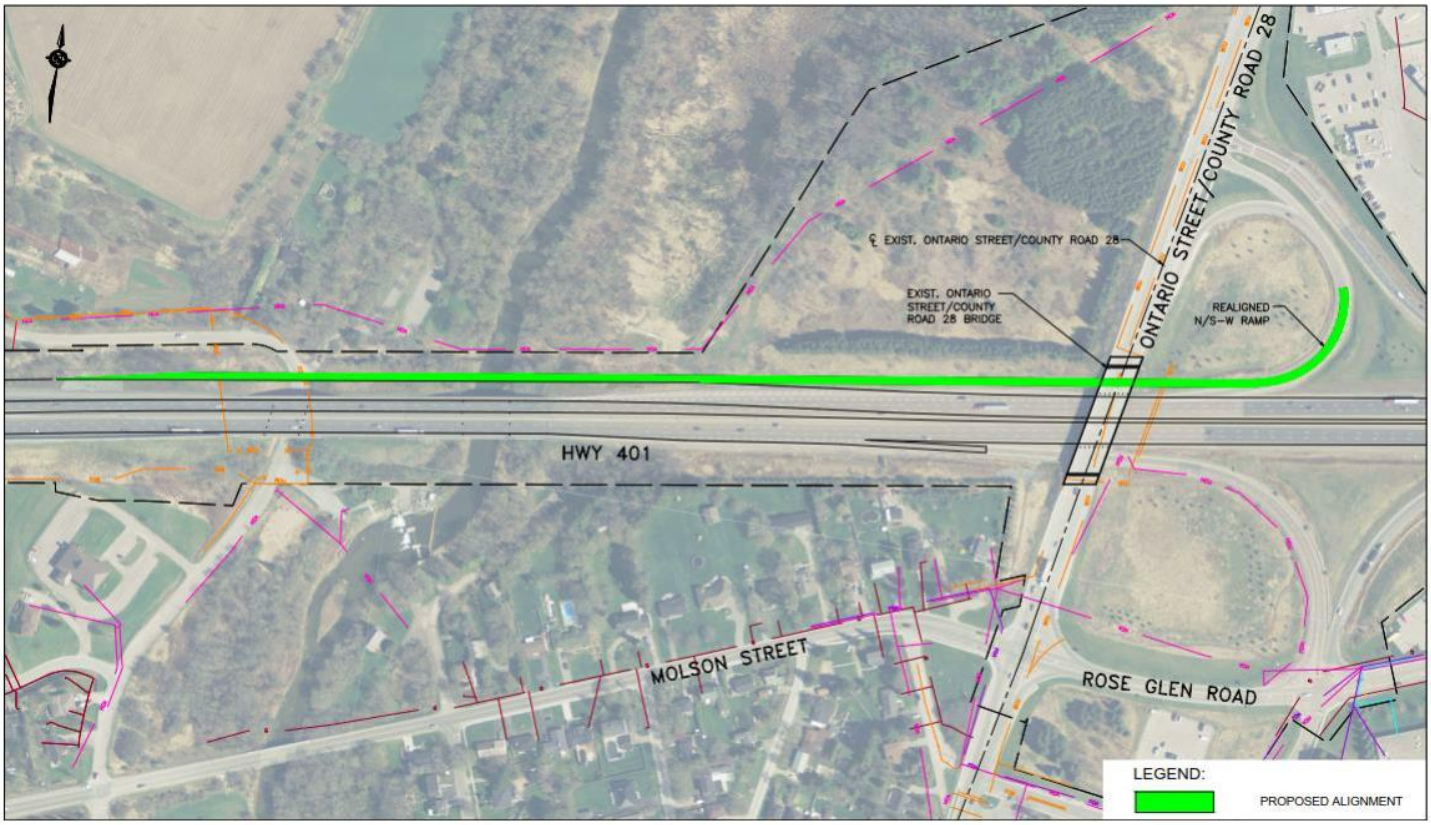


Figure 29: Relocation of the Westbound On-ramp at County Road 28

Figure 30: Property Requirements north of Highway 401

While traffic flow will be maintained on Highway 401 during the bridge replacements, full closures of Choate Road will be required during portions of the construction period. During the closures, traffic will be diverted to Cranberry Road and vehicles travelling east of Ontario Street may divert to Dale Road and then to Ontario Street. This will impact the residents living on Choate Road and will result in an additional 4.5km of travel distance. The Choate Road detour is shown in **Figure 31**.

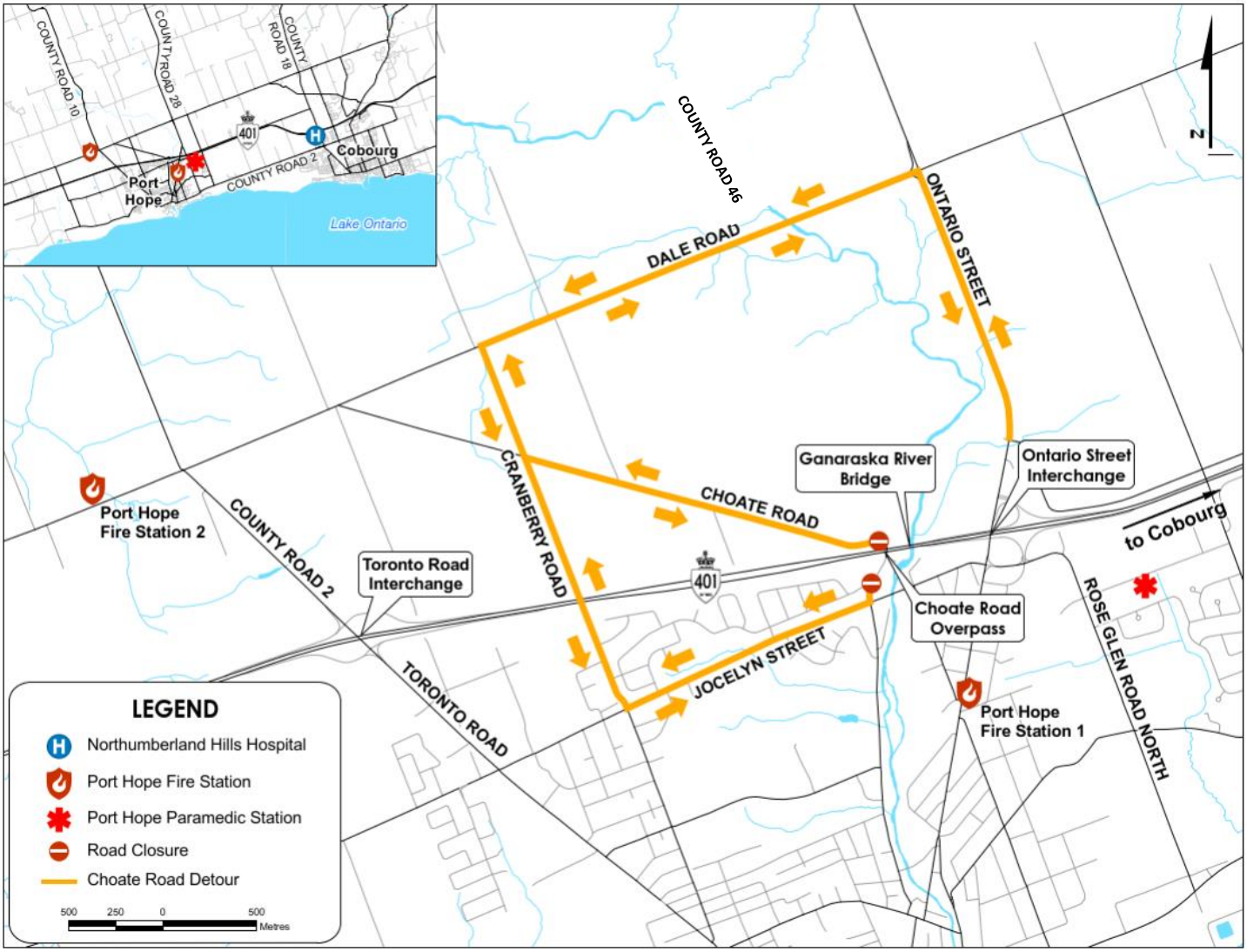


Figure 31: Choate Road Detour Route

9.0 ANALYSIS AND EVALUATION OF HIGHWAY 401 FUTURE FOOTPRINT

9.1 Course Screening of Alternatives

Determining the Recommended Plan for the Highway 401 Future Footprint was a key step in the process to guide the development of the Recommended Plan for the Cranberry Road, Choate Road and Ganaraska River bridges. While the current study is primarily focused on the replacement of the bridges in the study area, replacement bridges are designed with a 75-year lifespan so it is prudent to consider the future highway needs that may arise and what space may be needed to ensure the new structures can be maintained over their lifespan, including how traffic will be managed during both structure construction and maintenance. In addition, there is benefit in understanding what the future highway footprint may be to appropriately evaluate elements such as material movement/placement, environmental impacts, utility relocations, and property impacts.

As a result, the first step in the Preliminary Design process was to determine the broad alternatives for the Future Footprint of Highway 401. A series of highway future footprint alternatives considering various alignment configurations were developed for the Highway 401 Future Footprint to eight lanes, which was sub-divided into three (3) separate segments based on the changing median conditions throughout the corridor **(Figure 32).**

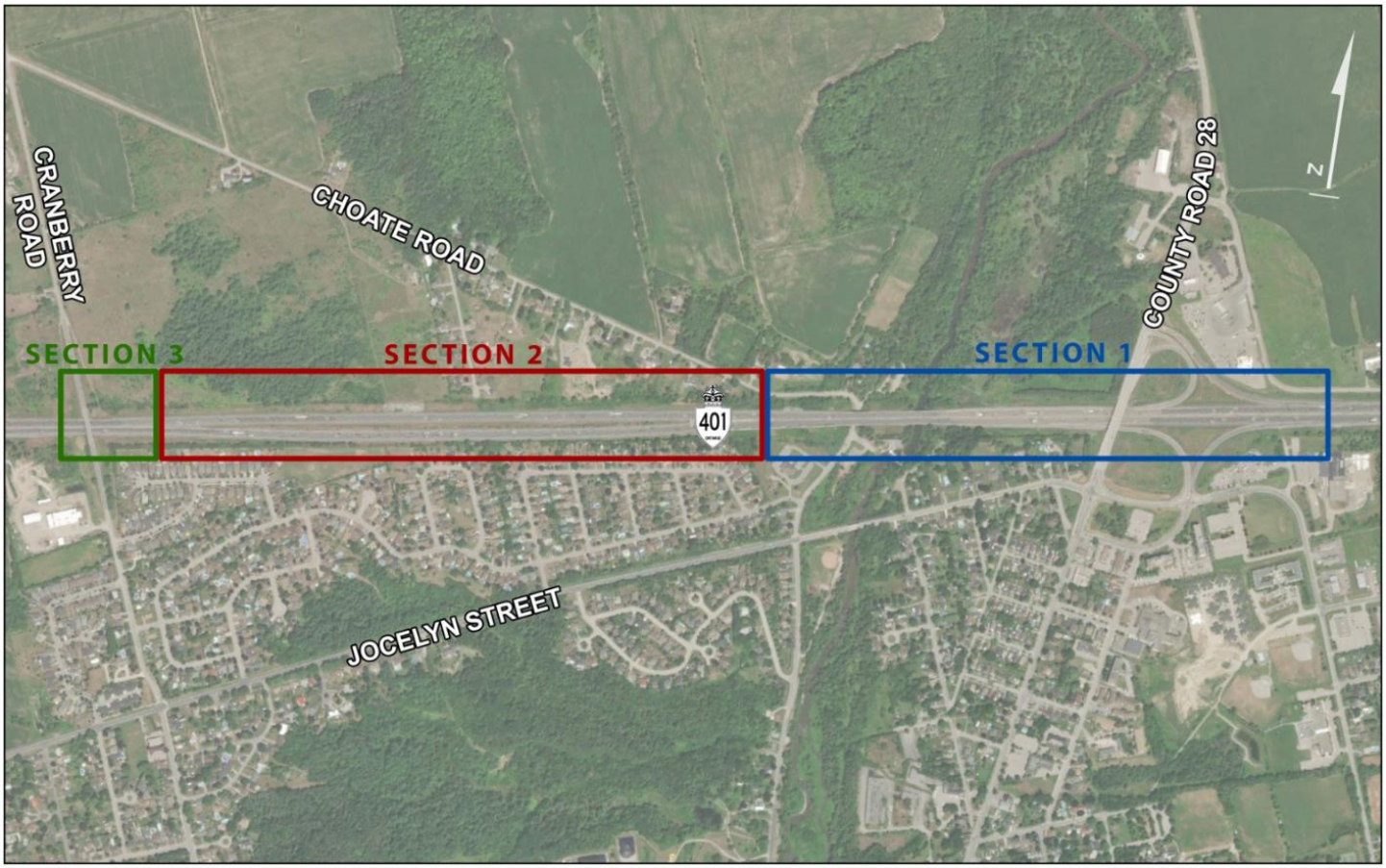


Figure 32– Highway 401 Study Area Segments

Section 1

This section starts approximately 450m east of County Road 28, which is the east limit of the study and extends 190m west of Choate Road **(Figure 33).** Section 1 has a six-lane cross-section with paved median and tall wall barrier. This section includes the Choate Road Bridge, Ganaraska River Bridge, and the County Road 28 Interchange. Land use in Section 1 includes the commercial area north of the County Road 28 interchange, the Port Hope Conservation Area and the Corbett's Dam Public area. Cultural heritage resources including buildings and landscapes are located north and south of Highway 401 Section 1.

Figure 33 – Highway 401 Section 1

Section 2

This section begins at the west limits of Section 1 (190m west of Choate Road) and extends westerly to approximately 150m east of Cranberry Road (**Figure 34).** It has a variable width grass/slope paving median, with a profile grade difference between the eastbound and westbound lanes. The maximum grade difference between the eastbound and westbound lanes is approximately 5.5 m, the eastbound lane being higher in elevation. Section 2 includes dense residential uses south of the highway and low-density housing north of the highway.

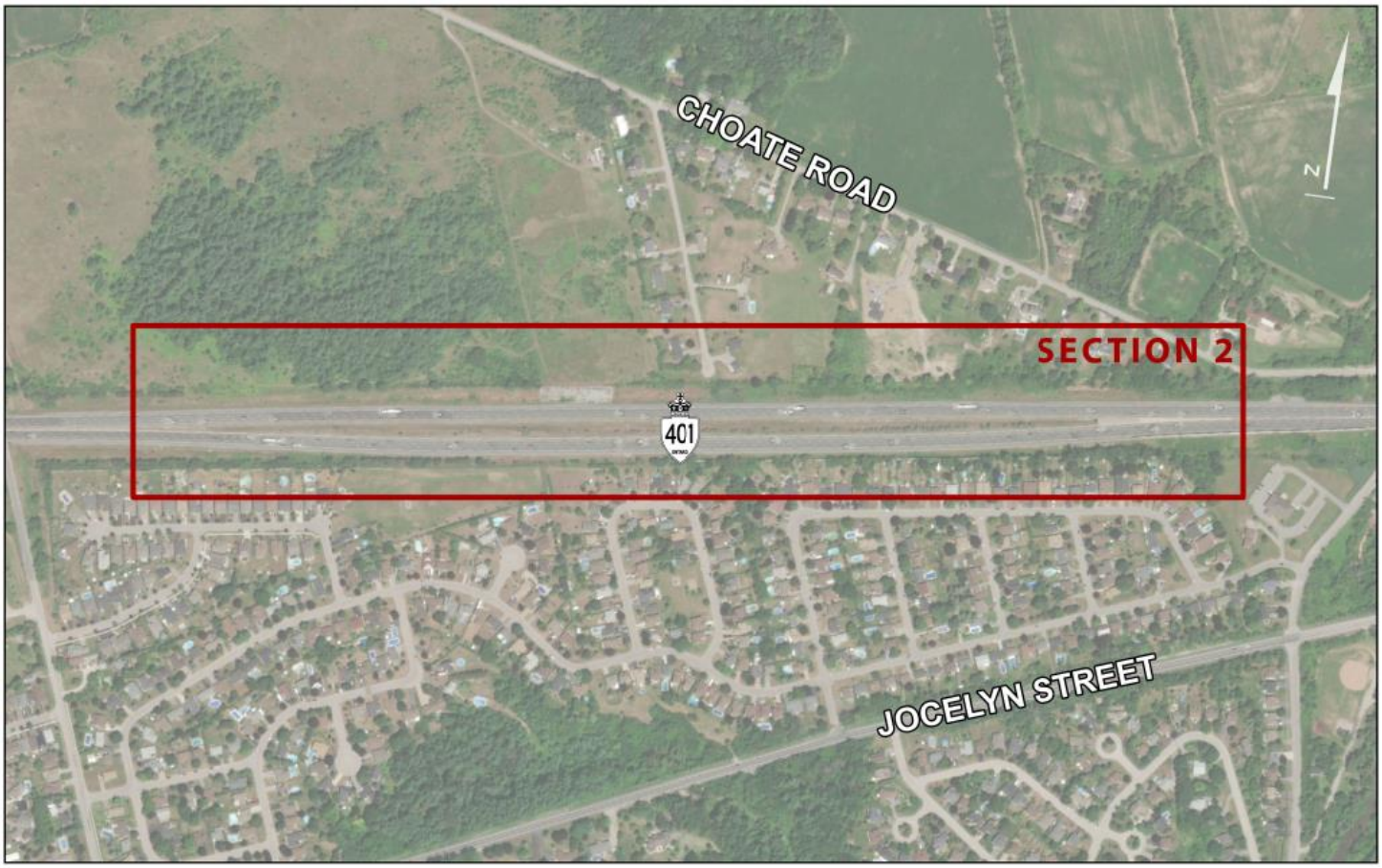


Figure 34 – Highway 401 Section 2

Section 3

This section starts from 150m east of Cranberry Road and extends to 50m west of Cranberry Road, which is the west limit of the study **(Figure 35).** It has a six-lane cross section with paved median and tall wall median barrier. This section includes the Victoria Street/ Cranberry Road Bridge and land uses are predominantly agricultural with the Port Hope Public Works Facility located southwest of the Cranberry Road bridge.

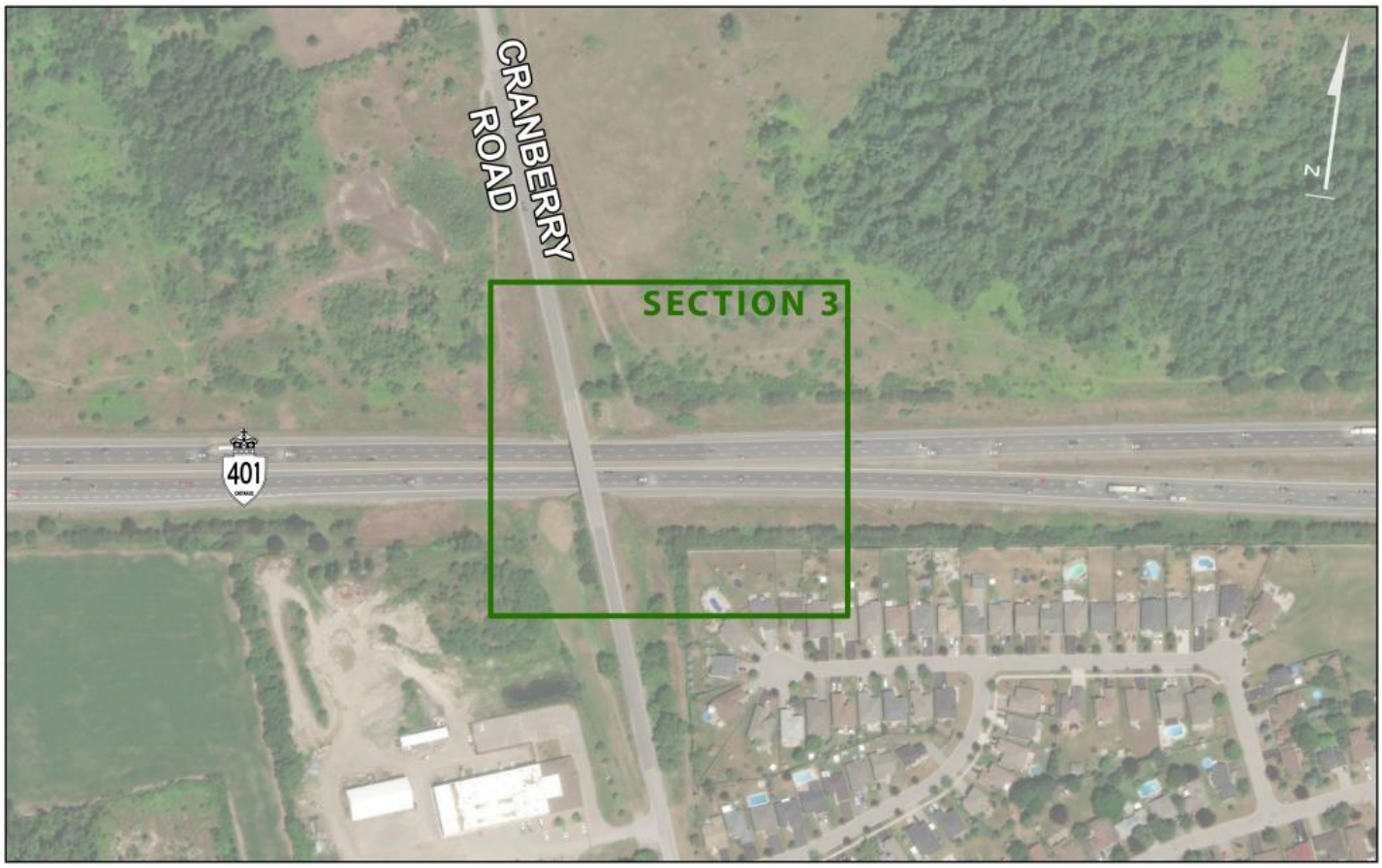


Figure 35 – Highway 401 Section 3

Alternatives to accommodate the three sections of Highway 401 within the study area were reviewed considering various combinations of segmental options for all three sections. As a result, three main future footprint configurations were developed for each of the three sections of Highway 401:

- Extend Highway 401 fully to the north;
- Split the extension for each direction of highway 401; and
- Extend Highway 401 fully to the south.

As mentioned above for Section 2, the eastbound lane is considerably higher in elevation than the westbound lane. Therefore, it is unfeasible for this section to be fully extended either to the north or to the south. The lanes must be extended separately.

9.1.1 Section 1 – 190m west of Choate Road to 450m east of County Road 28 (1.2 km)

Alternative 1- Extend Highway 401 fully to the North

In this option, the Highway 401 extension would occur completely on the north. The existing eastbound lanes would remain in place and the westbound lanes would be moved north to accommodate the extension.

Alternative 2 – Split the extension for each direction of Highway 401

In this option, the Highway 401 footprint to 8-lanes takes place to both the north and south equally, that being the north side of the WBL and the south side of the EBL.

Alternative 3 – Extend Highway 401 fully to the South

In this option, the Highway 401 footprint to 8-lanes takes place completely on the south. The existing westbound lanes would remain in place and the eastbound lanes would be moved south to accommodate the future footprint.

Figure 36 illustrates the existing cross-section for Section 1 and the additional footprint that would be required for each alternative (shaded in blue).

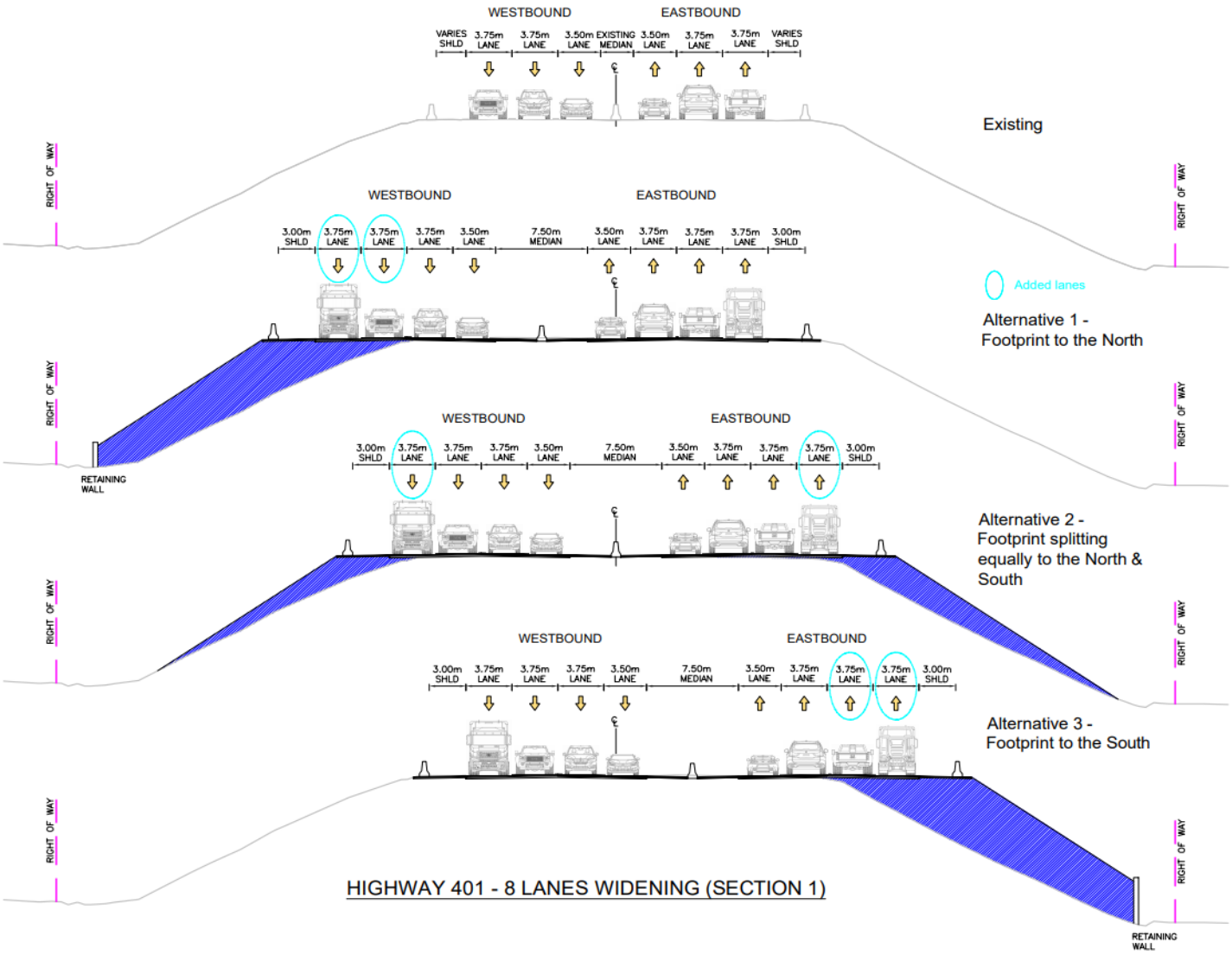


Figure 36 – Section 1 – Existing Cross-Section and Future Footprint Alternatives Considered

9.1.2 Section 2 – 150m east of Cranberry Road to 190m west of Choate Road (1.3 km)

Alternative 1- Extend Highway 401 Fully to the North

In this option, Highway 401 extension takes place on the north of both eastbound and westbound lanes. The existing eastbound outside pavement edge and westbound median pavement edge (at wide grass-median section) would remain in place.

Alternative 2 - Split the extension for each direction of Highway 401

In this option, Highway 401 extension to takes place south and north of the eastbound and westbound lanes respectively. Both the existing median pavement edge of eastbound and westbound lanes (at wide grass-median section) would remain in place while the outer pavement edge would be moved to accommodate the future footprint.

Alternative 3 – Extend Highway 401 Fully to the South

In this option, Highway 401 extension would take place to the south of both eastbound and westbound lanes. The existing eastbound median pavement edge and westbound outer pavement edge (at wide grass-median section) would remain in place.

Figure 37 illustrates the existing cross-section for Section 2 and the additional footprint that would be required for each alternative (shaded in red).

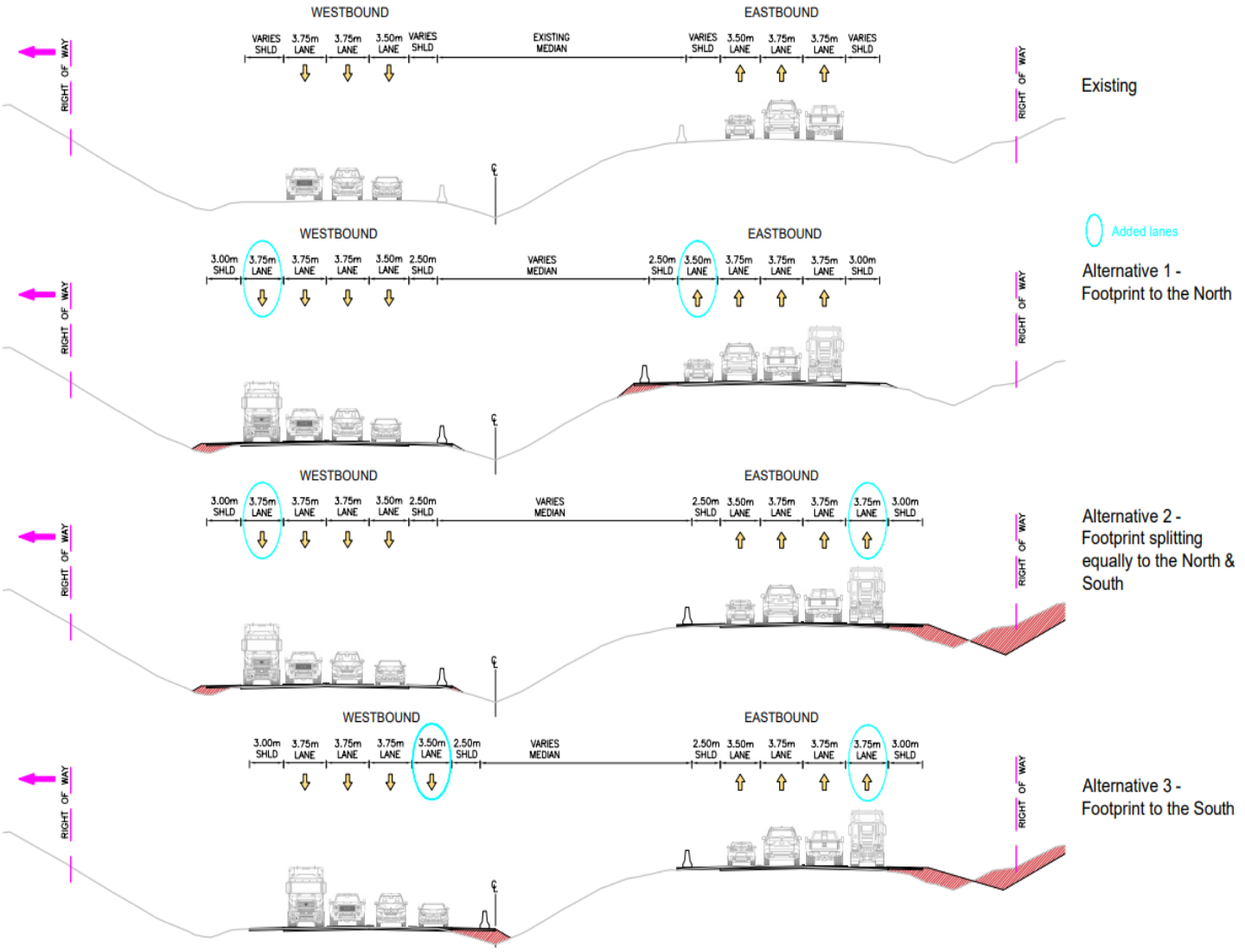


Figure 37 – Section 2 – Existing Cross-Section and Future Footprint Alternatives Considered

9.1.3 Section 3 – 50m west of Cranberry Road to 150m east of Cranberry Road (0.2 km)

Alternative 1- Extend Highway 401 Fully to the North

In this option, the Highway 401 extension would occur completely on the north. The existing eastbound south pavement edge would be retained.

Alternative 2 - Split the extension for each direction of Highway 401

In this option, the Highway 401 extension takes place about the centre, meaning the extension takes place equally on both south and north sides.

Alternative 3 – Extend Highway 401 Fully to the South

In this option, the Highway 401 extension to 8-lanes takes place completely on the south. The existing westbound lanes would remain in place and the eastbound lanes would be moved to accommodate the future footprint.

Figure 38 illustrates the existing cross-section for Section 3 and the additional footprint that would be required for each alternative (shaded in green).

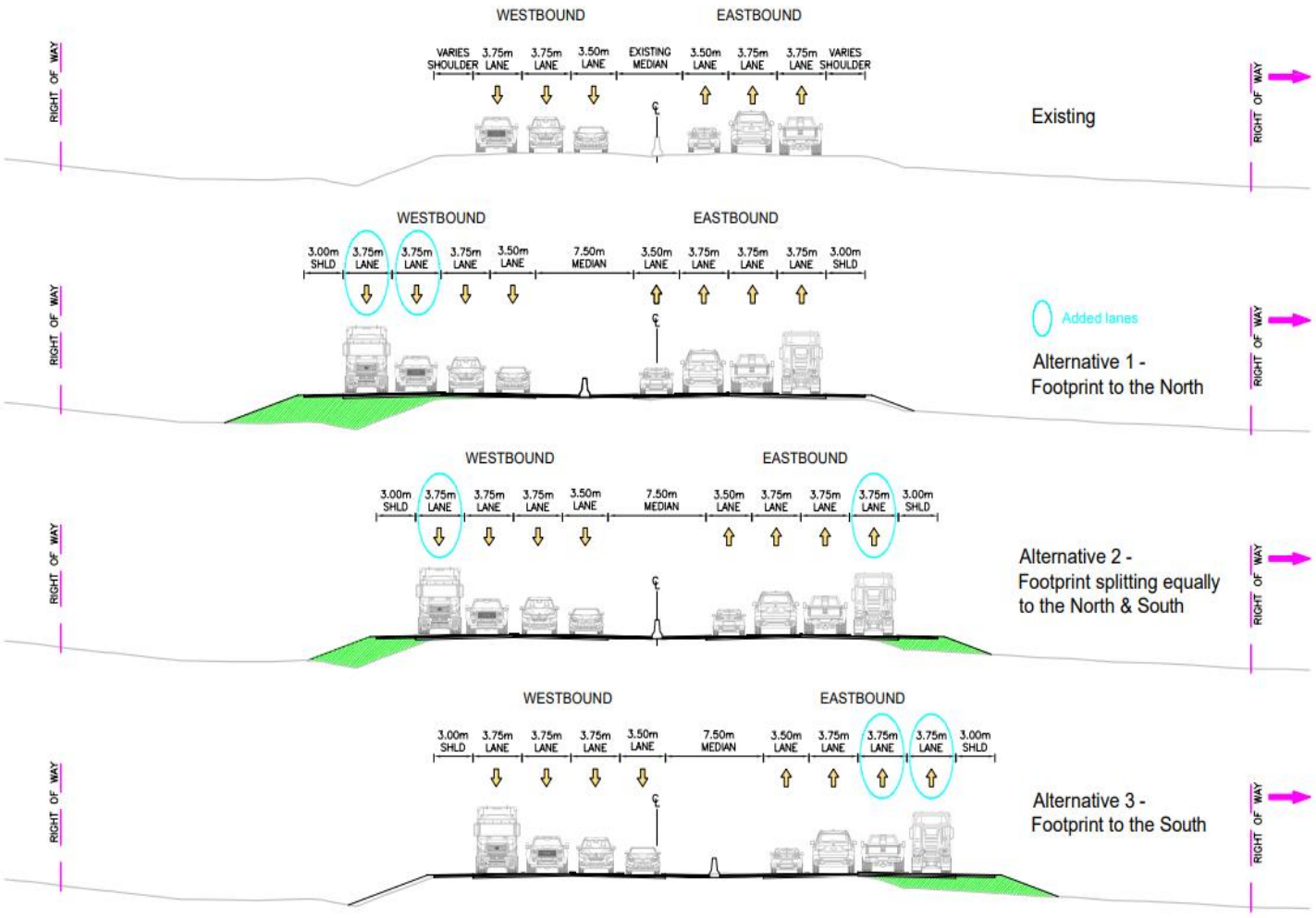


Figure 38 – Section 3 – Existing Cross-Section and Future Footprint Alternatives Considered

9.2 Screening and Evaluation of Alternatives

The project team, with experts in Highway Design, Structural Engineering, Traffic, Project Management, and the Environment, refined the list of highway design alternatives for each section. The team developed a consensus assessment of the advantages and disadvantages and identified critical flaws in the alternatives to develop a Recommended Plan for each section of Highway 401.

The evaluation process considered three major categories for screening assessment and rated the alternatives in each category from most preferred to least preferred.

- The first category is the 'Transportation/Technical Considerations' with several subcategories for evaluating specific areas.
- The second category, 'Socio Economic Environment (Community) Impacts', includes subcategories for Residential Properties, Agricultural Lands and Noise/Air.
- The final category is the 'Natural Environment Impacts' and includes the Fish and Fish Habitat, Terrestrial, Designated Natural Areas and Floodplain subcategories.

A reasoned argument method of evaluation was used to select a preferred alternative in which the advantages and disadvantages of each alternative, and the relative significance of the impacts were considered.

A detailed assessment and evaluation of the three alternative alignments for each of the three sections of mainline Highway 401 was conducted (**Table 16, 17 and 18).** This involved evaluating the mainline alternatives using a Reasoned Argument (trade-off) method of evaluation.

A Reasoned Argument is a method of analysis used to evaluate solutions where multiple objectives exist. The alternative that performs best in all the objectives is the preferred solution and would appear to be the solution to the problem. However, usually the selection objectives are not comparable and often conflict, making it impossible to have a preferred solution among the alternatives. Where this exists, trade-off analysis is required to identify the objectives or criteria that are, in short, more preferred, to choose a winning solution or shorten a lengthy list of alternatives. **Table 15** defines the relative impacts of each criterion for the trade-off analysis. This type of analysis is qualitative and prioritizes the identified project risks using a pre-defined rating scale. Risks are scored based on their probability or likelihood of occurring, and the impact on project objectives/alternatives should they occur. For the purposes of this analysis the following rating scale has been used:

Most Preferred	●
	◕
↓	◐
	◔
Least Preferred	○

The detailed evaluation criteria to determine the short list of alternatives or recommended alternative using the Reasoned Argument Method is found in **Table 15.**

For more information regarding the Highway 401 Future Footprint evaluation of alternatives, the *Highway 401 8-10 Lane Future Footprint Alternatives Report, MP-LEA Joint Venture, 2021* can be found under separate cover, as listed in **Appendix I.**

Table 15 Evaluation of Criteria for Highway 401 Alternatives			
Evaluation Component	**Criteria**	**Sub-Criteria**	**Relative Impact of Criteria**
Transportation/Technical Considerations	**Construction Staging**	▪ Construction impacts such as long duration ramp closures.	▪ Low relative impact. ▪ Staging complexity effects the duration of construction works, road closures/restrictions and ultimately safety of the public and workers during construction. ▪ Extending to the outside is easier to facilitate construction access.
	Other Infrastructure Impacts	▪ Impacts to noise barrier walls ▪ Impacts to existing drainage system	▪ Low relative impact. ▪ Alternatives have the potential to require relocation of noise walls and the existing drainage system may be impacted.
	Utility Impacts	▪ Construction impacts to existing utility infrastructure	▪ Low relative impact. ▪ Alternatives have the potential to impact existing utility infrastructure which may require relocation
	Implementation Cost	▪ Total cost including utility relocations, grading work, retaining walls and staging.	▪ Medium relative impact. ▪ Long-term maintenance costs are considered.
Socio-Economic Environment (Community) Impacts	**Residential Property**	▪ Impacts to private residential property	▪ High relative impact. ▪ Alternatives have the potential to impact a large number of residential properties including cultural heritage buildings and landscapes.
	Agricultural Land	▪ Impacts to agricultural lands	▪ Low relative impact. ▪ Alternatives have the potential to impact active agricultural lands.
	Noise/Air	▪ Impacts to sensitive noise receptors including nearby residences	▪ Medium relative impact. ▪ Alternatives have the potential to impact nearby residents. Noise mitigation is in place in many locations on the south side along the corridor.
Natural Environment Impacts	**Terrestrial Ecosystems**	▪ Impacts to wildlife habitat, significant trees or vegetation.	▪ Low relative impact. ▪ No significant wildlife habitat was identified in the study area. Right-of-way is scarcely vegetated with scattered trees more dense in the vicinity of the Ganaraska River. Landscape is more natural on the north side of Highway 401 with some wetland disturbance in the vicinity of the Ganaraska River.
	Fish and Fish Habitat	▪ Impacts to creeks, waterbodies, fish or fish habitat.	▪ Low relative impact. ▪ Limited fish habitat concerns throughout.
	Designated Natural Areas	▪ Impacts to the Ganaraska River Conservation Area or source water protection areas.	▪ Low relative impact. ▪ Limited terrestrial ecosystem concerns throughout (minimal impacts expected to GRCA lands and any impacts to lands designated in source water protection is expected to be able to be mitigated)
	Floodplain	▪ Permanent loss to floodplain area	▪ Low relative impact ▪ Alternatives have the potential to increase the footprint of the bridges and cause permanent losses to the floodplain area.

	Table 16: Evaluation of Section 1 Alternatives (From 190m West of Choate Road Easterly to 450m East of County Road 28)			
	CATEGORY	**Alternative 1 – Extend Highway 401 Fully to the North**	**Alternative 2 – Split the extension for each direction of Highway 401**	**Alternative 3 – Extend Highway 401 Fully to the South**
Alternative Overview	Description	▪ Proposed 8-lane footprint (at the Ganaraska River-Choate Road-County Road 28 section) takes place completely on the north. ▪ Existing eastbound outer pavement edge will remain in place.	▪ Proposed 8-lane footprint (at the Ganaraska River-Choate Road-County Road 28 section) takes place equally to the outside of the existing lanes in both the eastbound and westbound directions.	▪ Proposed 8-lane footprint (at the Ganaraska River-Choate Road-County Road 28 section) takes place completely on the south. ▪ Existing westbound outside edge of pavement will remain in place.
Transportation/Technical Considerations	Construction Staging	▪ Low complexity of staging. ▪ Westbound off ramp at County Road 28 (CR 28) interchange will be realigned between north pier and north abutment.	▪ Moderate complexity of staging. ▪ Eastbound Off Ramp at CR 28 interchange will be closed for a long duration.	▪ Moderate complexity of staging. ▪ Eastbound Off Ramp at CR 28 interchange will be closed for a long duration.
	Other Infrastructure Impacts (Noise Barrier, Drainage)	▪ Moderate to high impact on median ditch/drainage system.	▪ Low to moderate impact on median ditch/drainage system.	▪ Moderate to high impact on median ditch/drainage system.
	Utility	▪ Low to moderate – Buried Bell and Hydro aerial cable impacted	▪ Low – Buried Bell cable likely to be impacted at west of section 1	▪ Low to moderate – Buried Bell and Hydro and aerial Hydro cable impacted
	Implementation Cost	▪ Moderate Cost	▪ High Cost	▪ High Cost
Socio-Economic	Property	▪ No permanent private property acquisition. All additional highway footprint would be within the existing MTO property	▪ No private property acquisition. All additional highway footprint would be within the existing MTO property	▪ No private property acquisition. All additional highway footprint would be within the existing MTO property.
	Noise/Air	▪ Impacts two residences located within 120m (noise, air-quality, etc.).	▪ Impacts ~12 residences located within 120 m (noise, air-quality, etc.).	▪ Impacts >20 residences within 120 m (noise, air-quality, etc.).
Natural Environment	Terrestrial Ecosystems, Fish and Fish Habitat, Natural Areas, Floodplain	▪ Low impact (on drainage system and pattern, fish and fish habitat, terrestrial habitat and wildlife, SAR, etc.) as all works are occurring within the ROW. ▪ Impacts to floodplain from increase in existing footprint	▪ Low impact (on drainage system and pattern, fish and fish habitat, terrestrial habitat and wildlife, SAR, etc.) as all works are occurring within the ROW. ▪ Impacts to floodplain from increase in existing footprint	▪ Low impact (on drainage system and pattern, fish and fish habitat, terrestrial habitat and wildlife, SAR, etc.) as all works are occurring within the ROW. ▪ Impacts to floodplain from increase in existing footprint
Screening Summary	Advantages	▪ Lowest complexity of staging ▪ Lowest cost	▪ Lowest drainage impacts ▪ Least impact to utilities	▪ Lowest natural environmental impact as north side is more environmentally sensitive outside the ROW.
	Disadvantages	▪ Highest impact on drainage features	▪ Moderate to high complexity of staging. ▪ Highest cost	▪ Moderate to high complexity of staging ▪ Greatest potential impact on residences from noise increase
	Recommendation	**CARRIED FORWARD**	**NOT CARRIED FORWARD**	**NOT CARRIED FORWARD**
	Rationale	This option has low complexity of staging and minimizes impacts to existing noise receptors with the lowest cost.	This option has moderate complexity of staging, would require closure of the eastbound off ramp for long durations, increase noise to existing receptors, and has high cost.	This option has moderate complexity of staging, would require closure of the eastbound off ramp for long durations, increase noise to existing receptors, and has high cost.

	Table 17: Evaluation of Section 2 Alternatives (From 150m East of Cranberry Road Easterly to 175m West of Choate Road)			
	CATEGORY	Alternative 1 – Extend Highway 401 Fully to the North	Alternative 2 – Split the extension for each direction of Highway 401	Alternative 3 – Extend Highway 401 Fully to the South
Alternative Overview	Description	▪ Proposed 8-lane footprint takes place on the north of both eastbound and westbound. ▪ The existing outer edge of pavement of eastbound and lanes and median/inside edge of pavement of westbound (at wide grass-median section) will remain in place.	▪ Proposed 8-lane footprint takes place on south and north of eastbound and westbound respectively. Both existing median/inside edge of pavement in both directions (at wide grass-median section) will remain in place while existing outer pavement edge will be moved to accommodate the future footprint.	▪ Proposed 8-lane footprint takes place to the south of both eastbound and westbound. ▪ The existing median/inside pavement edge of the eastbound and outer pavement edge of the westbound (at wide grass-median section) will remain in place.
Transportation/Technical Considerations	Construction Staging	▪ Low to moderate complexity – local lane shift to south anticipated on both eastbound and westbound.	▪ Low to moderate complexity – local lane shift anticipated at the median on both eastbound and westbound.	▪ Low to moderate complexity - local lane shift to north anticipated on both eastbound and westbound.
	Other Infrastructure Impacts (Noise Barrier, Drainage)	▪ Moderate impact on median ditch/drainage system.	▪ High impact on noise barrier wall on east limit of section. ▪ Low impact on median ditch/drainage system.	▪ High impact on noise barrier wall on south at east limit of section. ▪ Moderate impact on median ditch/drainage system.
	Utility	▪ No impact	▪ No impact	▪ Low impact– one overhead hydro cable crossing, at the mid of section, needs relocation
	Implementation Cost	▪ Low to moderate cost	▪ High cost	▪ High cost
Socio-Economic	Property	▪ Moderate – Approx. 12 residential properties on north side of section impacted	▪ High – Approx. 40 residential properties on south impacted.	▪ High – Approx. 40 residential properties on south impacted.
	Noise/Air	▪ Moderate impact on residences (noise, air-quality, etc.).	▪ High impact on residences (noise, air-quality, etc.).	▪ High impact on residences (noise, air-quality, etc.).
Natural Environment	Terrestrial Ecosystems, Fish and Fish Habitat, Natural Areas, Floodplain	▪ Moderate impact (on drainage system and pattern, fish and fish habitat, terrestrial habitat and wildlife, SAR, Floodplain etc.)	▪ Highest impact (on drainage system and pattern, fish and fish habitat, terrestrial habitat and wildlife, SAR, Floodplain etc.)	▪ Low impacts (on drainage system and pattern, fish and fish habitat, terrestrial habitat and wildlife, SAR, Floodplain etc.)
Screening Summary	Advantages	▪ Minimum property impact ▪ Low to moderate cost	▪ Equivalent staging impacts to other options	▪ Low impact on natural environment
	Disadvantages	▪ N/A	▪ High property impact ▪ High cost ▪ Highest impact to natural environment. ▪ High impact on noise and barrier wall for residences.	▪ High property impact ▪ Highest cost ▪ High impact to infrastructure ▪ Highest ambient impact for noise and air
	Recommendation	**CARRIED FORWARD**	**NOT CARRIED FORWARD**	**NOT CARRIED FORWARD**
	Rationale	This option minimizes the property impacts and noise impacts.	This option has high property impacts to the approximately 40+ residential properties located south of the Highway.	This option has high property impacts to the approximately 40+ residential properties located south of the Highway.

	Table 18: Evaluation of Section 3 Alternatives (From 50m East of Cranberry Road Easterly to 150m East of Cranberry Road)			
	CATEGORY	Alternative 1 – Extend Highway 401 Fully to the North	Alternative 2 – Split the extension for each direction of Highway 401	Alternative 3 – Extend Highway 401 Fully to the South
Alternative Overview	Description	▪ Proposed 8-lane footprint of the highway at Cranberry Road takes place completely on the north. ▪ Eastbound outer edge of pavement will remain in place.	▪ Proposed 8-lane footprint of the highway takes place equally on both south and north in the vicinity of Cranberry Road.	▪ Proposed-8 lane footprint of the highway at Cranberry Road takes place completely on the south. ▪ Westbound outer edge of pavement will remain in place.
Transportation/Technical Considerations	Construction Staging	▪ Moderate complexity ▪ Local lane shift towards centreline is anticipated.	▪ Low complexity ▪ Local lane shift towards eastbound and westbound lanes is anticipated.	▪ Moderate complexity ▪ Local lane shift towards centerline is anticipated.
	Other Infrastructure Impacts (Noise Barrier, Drainage)	▪ No impact	▪ No impact	▪ No impact
	Utility	▪ No impact to existing utilities	▪ No impact to existing utilities	▪ No impact to existing utilities
	Implementation Cost	▪ Moderate Cost	▪ Lowest Cost	▪ Moderate Cost
Socio-Economic	Property	▪ No private property acquisition. All additional highway footprint would be within the existing MTO property.	▪ No private property acquisition. All additional highway footprint would be within the existing MTO property.	▪ No private property acquisition. All additional highway footprint would be within the existing MTO property.
	Noise/Air	▪ There are no residential properties located on the north side of Highway 401 that will be impacted (by noise, air-quality, etc.) by the improvements.	▪ Moderate impact to the ~10 residential properties located on the south side of Highway 401. Noise mitigation is already in place.	▪ Highest impact (noise, air-quality etc.) to ~10 residential properties located on the south side of Highway 401.
Natural Environme	Terrestrial Ecosystems, Fish and Fish Habitat, Natural Areas, Floodplain	▪ Low impact (on drainage system and pattern, fish and fish habitat, terrestrial habitat and wildlife, SAR, Floodplain etc.)	▪ Lowest impact (on drainage system and pattern, fish and fish habitat, terrestrial habitat and wildlife, SAR, Floodplain etc.)	▪ Low impact (on drainage system and pattern, fish and fish habitat, terrestrial habitat and wildlife, SAR, Floodplain etc.)
Screening Summary	Advantages	▪ No impact to residential properties	▪ Existing highway alignment remains unchanged. ▪ Low environmental impacts.	▪ Low impact on traffic operation.
	Disadvantages	▪ Moderate staging complexity ▪ Moderate cost	▪ Moderate noise impact to properties located on the south side of Highway 401	▪ Existing highway alignment is shifted significantly to the south. ▪ Highest noise impact to properties located on the south side of Highway 401
	Recommendation	**NOT CARRIED FORWARD**	**CARRIED FORWARD**	**NOT CARRIED FORWARD**
	Rationale	This option avoids noise impacts to the ~10 residences located south of Highway 401 but requires the existing highway centreline to be moved and staging is more complex.	This option allows the existing highway alignment to be maintained (lower cost).	This option has the highest noise impact to residences located south of Highway 401 and requires the existing alignment of Highway 401 to be moved (higher cost).

10.0 THE RECOMMENDED PLAN

The Preliminary Design study was undertaken to determine the most appropriate strategy for the Future Footprint of Highway 401. The Reasoned Argument approach was used to evaluate the various alternatives due to the low number of feasible solutions and lack of clear distinctions between the constraints for each option. The results of the evaluation of alternatives to determine the Recommended Plan for the eight (8) lane footprint of Highway 401 are as follows:

Section 1: East of County Road 28 west of Choate Road (1.2 km)

The Recommended Plan for Section 1 is Alternative 1 – Extend Highway 401 fully to the north. This alternative minimizes potential impacts to the residents and has the lowest complexity staging for construction. **Figure 39** provides a cross section view of the proposed highway alignment for Section 1. Please see **Appendix G** for detailed renderings of the Recommended Plan for the eight (8) lane footprint of Highway 401.

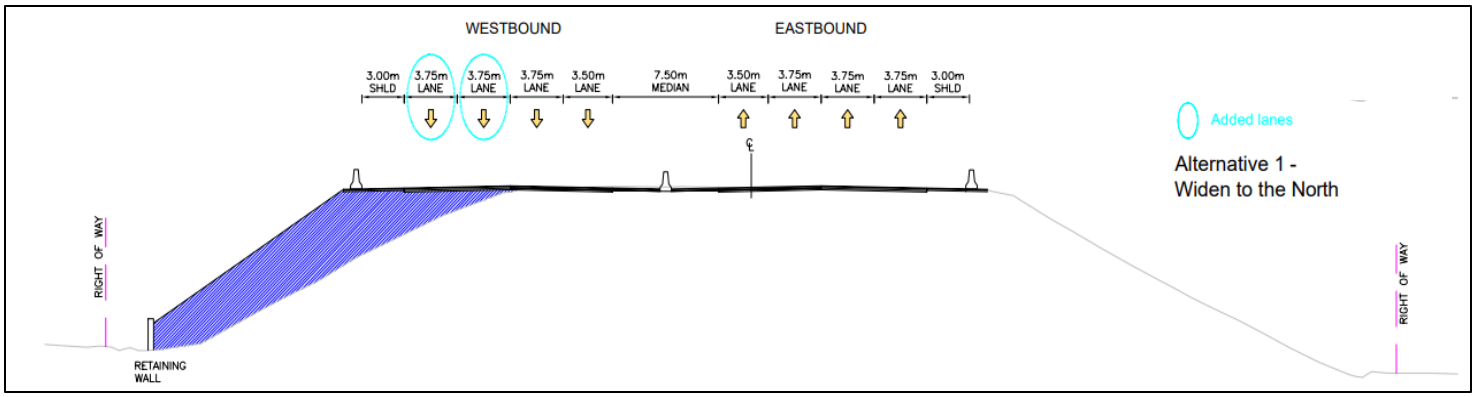


Figure 39 – Cross Section for the Preferred Alternative for Section 1 – Extend Fully to the North (8-Lane)

Section 2: West of Choate Road and westerly to east of Cranberry Road (1.3 km)

The Recommended Plan for Section 2 is Alternative 1 – Extend Highway 401 fully to the north. This alternative minimizes impacts to the residential properties and avoids impacts on the existing noise barrier walls south of Highway 401. **Figure 40** provides a cross section view of the proposed highway alignment for Section 2. Please see **Appendix G** for detailed renderings of the Recommended Plan for the eight (8) lane footprint of Highway 401.

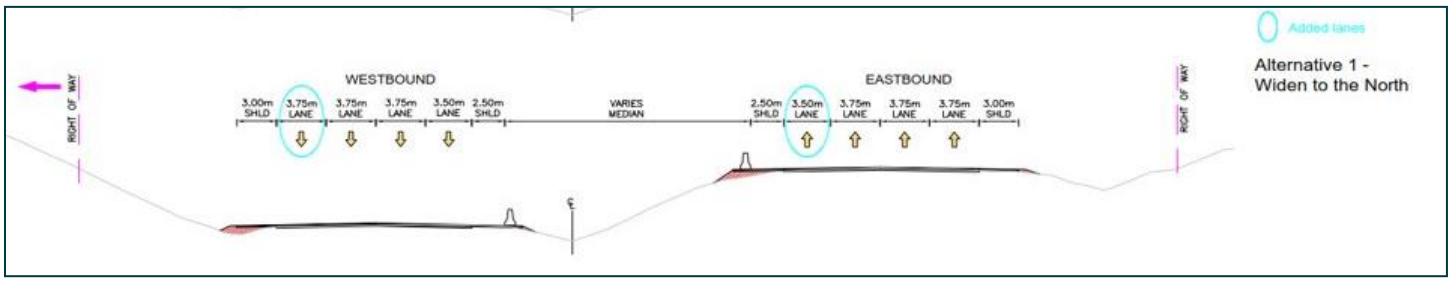


Figure 40 – Cross Section for the Preferred Alternative for Section 2 – Extend Fully to the North (8-Lane)

Section 3: East of Cranberry Road to west of Cranberry Road (0.2 km)

The Recommended Plan for Section 3 is Alternative 2 – Split the extension for each direction of Highway 401. This alternative allows the existing alignment to be maintained and has low complexity staging requirements for construction.

Figure 41 provides a cross section view of the proposed highway alignment for Section 3. Please see **Appendix G** for detailed renderings of the Recommended Plan for the eight (8) lane footprint of Highway 401.

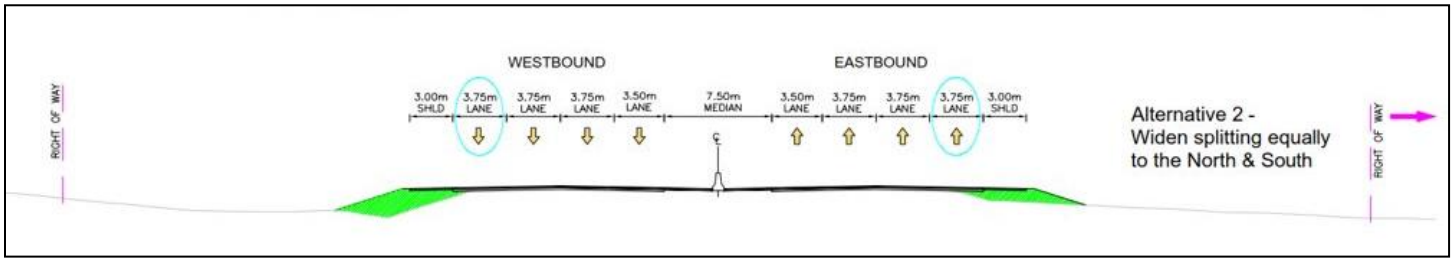


Figure 41 – Cross Section for the Preferred Alternative for Section 3 – Split the extension for each direction of Highway 401 (8-Lane)

The major features of the Recommended Plan are as follows:

- Extend Highway 401 on the north side only to accommodate four mainline lanes in each direction from west of Choate Road to east of Cranberry Road (Sections 1 and 2).
    - The centreline of both the westbound and eastbound lanes will be realigned to the north.
    - Minor amount of agricultural land/private property may be required.
    - A low vertical clearance will be tolerated for the westbound on-ramp under the County Road 28 bridge (until the bridge is replaced).
    - Modify the alignment of the Country Road 28 (Ontario Street) on-ramp to Highway 401 westbound (to facilitate the mainline lane shifts to the north).
    - Retain the existing vertical geometry
    - Revise/enhance the drainage system to accommodate the future footprint.

- Extend Highway 401 equally to the north and the south to accommodate four mainline lanes in each direction from east of Cranberry Road to west of Cranberry Road (Section 3).
    - Retain the existing horizontal and vertical geometry
    - Revise/enhance the drainage system to accommodate the proposed future footprint.

The preferred alternative for each of the three sections were combined to develop the recommended 8-lane footprint for Highway 401 through Port Hope. **Figure 42** illustrates a plan view drawing of the study area extension. Please see **Appendix G** for a detailed rendering of the Recommended Plan for the eight (8) lane footprint of Highway 401.

Figure 42 – Recommended Highway 401 8-Lane Footprint

It is anticipated that the ten (10) laning of Highway 401 will follow the same rationale as the eight (8) laning. The preferred alternative for the ultimate 10-laning of Highway 401 is extending to the north for Sections 1 and 2, and extending on both sides for Section 3. **Figures 43-45** illustrate the preferred alternative for the 10-laning of Highway 401 for each section within the study area and **Figure 46** illustrates a combined plan view drawing of the Highway 401 10-laning within the study area. The plan and cross sections can be viewed in more detail in **Appendix H.**

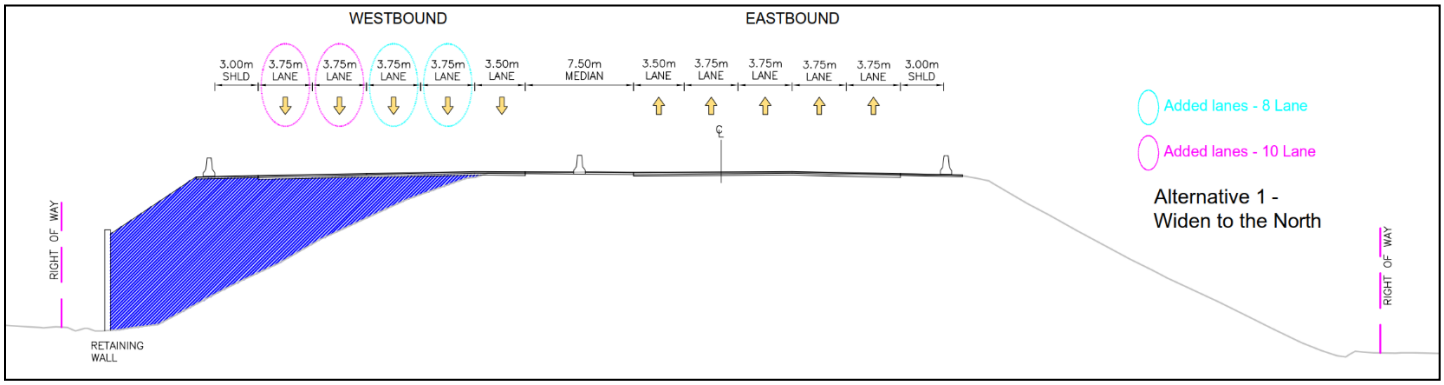


Figure 43 – Cross Section for Section 1 – Extend Fully to the North (10-Lane)

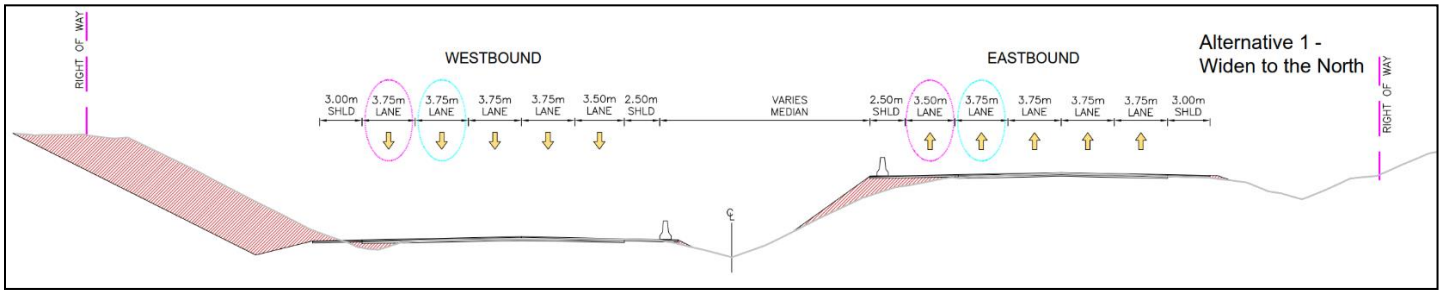


Figure 44 – Cross Section for Section 2 – Extend Fully to the North (10-Lane)

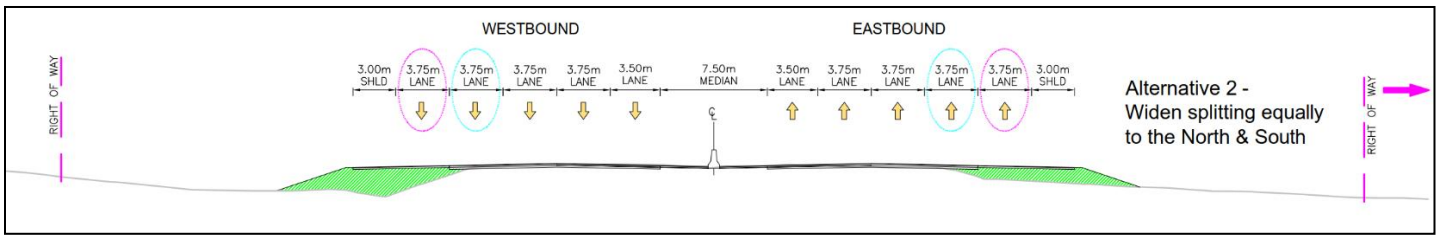


Figure 45 – Cross Section for Section 3 – Split the extension for each direction of Highway 401 (10-Lane)

Figure 46 – Designation Limits of the Recommended 10-Lane Future Footprint of Highway 401

11.0 ENVIRONMENTAL IMPACTS AND MITIGATION

This study followed the Class EA process and identified areas of environmental sensitivity or concern. Preliminary mitigation measures have been developed that will be refined in greater detail as the design is developed and assessed in the next phase of the project.

A Summary of Environmental Concerns and Commitments is provided in **Table 19**.

11.1 Natural Environment

Impacts to the natural environment have been minimized in part, by minimizing footprint impacts to undisturbed natural environments. A variety of environmental protection and mitigation measures have been adopted to guide the construction.

11.1.1 Fish and Fish Habitat

Potential impacts on the direct fish habitat in the tributaries of the Ganaraska River are anticipated as a result of the construction of retaining walls required to facilitate the extension of the Choate Road and Ganaraska River bridges north and avoid the need for property acquisition. No direct impacts are currently anticipated to the Ganaraska River itself, however it is anticipated that realignment of the tributaries and/or mitigation measures will be required as part of the construction of the new bridges, as they will extend further north than the existing bridges to accommodate for the Highway 401 Future Footprint. Realignment of the tributaries may require review and/or approval from the Department of Fisheries and Oceans Canada (DFO) if proper mitigation cannot be achieved.

A detailed habitat study of the fish bearing Ganaraska River tributaries, and a full impact assessment will be undertaken during detail design for both permanent and temporary impacts associated with the proposed works. A high-level preliminary review has developed mitigation measures that may include the following:

- If any in-water works are required during the bridge replacements and retaining wall installation, the works must be conducted during the MNDMNRF's in water works timing window from July 1 to September 14 of any year in the Ganaraska River to prevent negative impacts to fish spawning and migration activities.
- The duration of in-water work is to be minimized to the greatest extent possible and any in-water work that must be conducted shall be conducted in the dry to avoid introducing suspended sediment into the watercourse;
- Flows will be maintained at all times;
- When possible, work shall be scheduled to avoid wet and rainy periods that may increase the risk of erosion and sedimentation; and
- Access points are to be planned to minimize the amount of riparian vegetation lost or disturbed.

11.1.2 Vegetation Communities

Construction activities associated with the Cranberry Road, Choate Road and Ganaraska River bridge replacements as well as the Highway 401 Future Footprint works will result in localized loss and disturbance of existing vegetation within the study area. A comprehensive review of vegetation impacts within the study area will be undertaken during the subsequent detail design phase and a Landscaping Plan will be prepared to identify all areas where reinstatement of vegetation is required and to develop measures to mitigate vegetation impacts. Implementation of the mitigation measures will then be monitored and documented during construction. Relevant mitigation measures that should be considered during detail design include the following:

- Minimization of vegetation removal and protection of existing trees during the construction phase through the delineation of areas off-limits to construction activities;
- Slopes and embankment areas that are disturbed are to be restored and stabilized;
- Replacement of disturbed vegetative cover with topsoil and seed mix, and
- All trees that are affected by the project works are to be identified and a Landscape Plan will be completed.

11.1.2.1 Invasive Species

The large stands of invasive phragmites present along the Highway 401 ROW are anticipated to be impacted by the project works. As such, mitigation measures to control invasive and noxious plants during and after construction should be considered during detail design.

11.1.3 Wildlife/Migratory Birds

Migratory birds may be encountered nesting within vegetation and under bridges present in the study area. Several bird species listed as Threatened or Special Concern provincially are known to be present within or adjacent to the study area limits. This includes Eastern Meadowlark habitat near the Cranberry Road bridge, as well as American Robin, Rock Pigeon, Barn Swallow and Chimney Swift habitat near the Choate Road and Ganaraska River bridges. Given the preliminary scope of work, it is possible that construction work planned as part of this project may negatively impact migratory and SAR birds or the function of their habitat.

A comprehensive review of migratory bird habitat impacts (both temporary and permanent) within the study area will be undertaken and species-specific surveys will be conducted for grassland and forested birds as well as SAR bats.

In addition, the following relevent mitigation measures may be considered:

- Tree clearing and vegetation removals are to be completed outside the breeding bird timing window of April 15 to August 31 of any given year.
- A screening of the study area for the presence of migratory birds OR their nests should be undertaken prior to any disturbance if work will occur during the bird nesting window. The nests and eggs of many species are protected under federal and/or provincial legislation (i.e., MBCA, FWCA).
- If migratory birds or their nests are encountered at any time of the year, works shall not continue in the location of the nest until:
    - After it has been determined by an avian specialist that the young have fledged and vacated the nest and work area; or
    - An avian specialist determines a suitable buffer distance at which work may continue to prevent disturbance of the bird(s); and
    - Where a buffer distance has been implemented, an avian specialist must undertake monitoring during construction to ensure migratory birds, their nests, and eggs are not disturbed, destroyed or taken.

11.1.4 Species at Risk

Several SAR are known to occur in the general vicinity of the project works and may be encountered where suitable habitat is present within the study area. The proposed works have the potential to temporarily and permanently impact SAR habitat within the study area. These impacts will be confirmed during detail design and detailed mitigation measures will be prepared to offset any impacts. If any exemptions or permits are required for any permanent impacts to SAR that cannot be avoided, these will be obtained during detail design.

The following relevant mitigation measures should be considered to protect SAR and their habitat during project work and to maintain compliance with the Endangered Species Act (ESA):

- SAR awareness training;
- Daily site inspections;
- Temporary work stoppage during SAR encounter;
- SAR observations reporting to MECP; and
- Environmental Monitoring.

11.1.4.1 Butternut

Four hybrid butternuts are present within the study area which are not currently protected under the Endangered Species Act (ESA). However, there is one additional tree that requires further assessment during detail design to determine whether it is a Butternut, as the age of the tree at the time of field investigations prohibited crews from recording all identifying features.

11.1.4.2 SAR Turtles

SAR turtle species, including Snapping Turtle, Blanding's Turtle, Eastern Musk Turtle, and Northern Map Turtle may be encountered throughout the study area in the Ganaraska River, its associated wetlands and adjacent gravel shoulders. While no evidence of turtle nesting activity was observed during the field investigations, impacts on SAR turtle habitat may occur as a result of the Ganaraska River bridge replacement. These impacts will be confirmed and assessed during detail design and detailed mitigation measures will be developed.

The following relevent mitigation measures to protect SAR turtles should be considered during detail design:

- Exclusion fencing is recommended for areas where vegetation will be disturbed (i.e., cleared and grubbed) as these areas may be attractive to nesting turtles.
- No in-water work shall occur during the turtle overwintering period from October 1 to April 30 of the following year unless the work zone is isolated prior to October 1, and all turtles excluded from the work zone;
- No change in water levels shall occur in areas where SAR Turtles may be present from October 1 to April 30 of the following year (e.g., waterbody upstream and downstream of the bridge as a result of ongoing construction activities); and
- All stockpiled topsoil, sand, and gravel are to be covered with geotextile or encircled with wildlife fencing to prevent turtles from nesting in the materials from May 15 to August 15 of any year.
- Where turtles nests and/or eggs are found, the Peterborough MNDMNRF Biologist and Contract Administrator shall be notified immediately for further direction.

11.1.4.3 SAR Snakes and Amphibians

Several snake species including the Eastern Milksnake and Eastern Ribbonsnake are known to occur or may be encountered within the study area, including the areas adjacent to the Ganaraska River. There is also known Western Chorus Frog habitat along the banks of the Ganaraska within the study area. Impacts to SAR snake and frog habitat will be confirmed and assessed during detail design and detailed mitigation measures will be developed.

11.1.4.4 SAR Birds

Suitable breeding habitat for Bobolink, Eastern Meadowlark, and Grasshopper Sparrow is present within the study area along the north side of Highway 401, east and west of Cranberry Road. There is also suitable forested habitat present for the Eastern Wood-Pewee, Red-headed Woodpecker, and Wood Thrush within the general study area and suitable habitat for Barn Swallows and Chimney Swift, which were observed aerially foraging near the Choate Road bridge during field studies.

A comprehensive review of SAR bird habitat impacts (both temporary and permanent) within the study area will be undertaken and species-specific surveys will be conducted for SAR grassland and woodland birds. A detailed impact assessment will be conducted, and mitigation measures will be developed. If required, necessary environmental permits and/or exemptions will be obtained.

11.1.4.5 SAR Bats

There is potential habitat for Eastern Small-footed Myotis, Little Brown Myotis, Northern Myotis, and/or Tri-colored Bat in the forested areas adjacent to the Highway 401 ROW near the Cranberry Road bridge east and west of the Ganaraska River/Choate Road. Any tree removals within these areas may impact SAR bat habitat. Targeted bat surveys will be completed during detail design and a comprehensive review of SAR bat habitat impacts (both temporary and permanent) within the study area will be undertaken. Mitigation measures will be developed and if required, necessary environmental permits and/or exemptions will be obtained.

In addition, the following measures may be considered:

- No tree removal/clearing shall occur between May 15 and August 15 of any year to avoid harm to SAR bat species.

11.1.5 Surface Water and Groundwater

Surface drainage patterns are not anticipated to be impacted by the project works, however, there is potential for impacts to surface and groundwater, as well as unevaluated wetlands and the highly vulnerable aquifer located near the Cranberry Road bridge as a result of construction activities, such as refuelling, leaks and accidental spills during construction. Necessary precautions are to be prescribed during detail design for the prevention and response to spills.

A review of construction dewatering activities associated with excavations required within the construction area will be completed and the need for an Environmental Activity and Sector Registry (EASR) or Permit to Take Water (PTTW) for the construction works will be determined during detail design.

General mitigation measures to protect surface and groundwater from contamination during construction may include the following:

- A spill response plan shall be developed that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance. All spills of deleterious substances (as defined by the Fisheries Act) must be reported to the Ontario Spill's Action Center (https://www.ontario.ca/page/report-pollution-and-spills) **AND** DFO (FisheriesProtection@dfo-mpo.gc.ca) if the spill results in *the Harmful Alteration, Damage or Destruction* to fish or fish habitat;
- Emergency spill response kits are to be located on-site at all times;
- All necessary precautions are to be undertaken to prevent the accumulation of litter and construction debris and provisions for containment of construction debris will need to be specified;
- Equipment shall not enter the watercourse; and

- Ensure machinery is stored/refueled at least 30 m away from the watercourse and wetlands and is not leaking fuels or lubricants to prevent water contamination due to accidental fuel spills.

11.1.6 Contamination and Waste Management

It is understood that silica, lead, asbestos, and potentially arsenic were widely used in highway and bridge/culvert construction in the past and may be present within the project limits at the Choate Road and Ganaraska River bridges. Additionally, benzene may also be present in coating material or as a result of a spill or from contamination from an adjacent property.

Designated substances present in on-site existing construction materials, may pose a threat to the health and safety of the construction workers. Proper occupational health and safety measures should be followed at all times during construction.

During the detail design for the Cranberry Road bridge, it is recommended that a Designated Substance Survey take place to confirm the presence of any potentially harmful materials.

There are also large amounts of low-level radioactive waste (LLRW) known to be found within the soil and fill material in Port Hope. Consultation has begun during preliminary design with the Port Hope Area Initiative (PHAI), the group responsible for the cleanup, transportation, and storage of this contaminated waste. Discussions with this stakeholder will continue during detail design and mitigation measures to avoid impacting contaminated soils will be developed.

In addition, a review of the quantities of excess soils that will be created as a result of the project works will be undertaken during detail design to determine if excess soils can be managed on-site or will need to be removed off site. Any excess earth or disposable fill taken from the work area will be managed in a responsible and environmentally appropriate manner in accordance with *Ontario Regulation 406/19, Onsite and Excess Soil Management* to prevent impacts to the surface geology and groundwater within the study area.

11.1.7 Erosion and Sediment Control

Disturbance of soils during construction increases the potential for erosion and sedimentation in ditch lines and watercourses without proper mitigation. An Erosion and Sediment Overview Risk Assessment (ESORA) has been prepared as part of the preliminary design to guide the Erosion and Sediment Control (ESC) strategy (Approach 3) that will be further developed during detail design and to identify any areas of concern that are prone to erosion as a result of the project works. The ESORA will assist the design team and Contractor in planning and scheduling operations in such a manner that the potential for erosion at these points is reduced proactively.

In addition to the ESORA, the following general ESC measures should be considered during detail design for inclusion into the Contract Documents:

- If excavation is required within the watercourse, it should be done in isolation (i.e., isolated from the watercourse through the use of cofferdams, etc.) to prevent the release of sediment into the watercourse;
- Dewatering operations must provide an outlet to a *Natural Attenuation Area* (means a dry flat-grassed meadow or open area with existing vegetation that is not subject to erosion; and
- Cover (e.g. Straw mulch, bonded fibre matrix, erosion control blankets, fibre rolls) should be utilized for temporary erosion control as a part of the contract for areas where seeding is required.

11.2 Socio-economic Environment

11.2.1 Land Use

Land use designations in the study area are not expected to change as a result of the Recommended Plan.

11.2.1 Recreation and Tourism

Temporary impacts to recreational features within the study area are anticipated. Access to the Fish Ladder at Corbett's Dam will be impacted by the Choate Road and Ganaraska River bridge replacements, as will the recreational hiking trails within the Port Hope Conservation Area, including the trail that runs underneath the Ganaraska River bridge and the trail entrance along Choate Road adjacent to the bridge. These impacts will be temporary and all trail access/access to the Fish Ladder will be reinstated once construction is complete. Mitigation measures include coordinating the planned roadway closures with the local Municipality and Conservation Authority, detour route signage, and advanced notification.

11.2.2 Property

Property impacts are anticipated within the study area as a result of the proposed works. The westbound lane shifts required to stage traffic on the north of Highway 401 will impact private properties located along Choate Road. Permanent property acquisition is required at these locations to first facilitate the replacement of Choate Road and Ganaraska River bridges and then to accommodate for the Highway 401 Future Footprint. Consultation with impacted property owners has begun and the acquisition process will be finalized during detail design.

11.2.1 Student Transportation and Emergency Services

Delays for EMS providers and an increase in response times are expected during the construction of the Recommended Plan due to road closures at Choate Road and Cranberry Road, as well as various closures on Highway 401. Detour routes will be in effect during the full closures and advanced signage will be place along Highway 401 during lane closures. It is recommended that in advance of construction, notification of construction start be given to EMS providers (fire, police and paramedics) two weeks in advance of construction.

Discussions regarding construction staging plans with EMS providers have been undertaken during preliminary design. These discussions will continue during detail design once the impacts are confirmed.

Bus services operated by the Student Transportation Services of Central Ontario (STSCO) may be impacted by the planned road closures at Choate Road and Cranberry Road. Discussions with STSCO have been completed during preliminary design and will continue during detail design to confirm any impacts and develop necessary mitigation measures such as alternative pick-up routes, if required. It is recommended that the contract should include a notice of construction start provided two weeks in advance.

11.2.1 Aggregate and Mining

No impacts to the concrete supplier 500 m north of the Cranberry Road bridge are anticipated. This location will utilize the detour route while it is in effect during the full closure of Cranberry Road.

11.2.2 Commercial

During lane closures on Highway 401 to facilitate the Choate Road and Ganaraska River bridge replacements, highway traffic looking to access the commercial areas north and south of the County Road 28 interchange may be delayed and advanced signage will be place along Highway 401 to advise motorists of the lane closures.

11.2.1 Institutional

Access to the Municipality of Port Hope's Joint Operations Center adjacent to the Cranberry Road bridge is anticipated to be impacted during construction. During detail design of the Cranberry Road bridge, advance discussions with the Municipality will take place and mitigation measures will be developed.

11.2.1 Agricultural

The lands surrounding the Cranberry Road bridge to the north are heavily characterized by agricultural uses and consultation with the Northumberland Federation of Agriculture identified Cranberry Road as a transportation route utilized by tractors and other large farming equipment. It is anticipated that the full closure of Cranberry Road during construction may impact these operations. Communication with this group will continue during detail design.

11.2.2 Traffic

Construction activities for the Recommended Plan will result in impacts to traffic including increased traffic time and distance. During the Choate Road and Ganaraska River bridge replacements, Choate Road will experience full closures with periodic single lane short term closures in each direction on Highway 401. The short-term closures will be in effect for 5 construction seasons, while the exact duration of the Choate Road closure will be determined during details design. During the replacement of the Cranberry Road bridge, a full closure of Cranberry Road will be in effect for one full construction season. Short-term (night-time) full road closures of Highway 401 are also required. During the future construction of the Highway 401 Future Footprint, short-term single-lane closures in each direction on Highway 401 will be in effect.

Detour routes have been developed for the planned road and lane closures and include:

- During the full closure of Choate Road, local traffic will be detoured via Cranberry Road or Dale Road and Ontario Street.
- During the full closure of Cranberry Road, local traffic will be detoured via Dale Road, County Road 2 and Jocelyn Street.
- During the 2-3 night-time full closures of Highway 401 for the demolition of the existing Cranberry Road bridge, highway traffic will be detoured via the EDR (County Road 2, Dale Road and Burnham Street North).
- During the single lane closures of Highway 401, advanced signing will be placed along the highway to advise motorists of upcoming lane closures.

During detail design, Traffic Management Plans will be prepared to include finalized detour provisions for the road/lane closures and traffic mitigation measures. The following preliminary mitigation measures are recommended to be included in the Contract Documents:

- Signage should be placed two weeks before the start of construction at select locations to advise motorists of the upcoming closures;
- Adjacent landowners should be provided advance notice of construction start and notification of potential entrance impacts that may be required by the construction works;
- Private stakeholders, EMS providers, STSCO, The Municipality of Port Hope and County of Northumberland should be notified before the road closures, and
- Enhanced communication in advance of the planned closure should be provided through Ontario 511 and to the provincial trucking associations to advise them of the works.

11.2.3 Navigable Waters

The Ganaraska River is a navigable water as per Transport Canada guidelines and is known to be a recreational paddling route within the study area. As a navigable water, major construction works at the Ganaraska River are subject to approval from Transport Canada's Navigation Protection Program. During detail design, an application will be submitted for approval and a notice advising users of the upcoming construction works will be posted for a 30-day public review.

11.2.4 Noise

Permanent Noise

Under the Environmental Assessment process, a noise study was completed for the Port Hope Highway 401 Future Footprint. The purpose of this study is to determine if noise mitigation is warranted when the highway is expanded to 8 lanes between Cranberry Road and County Road 28 in the future. The criteria included in MTO's noise policy, "Environmental Guide for Noise" (October 2006), was used for this assessment.

Through the assessment, three areas were identified that meets the technical criteria for the installation of noise barrier walls when 8 lanes are established:

- South side of Highway 401 east of Victoria Street north;
- Between Sleeman Drive and County Road 28 north side of Highway 401; and
- Between Cavan Street and County Road 28 south side of Highway 401.

Timing for construction of the future highway is still to be determined and the installation of the noise barrier is dependant on economic and environmental approvals at the time of implementation.

For more details on noise considerations within the study area, the *Highway 401 at Port Hope – Road Widening Environmental Noise Assessment Report, RWDI 2022* can be found under separate cover, as listed in **Appendix I.**

Construction Noise

Temporary construction noise impacts are anticipated as a result of the proposed works. All reasonable attempts will be made to work within local bylaws, including as appropriate, public notification and mitigation measures to reduce noise.

Standard measures for mitigating noise emissions are recommended for consideration during detail design, including:

- Construction equipment is to be in an operating condition that prevents unnecessary noise including but not limited to the use of muffler systems, properly secured components, and the lubrication of moving parts, and
- Idling of equipment kept to the minimum necessary to perform the specified work and turned off when not in use.

11.2.5 Utilities

Impacts to existing utility infrastructure within the study area are anticipated. These requirements will be confirmed during detail design. Currently, the following utility impacts have been identified:

Due to the profile increase required for the Cranberry Road bridge replacement, the new toe of slope of the embankment would impact the existing ditches and utility poles/anchors. One utility pole on the northwest quadrant would require relocation to accommodate the increase in the embankment and ditches.

Due to establishing the Choate Road and Ganaraska River bridges and Highway 401 Future Footprint to the north, one utility pole carrying Hydro One cable west of Choate Road may require relocation.

Consultation with impacted utility companies will continue during detail design.

11.2.6 Air Quality

During construction, there is potential for the generation of dust, fumes, and odours during construction by machinery working within the study area. Odour and fume impacts can be minimized by ensuring that all equipment is properly maintained and that all pollution control devices on the equipment are operational and properly maintained.

The MTO has considered air quality in the preliminary design study and determined that in the short-term, the project is expected to have a negligible effect on the local airshed. Construction equipment will be required to have functional best management practices (BMPs) for emission controls of both greenhouse and non-greenhouse gas pollutants, and dust resuspension from vehicular traffic and mobile construction equipment can be controlled with standard construction BMPs (e.g. reduced speed limits, washing of vehicles, etc.). In the latter case of long-term impacts to the airshed, the project will likely have a net positive impact due to the increased flow of traffic; as the population in the project area grows, expanded bridges will allow for widening of roadways, and thus a reduction in vehicle idling hours (or at least the maintenance of a consistent road speed). This will typically result in reduced emissions of particulates, NO_X, VOCs, and other contaminants commonly associated with start/stop traffic.

The MTO has reviewed the need for conducting an air assessment as part of the Cranberry Road, Choate Road and Ganaraska River bridge replacements and determined that there is no substantial benefit in assessing air quality for a replacement build project with no added capacity. There are potential mitigation measures that could be implemented to address receptors in the study area, however, these receptors already operate under the expected conditions. With no significant change in operational emissions, if an air assessment were to be conducted, MTO would be assessing and mitigating background contaminant concentrations, which is not the objective. As a result, the bridge replacements are more accurately viewed as a Group C like-for-like build scenario, for which an air assessment would not be required. Based on this rationale and the exemption criteria listed within the MTO's *Environmental Guide for Assessing Air Quality and Greenhouse Gas Emissions*, an air assessment is not required as part of the bridge replacements.

A separate assessment of any future footprint of Highway 401 will be completed under the relevant legislation at the time.

11.2.7 Climate Change

It has been assessed that the differential climate change impact in the selection of preliminary design options for replacement of the Cranberry Road, Choate Road, and Ganaraska River bridges is negligible. Overall, the project is expected to have a positive impact on future traffic flow and will not change actual total vehicle kilometres (VKT) driven. The replacement of the bridges will afford MTO the opportunity to revisit and update floodplain mapping and ice-dam considerations for the Ganaraska River (as they pertain to an increase in extreme weather events) and will guarantee a level of operational flexibility to update stormwater infrastructure associated with Highway 401. Any land-use related impacts generated during construction (e.g. installation of lay-down areas, cofferdams causing upstream flooding, etc.) are expected to be minimal and of a transient nature.

A separate assessment of any future footprint of Highway 401 will be completed under the relevant legislation at the time.

11.2.8 Cultural Environment

11.2.8.1 Heritage

No impacts to heritage resources are anticipated.

11.2.8.2 Archaeology

Findspot 3, which is located on the northwest quadrant of the County Road 28 bridge, includes over 150 artifacts dating back to the Middle-Late Woodland period. This site underwent a Stage 2 and Stage 3 archaeological assessment in December 2021 and was registered with the MHSTCI as archaeological site AlGn-39. This site is of significant value or interest and will require a further Stage 4 investigation during detail design if it can't be protected during construction. All other areas of potential archaeological significance within the Study #1 area have been cleared of significance and require no further assessment.

11.3 Future Consultation

The consultation program was undertaken during the study, involving the adjacent property owners, the public, interest groups, stakeholders, municipal, provincial, and federal government agencies, Indigenous Communities, impacted property owners and businesses will be continued during the detail design study phase before any construction proceeds.

Future consultation requirements will include:

- Advising the public and stakeholders of project commencement, PIC(s) and project completion;
- Conducting PIC(s) to update the public on the detail design Recommended Plan;
- Advancing property acquisition agreements with impacted property owners;
- Conducting stakeholder meetings with Municipal and County representatives, Emergency Services, STSCO, PHIA, GRCA to discuss contaminated soils, detour routes, the timing of work, anticipated impacts and mitigation;
- Coordinating with utility companies regarding relocations and protection during construction;
- Presentation to council to present the detail design plans;
- Notification to the Northumberland Federation of Agriculture advising them of the Cranberry Road closure during construction; and
- Potential consultation with Indigenous Communities regarding the Stage 4 archaeological work.

11.4 Commitments to Future Work

Design and Construction Reports (DCRs) will be prepared to detail the environmental assessment, detail design, environmental mitigation and related construction methods and staging for the Cranberry Road bridge, Choate Road bridge and Ganaraska River bridge replacements and Highway 401 Future Footprint. Each DCR, once complete, will be made available for a 30-day public comment period.

Commitments to future work include:

- A fisheries impact assessment, including detailed mitigation, will be conducted for tributaries associated with the Ganaraska River;
- A terrestrial ecosystem impact assessment, including detailed mitigation, will be conducted;
- Targeted surveys of potentially impacted SAR and their habitat within the study area will be conducted and mitigation measures developed. If permits or approvals are required these will be obtained;
- A Landscaping Plan will be prepared;
- A butternut assessment will be conducted;

- A review of construction dewatering activities will be completed and the need for an Environmental Activity and Sector Registry (EASR) or Permit to Take Water (PTTW) for the construction works will be completed;
- The Erosion and Sediment Control (ESC) strategy will be further developed;
- Property acquisition agreements will be finalized;
- Traffic Management Plans will be prepared to include finalized detour provisions for the road/lane closures and traffic mitigation measures;
- Advanced coordination with utility companies regarding relocations;
- An air quality assessment will be undertaken specific to the Highway 401 Future Footprint work;
- A Stage 4 Archaeological Assessment will be conducted for archaeological site AlGn-39 during detail design, if it is determined that it cannot be protected during construction;
- Noise barrier economic feasibility review as part of the Highway 401 8 lane future footprint work;
- Designated Substance Survey for the Cranberry Road bridge; and
- Approval from Transport Canada for major works on a navigable waterway (Ganaraska River) will be obtained.

12.0 SUMMARY OF ENVIRONMENTAL CONCERNS AND COMMITMENTS

Table 19 summarizes the environmental concerns and mitigation measures and commitments to future work to be undertaken and confirmed during Detail Design.

Table 19: Summary of Environmental Concerns and Commitments Table

ID #	Issues/Concerns/Potential Affects	Concerned Stakeholders	ID #	Mitigation/Protection/Monitoring
1.0 Fish and Fish Habitat				
1.1	There is potential for fish and fish habitat within the tributaries of the Ganaraska River to be negatively impacted by the proposed construction works at the Choate Road and Ganaraska River bridge replacements.	Department of Fisheries and Oceans Canada (DFO) Ministry of Northern Development, Mines, Natural Resources and Forestry (MNDMNRF)	1.1.1	A fisheries impact assessment will be undertaken during detail design for both permanent and temporary impacts associated with the proposed works. A Project Notification Form or Fisheries and Oceans Canada (DFO) Request for Review submission, if required; will be submitted as part of detail design when the impact assessment is finalized. Detailed mitigation measures will be developed in detail design.
			1.1.3	If any in-water works are required during the bridge replacements and retaining wall installation, the works must be conducted during the MNDMNRF's in water works timing window from July 1 to September 14 of any year in the Ganaraska River to prevent negative impacts to fish spawning and migration activities.
			1.1.4	The duration of in-water work is to be minimized to the greatest extent possible and any in-water work that must be conducted shall be conducted in the dry to avoid introducing suspended sediment into the watercourse.
			1.1.5	Flows will be maintained at all times.
			1.1.6	When possible, work should be scheduled to avoid wet and rainy periods that may increase the risk of erosion and sedimentation.
			1.1.7	Access points are to be planned to minimize the amount of riparian vegetation lost or disturbed.
2.0 Terrestrial Ecosystem				
2.1	Loss and disturbance of vegetation.	MNDMNRF Environment Canada (EC)	2.1.1	During detail design, a comprehensive review of vegetation impacts within the study area will be undertaken and a Landscaping Plan will be prepared to identify all areas where reinstatement of vegetation is required and to develop measures to mitigate vegetation impacts as much as possible.
			2.1.2	Minimization of vegetation removal and protection of existing trees during the construction phase through the delineation of areas off-limits to construction activities.
			2.1.3	Slopes and embankment areas that are disturbed shall be restored and stabilized with re-seeding.
			2.1.4	All trees that are affected by the project works will be identified in the Contract Drawings and a Landscape Plan will be completed.
2.2	The use of construction equipment may increase the spread of non-native and invasive species.	EC	2.2.1	Mitigation measures to control invasive and noxious plants during and after construction should be considered during detail design.
2.3	Potential disturbance to nesting migratory birds.	EC	2.3.1	During detail design, an impact assessment of migratory bird habitat impacts (both temporary and permanent) within the study area will be undertaken and species-specific surveys will be conducted for grassland and forested birds. Mitigation will be finalized in detail design.
			2.3.2	Tree clearing and vegetation removals shall be completed outside the breeding bird timing window of April 15 to August 31 of any given year.
			2.3.3	A screening of the study area for the presence of migratory birds OR their nests are to be undertaken prior to any disturbance if work will occur during the bird nesting window. The nests and eggs of many species are protected under federal and/or provincial legislation (i.e., MBCA, FWCA).

Table 19: Summary of Environmental Concerns and Commitments Table				
ID #	**Issues/Concerns/Potential Affects**	**Concerned Stakeholders**	**ID #**	**Mitigation/Protection/Monitoring**
			2.3.4	If migratory birds or their nests are encountered at any time of the year, works should not continue in the location of the nest until: o After it has been determined by an avian specialist that the young have fledged and vacated the nest and work area; or o An avian specialist determines a suitable buffer distance at which work may continue to prevent disturbance of the bird(s); and o Where a buffer distance has been implemented, an avian specialist must undertake monitoring during construction to ensure migratory birds, their nests, and eggs are not disturbed, destroyed or taken.
3.0 Species at Risk				
3.1	Potential for Species at Risk (SAR) (i.e., Butternut, Blanding's Turtle, Western Chorus Frog, SAR birds and bats) to be encountered within the study area.	Ministry of Environment, Conservation and Parks (MECP) EC	3.1.1	The following general mitigation measures should be considered in detail design to protect SAR and their habitat during project work and to maintain compliance with the Endangered Species Act (ESA): • SAR awareness training; • Daily site inspections; • Temporary work stoppage during SAR encounter; • SAR observations reporting to MECP; and • Environmental Monitoring.
		MECP MTO	3.1.2	A butternut tree assessment will be undertaken during detail design to determine the status of the potential butternut tree south of the Ganaraska River bridge.
			3.1.3	A comprehensive assessment of impacts on SAR within the study area will be conducted and detailed mitigation measures, including the need for any required permits or approvals will be developed.
			3.1.4	Turtle exclusion fencing is recommended for areas where vegetation will be disturbed (i.e., cleared and grubbed) as these areas may be attractive to nesting turtles.
			3.1.5	No in-water work shall occur during the turtle overwintering period from October 1 to April 30 of the following year unless the work zone is isolated prior to October 1, and all turtles excluded from the work zone.
			3.1.6	No change in water levels shall occur in areas where SAR Turtles may be present from October 1 to April 30 of the following year (e.g., waterbody upstream and downstream of the bridge as a result of ongoing construction activities).
			3.1.7	All stockpiled topsoil, sand, and gravel should be covered with geotextile or encircled with wildlife fencing to prevent turtles from nesting in the materials from May 15 to August 15 of any year.
			3.1.8	Where turtles nests and/or eggs are found, the Contract Administrator shall be notified immediately for further direction.
			3.1.9	No tree removal/clearing is to occur between May 15 and August 15 of any year to avoid harm to SAR bat species.

Table 19: Summary of Environmental Concerns and Commitments Table				
ID #	**Issues/Concerns/Potential Affects**	**Concerned Stakeholders**	**ID #**	**Mitigation/Protection/Monitoring**
4.0 Surface Water and Groundwater				
4.1	Construction activities, such as refuelling, leaks and accidental spills during construction can impact surface water and groundwater.	MECP DFO	4.1.1	A spill response plan shall be developed that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance. All spills of deleterious substances (as defined by the Fisheries Act) must be reported to the Ontario Spill's Action Center (https://www.ontario.ca/page/report-pollution-and-spills) **AND** DFO (FisheriesProtection@dfo-mpo.gc.ca) if the spill results in *the Harmful Alteration, Damage or Destruction* to fish or fish habitat.
			4.1.2	Emergency spill response kits are to be located on-site at all times.
			4.1.3	All necessary precautions should be taken to prevent the accumulation of litter and construction debris and provisions for containment of construction debris will need to be specified.
			4.1.4	Equipment shall not enter the watercourse.
			4.1.5	Ensure machinery is stored/refueled at least 30 m away from the watercourse and wetlands and is not leaking fuels or lubricants as per *OPSS 182* to prevent water contamination due to accidental fuel spills.
5.0 Contamination and Waste Management				
5.1	Designated substances are present in on-site existing construction materials, which may pose a threat to the health and safety of the construction workers.	Construction staff MECP	5.1.1	Proper occupational health and safety measures should be followed all times during construction.
5.2	Stockpiled construction materials such as aggregate, concrete, and earth may potentially contaminate the work area without proper containment and environmental protection measures.	Construction staff MECP	5.2.1	A review of the quantities of excess soil that will be created as a result of the project works will be undertaken during detail design to determine if excess soils can be managed on-site or will need to be removed off site.
			5.2.2	Any excess earth or disposable fill taken from the work area is to be managed in a responsible and environmentally appropriate manner in accordance with *Ontario Regulation 406/19, Onsite and Excess Soil Management* to prevent impacts to the surface geology and groundwater within the study area.
			5.2.3	Consultation with the PHAI in regard to the radioactive waste found within the soil and fill materials in Port Hope will continue during detail design and mitigation measures to avoid impacting contaminated soils will be developed.
6.0 Erosion and Sediment Control				
6.1	Disturbance of soils during construction increases the potential for erosion and sedimentation in ditch lines, watercourses and wetlands without proper mitigation.	MNDMNRF MECP DFO	6.1.1	The Erosion and Sediment Control strategy (Approach 3) will be further developed during detail design.
			6.1.2	If excavation is required within the watercourse, it is to be done in isolation (i.e., isolated from the watercourse through the use of cofferdams, etc.) to prevent the release of sediment into the watercourse.
			6.1.3	All Dewatering operations must provide an outlet to a *Natural Attenuation Area* (means a dry flat-grassed meadow or open area with existing vegetation that is not subject to erosion.
			6.1.4	Cover (Straw mulch, bonded fibre matrix, erosion control blankets, fibre rolls) should be utilized for temporary erosion control as part of the contract for areas where seeding is required.
7.0 Land Use/Traffic				

Table 19: Summary of Environmental Concerns and Commitments Table

ID #	Issues/Concerns/Potential Affects	Concerned Stakeholders	ID #	Mitigation/Protection/Monitoring
7.1	Road closures, traffic delays/detours. Impacts to adjacent landowners and access to adjacent land uses is anticipated.	Municipality of Port Hope County of Northumberland Motorists including EMS (police, fire and paramedic) Northumberland Federation of Agriculture Local Residents Ontario Trucking Association (OTA) MTO	7.1.1	Negotiations with impacted property owners will be continued during detail design to finalize property acquisition agreements and consultation with relevant stakeholders will continue to assist in developing mitigation measures for land use and traffic impacts within the study area.
			7.1.2	During detail design, Traffic Management Plans will be prepared to include finalized detour provisions for the road/lane closures and traffic mitigation measures.
			7.1.3	Signage is to be placed two weeks before the start of construction at select locations to advise motorists of the upcoming closures.
			7.1.4	Private stakeholders, EMS providers, The Municipality of Port Hope and County of Northumberland are to be notified before the road closures.
			7.1.5	Adjacent landowners should be provided advance notice of construction start and notification of potential entrance impacts that may be required by the construction works
			7.1.6	Enhanced communication in advance of the planned closure should be provided to the provincial trucking associations to advise them of the work.
8.0 Noise				
8.1	Noise from construction, equipment and vehicles may disturb neighbouring residents. Permanent noise from the Highway 401 Future Footprint is anticipated.	Nearby Residents Municipality of Port Hope	8.1.1	Noise barrier economic feasibility review as part of the Highway 401 8 lane future footprint work.
			8.1.2	Construction equipment is to be in an operating condition that prevents unnecessary noise including but not limited to the use of muffler systems, properly secured components, and the lubrication of moving parts.
			8.1.3	Idling of equipment kept to the minimum necessary to perform the specified work and turned off when not in use.
9.0 Utilities				
9.1	Impacts on existing utilities within the study area are anticipated.	Hydro One Bell Canada	9.1.1	Ensure advanced coordination with utility companies for utility relocations during detail design.
10.0 Air Quality				
10.1	Potential that dust and emissions from machinery will be generated during construction.	EC Local Residents	9.1.1	Odour and fume impacts should be minimized by ensuring that all equipment is properly maintained and that all pollution control devices on the equipment are operational and properly maintained.
11.0 Cultural Environment				
11.1	Potential for archaeological resources to be disturbed by the construction works.	Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI)	11.1.2	The need for further archaeology assessment will be identified during detail design.

LIST OF REFERENCE DOCUMENTS

Municipality of Port Hope Official Plan (2018)

County of Northumberland Official Plan (2015)

Class Environmental Assessment for Provincial Transportation Facilities (2000)

LIST OF REFERENCE ACTS

Canadian Environment Assessment Act (2012)

Endangered Species Act (2007)

Environmental Assessment Act (2012)

Environment Protection Act (1990)

Ontario Clean Water Act (2006)

Species at Risk Act (SARA) (2002)

APPENDIX A – PUBLIC CONSULTATION/GOVERNMENT NOTICES

APPENDIX B – CORRESPONDENCE

APPENDIX C – MEETING MINUTES

APPENDIX D – PUBLIC INFORMATION CENTRE

APPENDIX E – CRANBERRY ROAD RECOMMENDED PLAN DRAWINGS

APPENDIX F – CHOATE ROAD BRIDGE AND GANARASKA RIVER BRIDGE RECOMMENDED PLAN DRAWINGS

APPENDIX G – HIGHWAY 401 8-LANE RECOMMENDED PLAN DRAWINGS

APPENDIX H – HIGHWAY 401 10-LANE RECOMMENDED PLAN DRAWINGS

APPENDIX I – LIST OF REPORTS UNDER SEPARATE COVER

Fish and Fish Habitat Existing Condition Report, McIntosh Perry 2022

Terrestrial Ecosystem Existing Conditions Report, McIntosh Perry 2022

Groundwater Assessment Report, WSP 2019

Cranberry Road Foundations Investigation Design Reports, Thurber 2020

Choate Road Foundations Investigations Design Reports, Thurber 2020

Highway 401 Future Footprint Foundations Investigations Design Reports, Thurber 2020

Designated Substances Survey Report, MMM Group 2016

Noise Assessment Report, RWDI 2022

Cultural Heritage Resource Assessment Report, WSP 2019

Cultural Heritage Evaluation Report, Choate Road, Unterman McPhail Associates, 2019

Stage 1 Archaeological Assessment Report, WSP 2019

Cranberry Road Long List Evaluation Report, MP-LEA Joint Venture, 2021

Cranberry Road Short List Evaluation Report, MP-LEA Joint Venture, 2021

Choate Road and Ganaraska River Long List Evaluation Report, MP-LEA Joint Venture, 2021

Choate Road and Ganaraska River Short List Evaluation Report, MP-LEA Joint Venture, 2021

Highway 401 8-10 Lane Future Footprint Report, MP-LEA Joint Venture, 2021