Steeles Avenue (Regional Road 8) Transportation Corridor Improvements Tremaine Road (Regional Road 22) to Industrial Drive Municipal Class Environmental Assessment Study

ENVIRONMENTAL STUDY REPORT

DECEMBER 2022

THE PUBLIC RECORD

This Environmental Study Report is available for a 45 calendar-day public review period from **December 15, 2022, to January 30, 2023.**

Interested members of the public may view the document on the Region's website: **https://www.halton.ca/For-Residents/Roads-Construction/Municipal-Class-Environmental-Assessment-Studies/Steeles-Avenue-Corridor-Study-%E2%80%93-Tremaine-Road-to-I**

Executive Summary

ES.1 Introduction

Halton Region has completed a Municipal Class Environmental Assessment (MCEA) Study to assess and confirm the transportation demand and need for improvements on Steeles Avenue (Regional Road 8) between Tremaine Road (Regional Road 22) and Industrial Drive in the Town of Milton.

Steeles Avenue is an important transportation facility in Halton Region's existing and future transportation network. This roadway serves the movement of goods and commuters and distributes traffic to and from the Provincial freeway system. Steeles Avenue also provides access to residential, commercial and industrial land uses in the Towns of Milton and Halton Hills.

Steeles Avenue consists of two lanes between Tremaine Road and Industrial Drive. Between Industrial Drive and Regional Road 25, Steeles Avenue has been widened to four lanes that include on-road bike lanes and an in-boulevard multi-use trail on both sides. Steeles Avenue continues as a four-lane arterial road to the east.

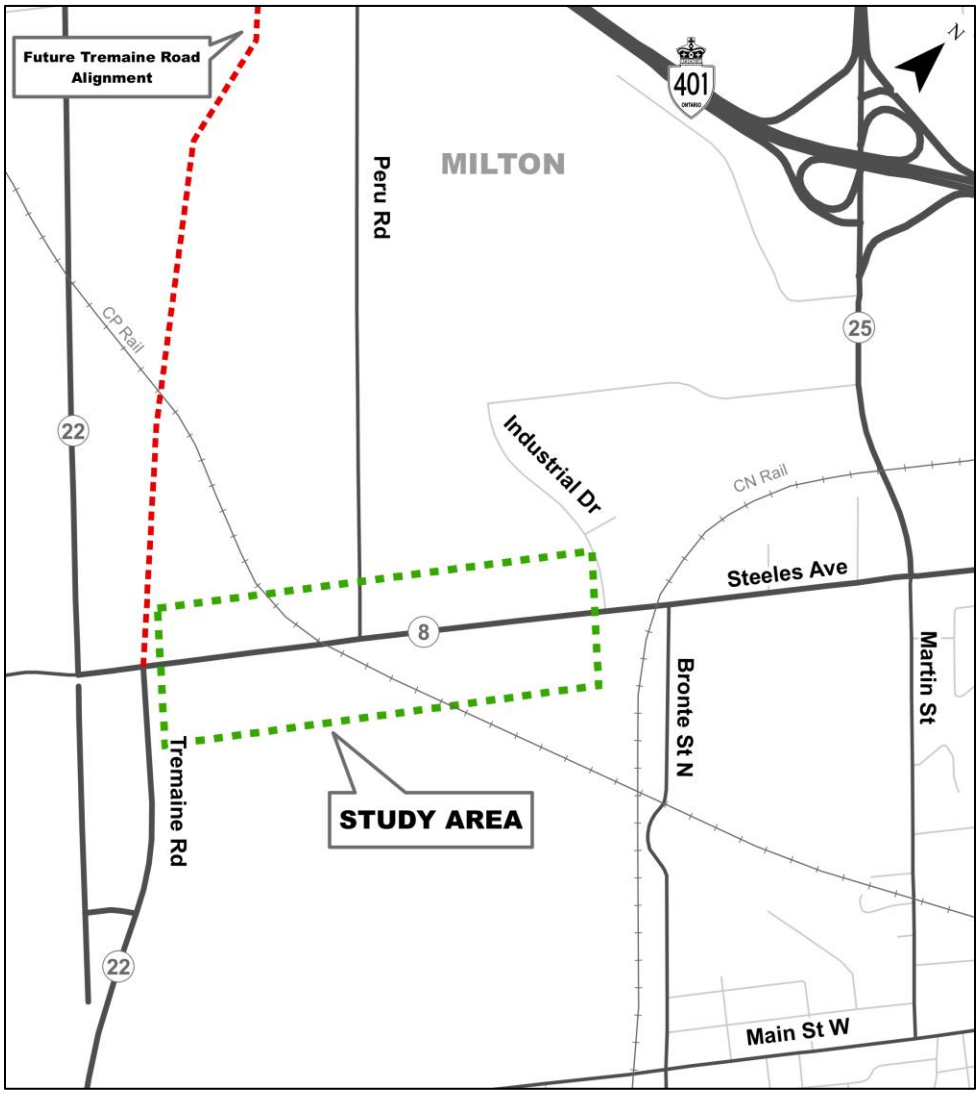
The need for improvements to the Steeles Avenue corridor between Tremaine Road and Industrial Drive was identified in the Halton Region Transportation Master Plan to 2031 – *The Road to Change* (October 2011), as well as the Region's Active Transportation Master Plan (May 2015) to support active transportation uses. As such, this MCEA Study was conducted to support future travel demand based on planned land uses.

To assess potential improvements for Steeles Avenue from Tremaine Road and Industrial Drive, Halton Region retained WSP Canada Inc. to conduct this MCEA study. The Steeles Avenue MCEA Study was carried out in accordance with a Schedule 'C' of the Municipal Class Environmental Assessment document (Municipal Engineers Association October 2000, as amended in 2007, 2011, and 2015). This Environmental Study Report (ESR) documents the decision-making process carried out during the MCEA study.

The study area extends approximately 1.3 km east of realigned Tremaine Road to west of Industrial Drive in the Town of Milton, as shown in **Exhibit ES-1**. The eastern study limit will tie into the improvements completed east of Industrial Drive (i.e. widening to four-lanes with multi-use trail and sidewalk), and the western limit will tie into the

existing roundabout at Tremaine Road, thereby completing the transportation network in the area.

Exhibit ES-1: Study Area



ES.2 Need and Justification

Planning Context

A number of Regional planning documents were reviewed in the context of the Steeles Avenue MCEA Study including Halton Region Official Plan (Consolidated November 10, 2021), Halton Region Transportation Master Plan (2011), and Halton Region Active

Transportation Master Plan (2016). Policy recommendations provided the necessary foundation and framework to make decisions about the potential improvements required on Steeles Avenue.

Specifically, the Halton Region Transportation Master Plan (2011) identifies a 35 m right-of-way for Steeles Avenue between Tremaine Road and Industrial Drive, Steeles Avenue to be widened from 2 to 4 travel lanes and the need for a Steeles Avenue grade separation at the CP railway crossing. The Halton Region Active Transportation Master Plan (2016) proposes bike lakes for Steeles Avenue from Tremaine Road to Industrial Drive, as well as a sidewalk and/or multi-use trail.

Other planning documents such as the Town of Milton Official Plan (2008), Town of Milton Transportation Master Plan (2018), and the Town of Milton Sherwood Survey Secondary Plan (2008) provide growth and transportation planning that recommends improvements to Steeles Avenue. More details are provided in **Section 2** of this ESR. The Steeles Avenue improvements that are recommended between Tremaine Road and Industrial Drive consider these policies and are consistent with the Town's overall plan and vision for the transportation system.

Traffic Analysis

As part of this study, a traffic analysis was carried out for Steeles Avenue between Tremaine Road and Industrial Drive for the existing (2017) and future (2031) conditions (**Section 2.2**).

Problem Being Addressed

The key problems and opportunities being addressed by the Steeles Avenue MCEA Study include:

- Without improvements, Steeles Avenue is expected to experience significant delays during peak periods as travel demand continues to grow by 2031.
- To support future growth and travel demands, improvements to Steeles Avenue are required.
- The improved corridor should support all modes of transportation (i.e. active transportation, transit services inter-regional travel, and goods movement).

Halton Region has carried out this study for the improvements on Steeles Avenue corridor to address these requirements in accordance with the MCEA process.

A problem and opportunity statement was developed to guide this study:

Without improvements, Steeles Avenue is expected to experience delays during peak periods as travel demand continues to grow by 2031. Halton Region's Transportation Master Plan, in conformity with Provincial Plans, identifies the widening of Steeles Avenue between Tremaine Road and Industrial Drive. To support future growth and travel demand, and provide network continuity, improvements to the Steeles Avenue corridor are required. A grade separation at CP Railway between Tremaine Road and Peru Road is recommended. The improved corridor should support all modes of transportation (i.e. active transportation) and provide safety for all road users.

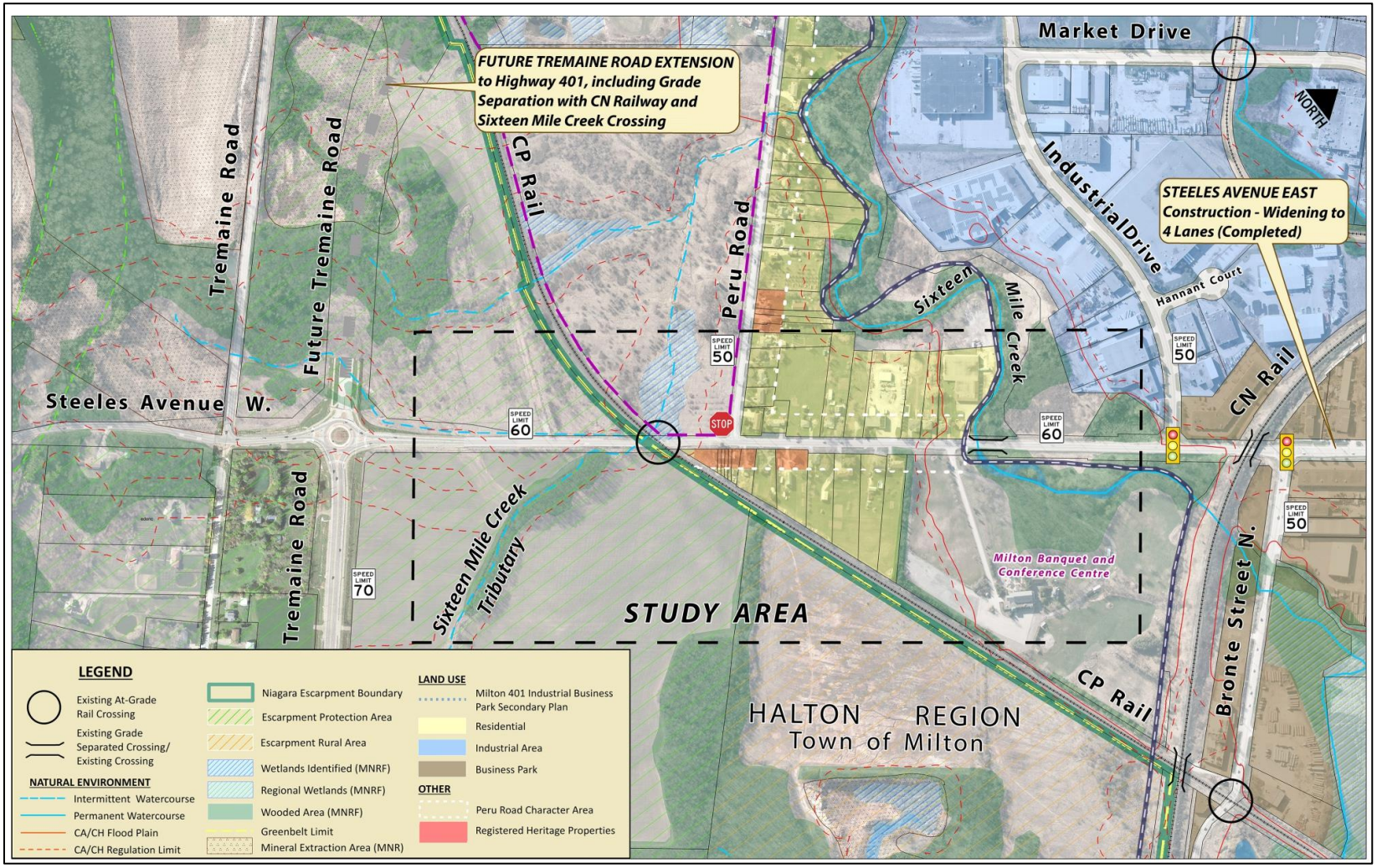
ES.3 Existing Conditions

As documented in **Section 3** of this ESR, an important undertaking of this study was to establish the study area's existing conditions to identify potential constraints as it related to developing transportation improvements along Steeles Avenue. Existing conditions assessed for this study included the natural, socio-economic and cultural environment, drainage and watershed characteristics, hydrogeology, source water protection and utilities. The existing conditions assessment included an overview of the transportation features and facilities that exist within the study area.

Exhibit ES-2 depicts the study area's key features. An overview of existing conditions includes the following:

- The character of Steeles Avenue is generally rural within the study area.
- Existing land uses include the Village of Peru which comprise residences and businesses along Steeles Avenue and Peru Road.
- Commercial/industrial land uses exist on Industrial Drive and along the north side of Steeles Avenue.
- Between Peru Road and Tremaine Road, lands are designated under the Niagara Escarpment Plan Protection Area and Greenbelt Plan which will likely remain undeveloped in the future.
- A bridge crosses Sixteen Mile Creek east of Peru Road and an at-grade crossing traverses the CP railway (two tracks) west of Peru Road.

Exhibit ES-2: Existing Conditions / Natural Heritage Features Plan



ES.4 Alternative Planning Solutions

As Phase 2 of the MCEA process indicates, alternative planning solutions provide an opportunity to broadly examine fundamentally different ways to address transportation problems and opportunities. The alternative planning solutions are assessed against their ability to reasonably address the problems and opportunities, and in consideration of the constraints identified in the early stages of the study, to identify a preferred solution(s) for which alternative designs can be developed.

For this study, alternative planning solutions have been identified and the results of the evaluation are provided below in **Table ES-1**.

Table ES-1: Results of the Evaluation of Alternative Planning Solutions

Alternative Planning Solutions	Results of the Evaluation
Alternative 1: "Do Nothing"	Does not address any of the Problems and Opportunities
Alternative 2: Limit Development	Limiting Development was not considered to be reasonable in isolation, and does not contribute to a fine-grained street network that supports community growth, improved pedestrian options and access to transit.
Alternative 3: Travel Demand Management (TDM) Measures	Travel Demand Management (TDM) Measures does not fully address the future needs on Steeles Avenue, as travel demand continues to increase with ongoing growth and development. However, this would be considered as part of the overall improvement strategy.
Alternative 4: Improved Transit Services (Milton Transit and GO Transit) / Other Modes of Transportation	Improved Transit Services (Milton Transit and GO Transit) / Other Modes of Transportation are part of the overall transportation strategy but does not address the problem on their own. However, this would be considered as part of the overall improvement strategy.
Alternative 5: Intersection and / or Operation Improvements	Intersection and / or Operation Improvements would not fully address the identified problem. However, this would be considered as part of the overall improvement strategy.
Alternative 6: Improvements to Other Roadways Beyond the Planned Program	Improvements to Other Roadways Beyond the Planned Program would require separate studies and widening beyond the planned program will not be consistent with the overall transportation network and land use planning.
Alternative 7: Improvements to Steeles Avenue, including widening from two to four general purpose lanes (along the existing Steeles Avenue alignment or a realigned/bypass route), provision for active transportation, and the consideration of a grade separation with CP Rail.	Improvements to Steeles Avenue is recommended because it fully addressed the problems and opportunities identified for this study by: ▶ Addressing the needs identified in Halton Region Transportation Master Plan and Active Transportation Master Plan to support future growth; ▶ Providing for active transportation facilities; and, ▶ Creating a grade separation at the CP Rail crossing.

ES.5 Design Alternatives

The development and evaluation of alternative design concepts was an iterative process and consisted of the following stages (see **Section 5** of the ESR):

- Develop road cross section (see **Section 5.2**);
- Evaluate and identify a recommended or preferred road corridor concept (i.e., corridor to the north, south or along existing alignment) (see **Section 5.4**);
- Develop and evaluate road design alternatives within the preferred road corridor concept, and select a preferred road alignment (see **Section 5.5**);
- Compare and identify a preferred CP grade separation type (i.e., overpass vs. underpass) (see **Section 5.6**); and,
- Prepare a preliminary design of the preferred design alternative (see **Section 5.9**).

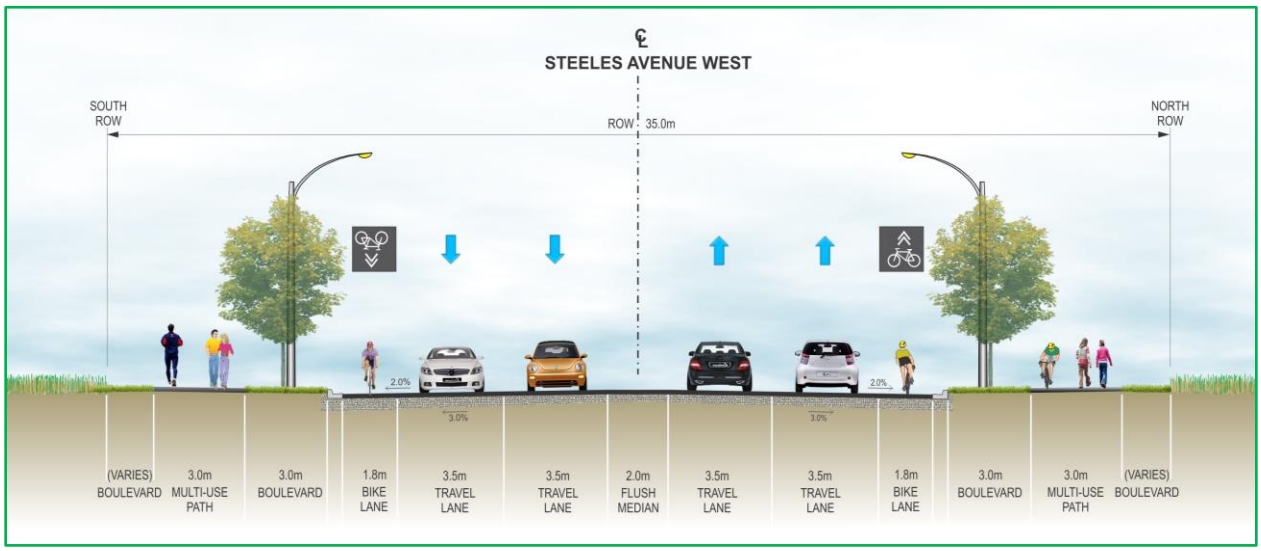
Typical Road Cross Section

The typical section for the proposed 4-lane Steeles Avenue was developed based on the planned overall right-of-way width of 35 m, which is consistent with the Halton Region Transportation Master Plan – The Road to Change (2011), as well as the Region's Active Transportation Master Plan (2016) and the Official Plan.

The typical cross section of the future Steeles Avenue corridor is shown in **Exhibit ES-3**. It is proposed that the typical cross section will consist of two 3.5 m vehicle travel lanes in each direction. On-road bike lanes (1.8 m) and multi-use trails (3.0 m) will be provided on both sides of the road to accommodate cyclists, pedestrians and users of mobility devices.

It should be noted that, during detailed design, there may be minor adjustments to the typical cross section at approaches to intersections to accommodate operational requirements and in constrained areas to minimize impacts to adjacent land uses where feasible.

Exhibit ES-3: Proposed Typical Cross Section



Road Corridor Concept Alternatives

Within the study limits between Tremaine Road and Industrial Drive, three road corridor concept alternatives were considered: Corridor Concept 1 – Improvements along the existing right-of-way; Corridor Concept 2 – New corridor to the south of the existing right-of-way; and Corridor Concept 3 – New corridor to the north of the existing right-of-way.

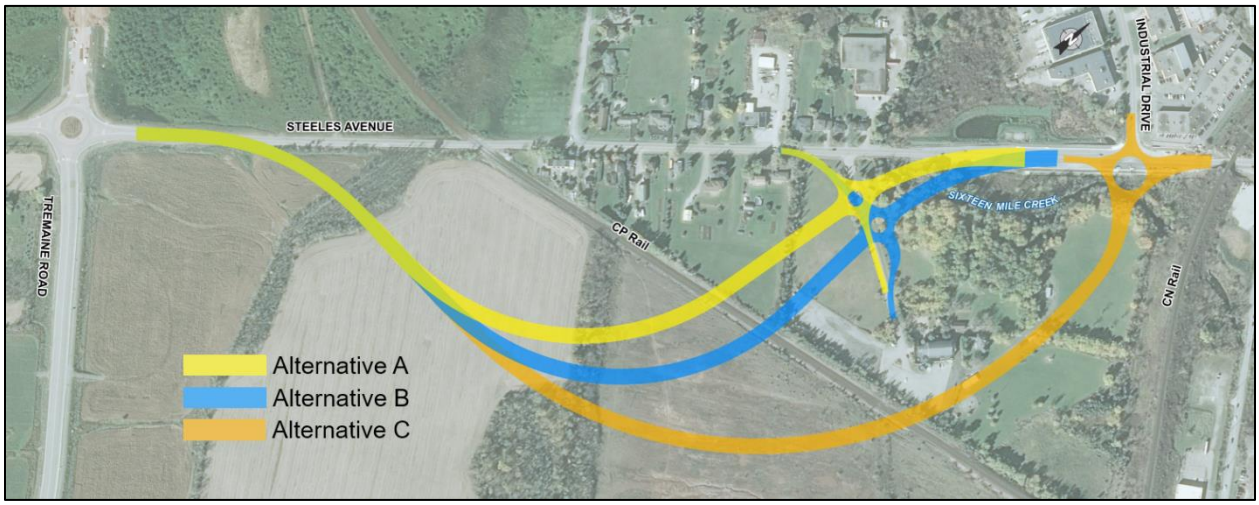
As a result of a detailed evaluation, the South Corridor Concept was recommended based on the following:

- It is consistent with the Town's and Region's planning policies.
- The ability to avoid direct impacts to the historic hamlet of Peru and Character Area located along Peru Road north of Steeles Avenue.
- The opportunity to mitigate flooding concerns and provide a more perpendicular design at the new Sixteen Mile Creek crossing.
- The relative ease in construction as it could be staged within existing greenfield sites.
- It would provide greater spatial separation between the CP Rail line and watercourses.

Alignment Alternatives

Three design alternatives were developed for the realignment of Steeles Avenue within the south corridor concept (see **Exhibit ES-4**).

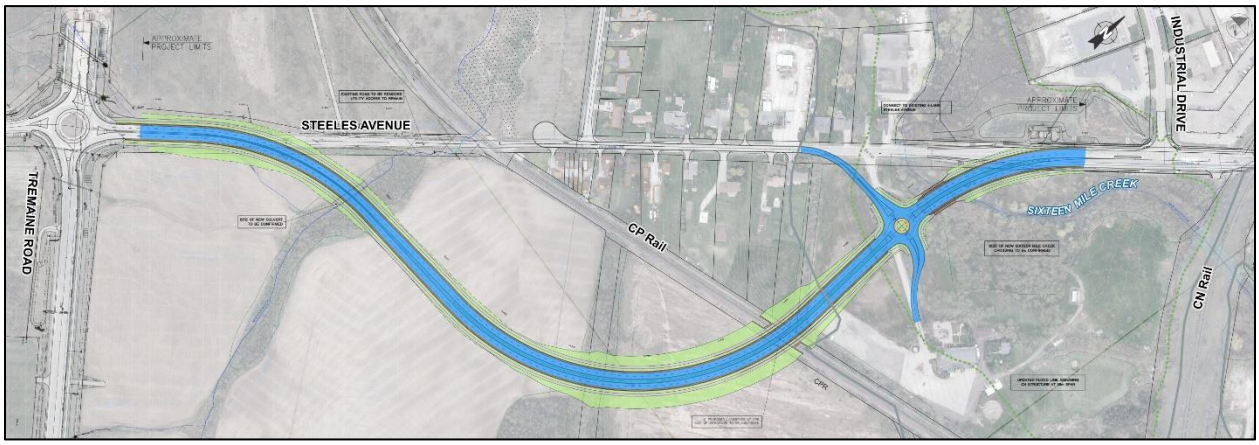
Exhibit ES-4: Road Alignment – All Alternatives



The detailed assessment and evaluation table, shown in **Table 5-3**, provides an assessment and evaluation of the three road alignment alternatives based on key technical, environmental, socio-economic and cultural criteria (per **Section 5.3**).

Alternative B is recommended as the preferred road alignment as it provides the best 'balance' among all factors that were considered (see **Exhibit ES-5**).

Exhibit ES-5: Preliminary Preferred Road Alignment Alternative – Alternative B



Grade Separation Design Alternatives

As part of the proposed realignment of Steeles Avenue and future improvements to the corridor, a grade separation is proposed between the new Steeles Avenue alignment and CP railway (south of existing Steeles Avenue corridor). Two basic grade separation design alternatives were evaluated:

- Overpass – road over rail; and
- Underpass – rail over road.

The evaluation of the overpass versus underpass is presented in **Table 5-4**. An underpass (rail over road) is preferred because this option:

- impacts property less;
- is more consistent with the Niagara Escarpment Plan's policies that help protect escarpment views;
- has less visual intrusion on the adjacent community; and
- is more attractive to pedestrians, cyclists and users of mobility devices since the multi-use trail is raised above the roadway, under the bridge.

Intersections

The proposed realignment of Steeles Avenue to the south of the existing corridor would connect the Tremaine Road roundabout and the intersection at Industrial Drive (which has been widened to four lanes easterly).

A new intersection will be provided to connect Steeles Avenue and Peru Road. While the connection is being proposed as a roundabout in this study (as shown in **Exhibit 5-6)**, both a roundabout intersection and a signalized intersection will be evaluated during the detailed design stage.

ES.6 Project Description

Major Features

Currently, Steeles Avenue is posted at 60 km/h between Tremaine Road and Industrial Drive. During detailed design, the proposed posted speed limit for Steeles Avenue will be reviewed. It is currently anticipated that the proposed posted speed limit will be 60 to 70 km/h. The preliminary plan is provided in **Appendix J**; the Project Overview is provided in **Exhibit ES-6**.

Exhibit ES-6: Project Overview

Horizontal Alignment

The widening and realignment of Steeles Avenue from Tremaine Road to Industrial Drive will generally be shifted to the south of the existing road allowance and cross under the CP railway tracks (at a skew) with a “best fit” approach to minimize property impacts. Near the CP grade separation (**Appendix J**, Plate #7, approximately station 5+900), Steeles Avenue will be aligned to minimize property impacts to the residential properties on the north side and business property on the south side.

The proposed roundabout intersection along Steeles Avenue at station 6+060 (**Appendix J**, Plate #9) will provide a connection to existing Steeles Avenue and the driveway to 3090 Steeles Avenue. While the connection is being proposed as a

roundabout in this study, both a roundabout intersection and a signalized intersection will be evaluated during the detailed design stage.

Typical Road Cross-Section

The typical road cross-section for the proposed 4-lane Steeles Avenue was developed based on the planned overall right-of-way width of 35 m. The typical cross section of the future Steeles Avenue corridor is shown in **Exhibit ES-3**. It is proposed that the typical road cross-section will consist of two 3.5 m vehicle travel lanes in each direction. On-road bike lanes (1.8 m) and multi-use trails (3.0 m) will be provided on both sides of the road to accommodate cyclists, pedestrians and users of mobility devices.

It should be noted that, during detailed design, there may be adjustments to the typical road cross-section at approaches to intersections to accommodate operational requirements and further reduce impacts to adjacent land uses where feasible.

Intersection and Access

In the preferred design, the future east-to-west Steeles Avenue corridor will start just east of the existing Tremaine Road roundabout. A grade separation will be constructed at the CP Rail and new bridge will be constructed at Sixteen Mile Creek . The alignment of Steeles Avenue will reconnect with the existing road, just west of Industrial Drive.

A roundabout will provide a connection to Steeles Avenue and the Peru neighbourhood. The existing portion of Steeles Avenue will end in a cul-de-sac just west of Peru Road, and east of the CP Rail line. The section of Steeles Avenue west of this area will be closed, including the existing CP Rail crossing. The type of intersection control will be reconfirmed during the detailed design stage.

The above noted roundabout or signalized intersection will also provide a new driveway access to 3090 Steeles Avenue.

Provisions for Active Transportation

The preliminary preferred design will include a multi-use trail and on-road bike lanes on both sides of the road. The multi-use trail will be a concrete sidewalk on the Steeles Avenue bridge over Sixteen Mile Creek.

Construction Phasing

With the realignment of the proposed Steeles Avenue to the south of the existing road allowance, it is anticipated that the proposed structures and majority of the roadwork can be constructed while maintaining traffic on the existing roadway. Once completed, the Steeles Avenue traffic can be moved to the new roadway, the existing CP at-grade crossing will be removed, and the closed section of the existing Steeles Avenue will remain open for to access Milton Hydro.

Property Requirements

The approximate property requirements for privately owned or publicly owned (municipal) properties are summarized in **Table ES-2**. Property requirements are preliminary only and subject to further review and confirmation during detailed design.

A total of seven (7) properties may be impacted, including a Town of Milton property:

Table ES-2: Preliminary Property Requirements

Location	Preliminary Property Requirements (ha) (35 m ROW / Grading Easement / Permanent Easement / Non-ROW Regionally Owned)
7649 Tremaine Road	2.478 / 0 / 0.030 / 0.359
Town of Milton Property	1.627 / 0 / 0 / 0
3164 Steeles Avenue	0.0094 / 0 / 0 / 0
3156 Steeles Avenue	0.116 / 0 / 0 / 0
3090 Steeles Avenue	1.675 / 0.512 / 0 / 0
Property on the NW corner of Peru Road and Steeles Avenue West	0.139 / 0 / 0 /0
3230 Steeles Avenue	0.0064 / 0 / 0 / 0
Total Area	**6.051 / 0.512 / 0.030 / 0.359**

Preliminary Cost Estimate

The total cost to realign Steeles Avenue between Tremaine Road and Industrial Drive, including structural costs, is estimated to be $49,518,697 million (excluding HST), excluding property. Detailed costs are provided in the **Section 6.16**.

ES.7 Consultation

Throughout this study, Halton Region engaged local residents, key stakeholders, technical agencies and Indigenous communities on important elements of this undertaking.

Outreach and engagement tools included notices, newspaper ads, direct mail, email correspondence, project website updates, PICs, as well as agency and individual property owner meetings. All public notifications, materials, comments received and responses, excluding personal information are provided in **Appendix A**.

Notices were emailed and mailed to property owners within the study area, stakeholders, agencies and Indigenous Communities. Key consultation events are outlined in **Table ES-3** below. Following the study commencement, individuals who expressed interest in the project and as requested, were added to the project mailing list to receive updates on the study as it progressed.

Table ES-3: Key Consultation Events

Consultation Event	Date
Notice of Study Commencement	June 1, 2017
Notice of Public Information Centre #1	November 2019
Public Information Centre #1	November 21, 2019
Notice of Public Information Centre #2	April 2021
Public Information Centre #2	April 15, 2021 – May 17, 2021
Notice of Study Completion	December 15, 2022

Indigenous communities notified to participate in this study included the Mississaugas of the Credit First Nation, Six Nations of the Grand River, Haudenosaunee Confederacy Chiefs Council (consultation is typically deferred through the Haudenosaunee Development Institute (HDI)), and the Credit River Métis Council.

Halton Region engaged several technical agencies throughout the MCEA Study. The list of technical agencies, including utility companies and stakeholder groups, that were contacted is provided below.

- Conservation Halton (CH)
- Niagara Escarpment Commission (NEC)
- Halton Region Police Services

- Town of Milton
- Ministry of the Environment, Conservation and Parks (MECP)
- Ministry of Natural Resources and Forestry (MNRF)
- Canadian National Railway (CN)
- Canadian Pacific Railway (CP Rail)
- Ministry of Citizenship and Multiculturalism (MCM)
- Milton Hydro
- Halton District School Board
- Halton Catholic District School Board
- Halton Student Transportation Services
- Milton Fire
- Zayo Utilities
- Hydro One

Halton Region also hosted two Technical Agency Committee (TAC) meetings, which are documented in **Section 7.2**.

ES.10 Potential Environmental Impacts, Mitigation Measures and Commitments to Future Work

In addition to developing the preferred design to address transportation problems and opportunities described above, the Region also identified mitigation measures designed to avoid or minimize impacts to the natural, socio-economic and cultural environments as well as a set of commitments that the Region will comply with as the study progresses to detailed design and construction (see **Section 8**).

A fulsome list of mitigation measures and commitments to future work are provided in **Sections 8.7** and **8.9**.

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1 INTRODUCTION AND STUDY PROCESS

1.1 Introduction

Halton Region has completed a Municipal Class Environmental Assessment (MCEA) Study to assess and confirm the transportation demand and need for improvements on Steeles Avenue (Regional Road 8), between Tremaine Road (Regional Road 22) and Industrial Drive in the Town of Milton (Steeles Avenue MCEA Study). The Steeles Avenue MCEA Study was carried out in accordance with Schedule 'C' of the Municipal Class Environmental Assessment (MCEA) (October 2000, as amended 2007, 2011, and 2015), which is an approved process under the Ontario *Environmental Assessment Act*.

Steeles Avenue is a Regional Road between Winston Churchill Boulevard and Tremaine Road, and is a local road from Tremaine Road to Appleby Line within Halton Region. Beyond Halton Region, Steeles Avenue continues easterly into the City of Mississauga (Peel Region) and City of Toronto. Steeles Avenue is an important transportation facility in the existing and future Halton Region transportation network. This roadway serves the movement of goods and commuters and distributes traffic to and from the Provincial freeway system. Steeles Avenue also provides access to residential, commercial and industrial land uses in the Towns of Milton and Halton Hills.

Steeles Avenue consists of two-lanes between Tremaine Road and Industrial Drive. Steeles Avenue from Industrial Drive to Regional Road 25 has been widened from two lanes to four lanes with on-road bike lanes and an in-boulevard multi-use trail in both directions. Steeles Avenue continues as a four-lane arterial road to the east.

The need for improvements to the Steeles Avenue corridor between Tremaine Road and Industrial Drive was identified in the Halton Region Transportation Master Plan to 2031 – The Road to Change (October 2011), as well as the Region's Active Transportation Master Plan (May 2015) to support active transportation uses. As such, the MCEA Study was carried out in order to support future traffic demand based on planned land uses.

The Environmental Study Report (ESR) documents the decision making throughout the MCEA Study. This is discussed further in **Section 1.3.1.1**.

1.2 Study Area

The study area extends for a distance of approximately 1.3 km from east of realigned Tremaine Road to west of Industrial Drive in the Town of Milton, as shown **Exhibit 1-1**.

The easterly study limit will tie into the improvements completed east of Industrial Drive (i.e. widening to four-lanes with multi-use trail and sidewalk), and the westerly limit will tie into the existing roundabout at Tremaine Road, therefore completing the transportation network in the area.

1.3 Environmental Assessment Process

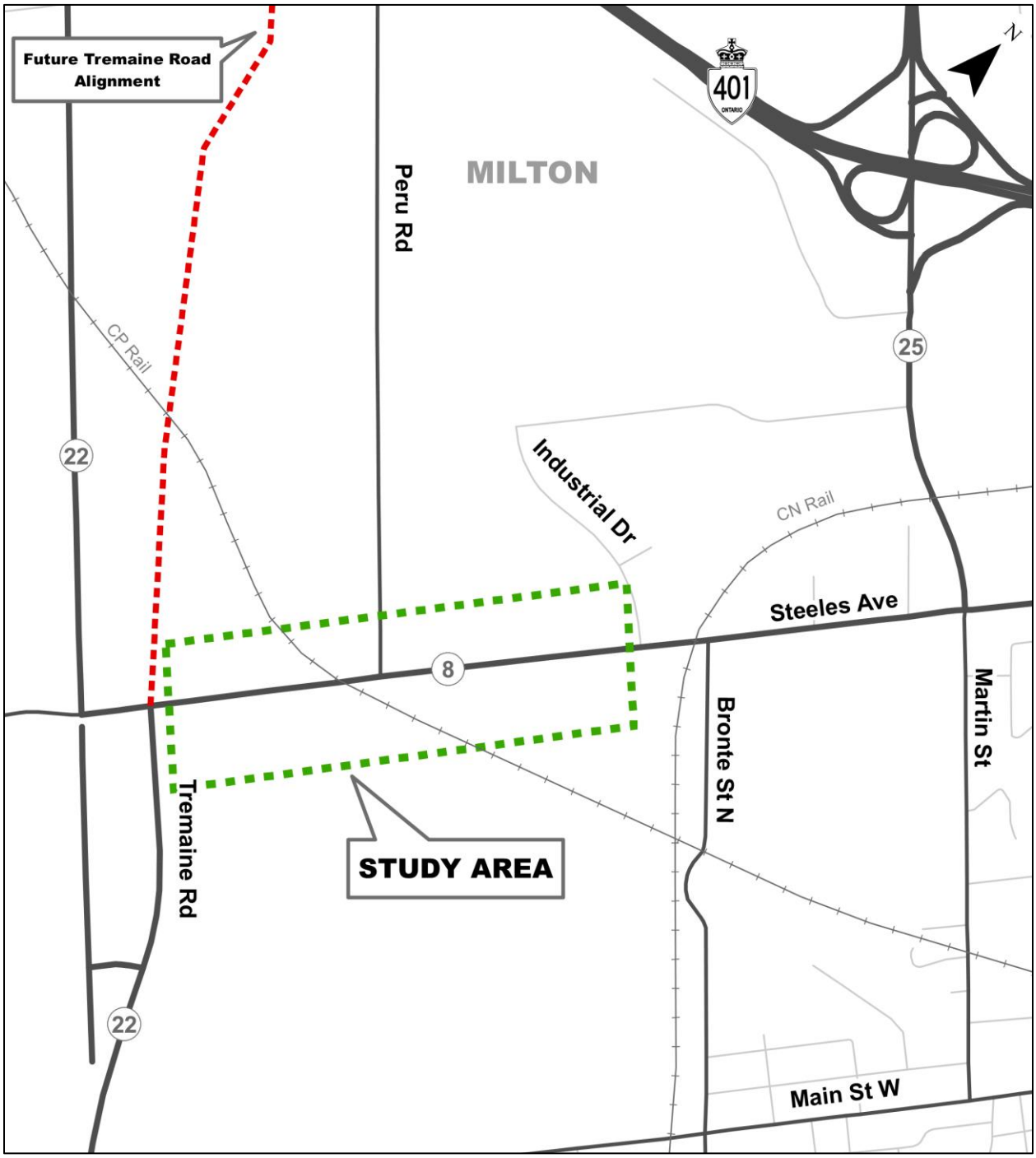
Municipal infrastructure projects are subject to the Ontario *Environmental Assessment Act* (EA Act). The Class Environmental Assessment (MCEA) is an approved self-assessment process under the EA Act for a specific group or "class" of projects. Projects are considered approved, subject to compliance with an approved MCEA process. The Municipal MCEA (October 2000, as amended 2007, 2011, and 2015) applies to municipal infrastructure projects including roads, water and wastewater.

1.3.1 Municipal Class Environmental Assessment

The Municipal Class Environmental Assessment (MCEA) outlines a comprehensive planning process and rational approach when considering the environmental and technical advantages and disadvantages of alternatives. It also identifies consultation requirements with agencies, directly affected stakeholders, Indigenous Communities and the general public throughout the process. The key principles of successful environmental assessment planning include:

- Consultation;
- Consideration of a reasonable range of alternatives;
- Consideration of effects on natural, social, cultural, and economic environments and technical components;
- Systematic evaluation;
- Clear documentation; and
- Traceable decision making.

Exhibit 1-1: Steeles Avenue MCEA Study Area



Provided that the MCEA planning process is followed, a proponent does not have to apply for formal approval under the Ontario *Environmental Assessment Act*. The MCEA process is shown on **Exhibit 1-2** and includes:

- Phase 1: identify the problem or opportunity;
- Phase 2: identify alternative solutions;
- Phase 3: examine alternative methods of implementing the preferred solution;
- Phase 4: prepare and file an Environmental Study Report; and
- Phase 5: proceed to detailed design, construction and operation.

The classification of projects and activities under the MCEA is as follows:

- Schedule A: Includes normal or emergency operational and maintenance activities, which are limited in scale and have minimal adverse environmental effects. These undertakings are pre-approved, and the proponent can proceed without further assessment and approval.
- Schedule A+: Introduced in 2007, these projects are also pre-approved. The public is to be advised prior to the implementation of the project.
- Schedule B: Includes projects that have the potential for adverse environmental effects. This includes improvements and minor expansions of existing facilities. These projects are approved subject to a screening process which includes consulting with stakeholders who may be directly affected and relevant review agencies.
- Schedule C: Includes the construction of new facilities and major expansions to existing facilities. These undertakings have the potential for significant environmental effects and must proceed under the planning and documentation procedures outlined in the MCEA document.

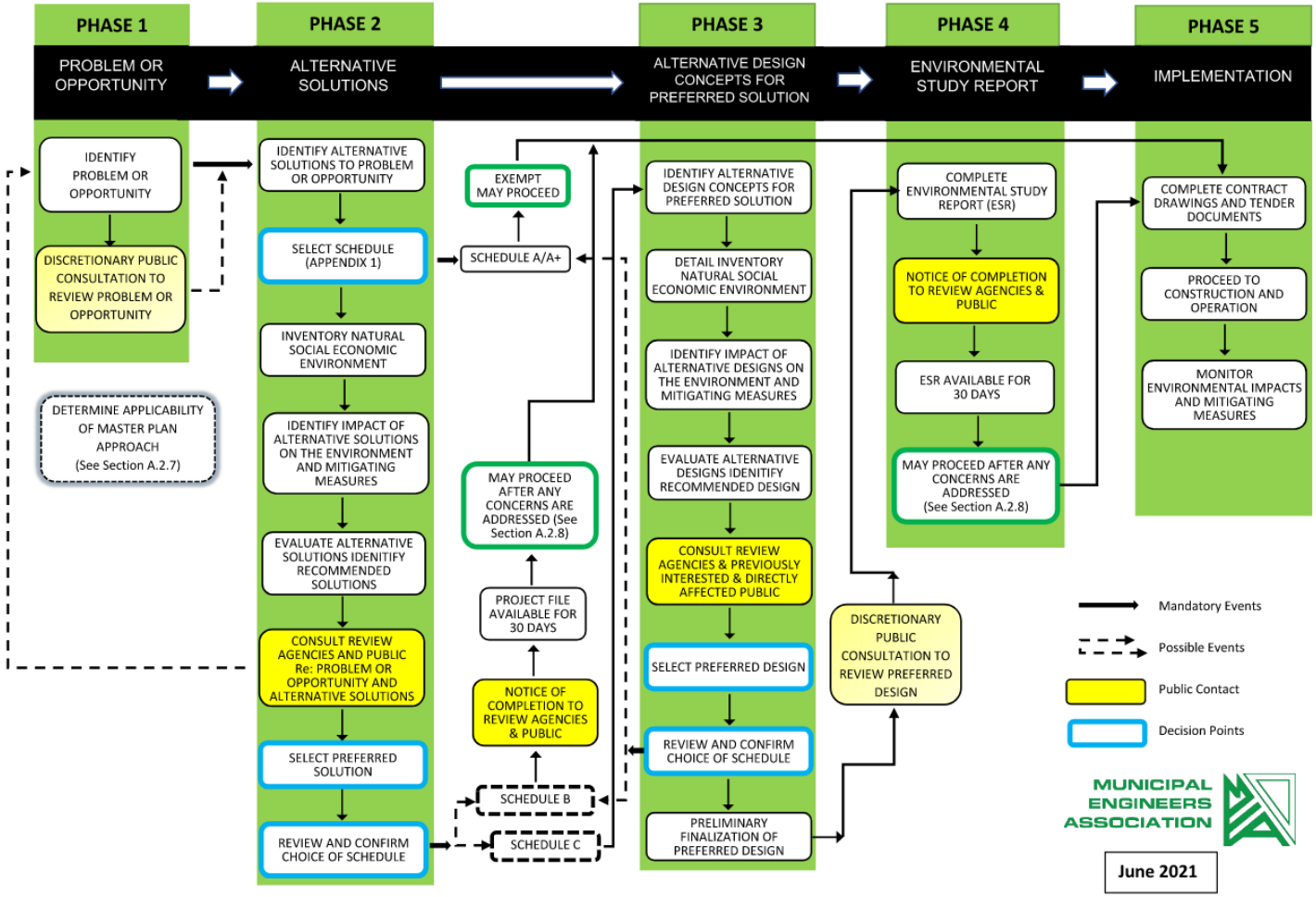
The Steeles Avenue MCEA Study has been identified as a Schedule 'C' project under the MCEA (**Exhibit 1-2**). An Environmental Study Report is required for Schedule 'C' projects to document the decision-making process.

For further information on the MCEA process, readers are referred to the Municipal Class Environmental Assessment (2000, as amended 2007, 2011 and 2015). The Halton Region Project Manager for this MCEA is also available to discuss this information and can be contacted as follows:

Ms. Jessica (Dorgo) Passingham, P. Eng.
Project Manager
Halton Region

1151 Bronte Road
Oakville, ON L6M 3L1
905-825-6000 ext. 7556
SteelesMCEA@halton.ca

Exhibit 1-2: Municipal Class Environmental Assessment Process



Source: Municipal Class Environmental Assessment, Municipal Engineers Association, October 2000, as amended 2007, 2011, and 2015.

Environmental Study Report

This Environmental Study Report (ESR) documents the process followed to develop the Preferred Design and the environmentally significant aspects of the planning, design and construction of the proposed works. The ESR describes:

- the problem being addressed
- the existing social, natural, cultural environmental considerations;
- planning and design alternatives that were considered;
- a description of the recommended alternative and its environmental effects; and
- proposed mitigation measures, commitments to further work, consultation, and monitoring associated with the implementation of the project.

As required by the MCEA, this ESR is being made available to stakeholders, regulatory agencies, Indigenous Communities and the public for a minimum 30 calendar-day review period. A Notice of Study Completion was placed in local newspapers, posted on the Region's website, and mailed or emailed to notify government agencies, Indigenous Communities, impacted property owners and members of the public on the study mailing list. During the review period, parties with outstanding issues are encouraged to bring their project concerns to the attention of Halton Region for resolution.

Section 16 Order

The MCEA process includes an appeal provision. The Minister of the Environment, Conservation and Parks has the authority and discretion to make an Order under Section 16 of the *Environmental Assessment Act*.

A Section 16 Order may require that the proponent of a project going through a Class Environmental Assessment (Class EA) process, such as the MCEA:

1. Submit an application for approval of the project before they proceed. This is generally referred to as an Individual Environmental Assessment (individual EA).

2. Meet further conditions in addition to the conditions in the Class EA. This could include conditions for: further study, monitoring and/or consultation

The Minister can also refer a matter in relation to a section 16(6) Order request to mediation.

Before making an Order, the Minister must consider the factors set out in section 16(5) of the Environmental Assessment Act. If a Section 16 Order request is made, the project proponent cannot proceed with the project until the minister makes a decision on the request. If the Minister makes a Section 16 Order, the proponent may only proceed with the project if they follow the conditions in the Order.

Note, Section 16 Order requests were previously known as Part II Order requests.

Reasons for Requesting an Order

A concerned party may ask the Minister to make a Section 16(6) Order if:

- they have outstanding concerns that a project going through a Class EA process may have a potential adverse impact on constitutionally protected Aboriginal and treaty rights;
- they believe that an Order may prevent, mitigate or remedy this impact.

A Section 16(6) Order request cannot be made to simply delay or stop the planning and implementation of a project that is going through a Class EA process. Prior to making a Section 16(6) Order request, the concerned party should first try to resolve any concerns directly with the project proponent, in this case, Halton Region.

Timing for an Order Request

During the minimum 30-day public comment period, anyone can review the documentation, submit any comments or concerns to the proponent, and request a Section 16(6) Order

To request a Section 16 Order for a project, on the grounds that an Order may prevent, mitigate or remedy potential adverse impacts on constitutionally protected, Aboriginal and treaty rights, a concerned party must make the request before the public comment period is complete.

How to make a request

To submit a Section 16(6) Order request, the following information must be provided:

- name, address and email address;
- project name;
- proponent name;

- what kind of Order is being requested i.e., a request for additional conditions or a request for an individual environmental assessment;
- details about the concerns about potential adverse impacts on constitutionally protected Aboriginal or treaty rights and how the proposed Order may prevent, mitigate or remedy the identified adverse impacts;
- whether the concerned party belongs to, represents or has spoken with an Indigenous community whose constitutionally protected Aboriginal or treaty rights may be adversely impacted by the proposed project;
- whether the concerned party has raised their concerns with the proponent, the proponent's response (if any) and why the concerns could not be resolved with the proponent;
- any other information to support the request.

Section 16 Order requests are made to the Minister of Environment, Conservation and Parks and the Director of Environmental Assessment Branch:

Minister
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 Avenue West, 1st Floor
Toronto ON M4V 1P5
enviropermissions@ontario.ca

There is no appeal of the Minister's decision with respect to a Section 16 Order. If the request for a Section 16(6) Order is denied by the Minister, the proponent can proceed with the project. If the Minister makes an Order, the proponent may only proceed with the project if they follow the conditions in the Order.

The above discussion is intended as an overview of the process only. For more information and specific instruction, please visit:

https://www.ontario.ca/page/class-environmental-assessments-section-16-order

1.3.2 The Federal Impact Assessment Act

The *Impact Assessment Act,* 2019 (IAA 2019) and associated regulations came into effect on August 28, 2019. Under IAA 2019, a federal environmental assessment is required for "designated projects". A designated project is one that includes one or more physical activities that are set out in the regulations under IAA 2019 or by order of the federal Minister of the Environment and Climate Change.

The scope of the Steeles Avenue MCEA Study was reviewed by the Project Team against the Federal Regulations Designating Physical Activities, and the Project Team determined that the study is not "designated" and therefore will not require consideration of a federal environmental assessment.

More information about the *Impact Assessment Act* (2019) is available at the following link: https://www.canada.ca/en/impact-assessment-agency.html.

1.4 Study Approach and Organization

In order to fulfill the MCEA requirements, the study followed the MCEA process as shown in **Exhibit 1-2** (above) and **Exhibit 1-3** (below). This process ensures a thorough understanding of the problem being addressed, the alternatives considered, their associated potential environmental effects and mitigation measures. This process also includes consultation with the public, agencies, and Indigenous Communities.

The study organization reflects the general administrative and technical needs of the study, as well as the study's consultation plan. The latter has been developed to ensure that all of those with a potential interest in the study have the opportunity to participate and provide input during the process.

The study organization and overview of key study stages are shown in **Exhibit 1-4** and **Exhibit 1-5**, respectively.

Exhibit 1-3: Steeles Avenue Municipal Class Environmental Assessment (MCEA) Process

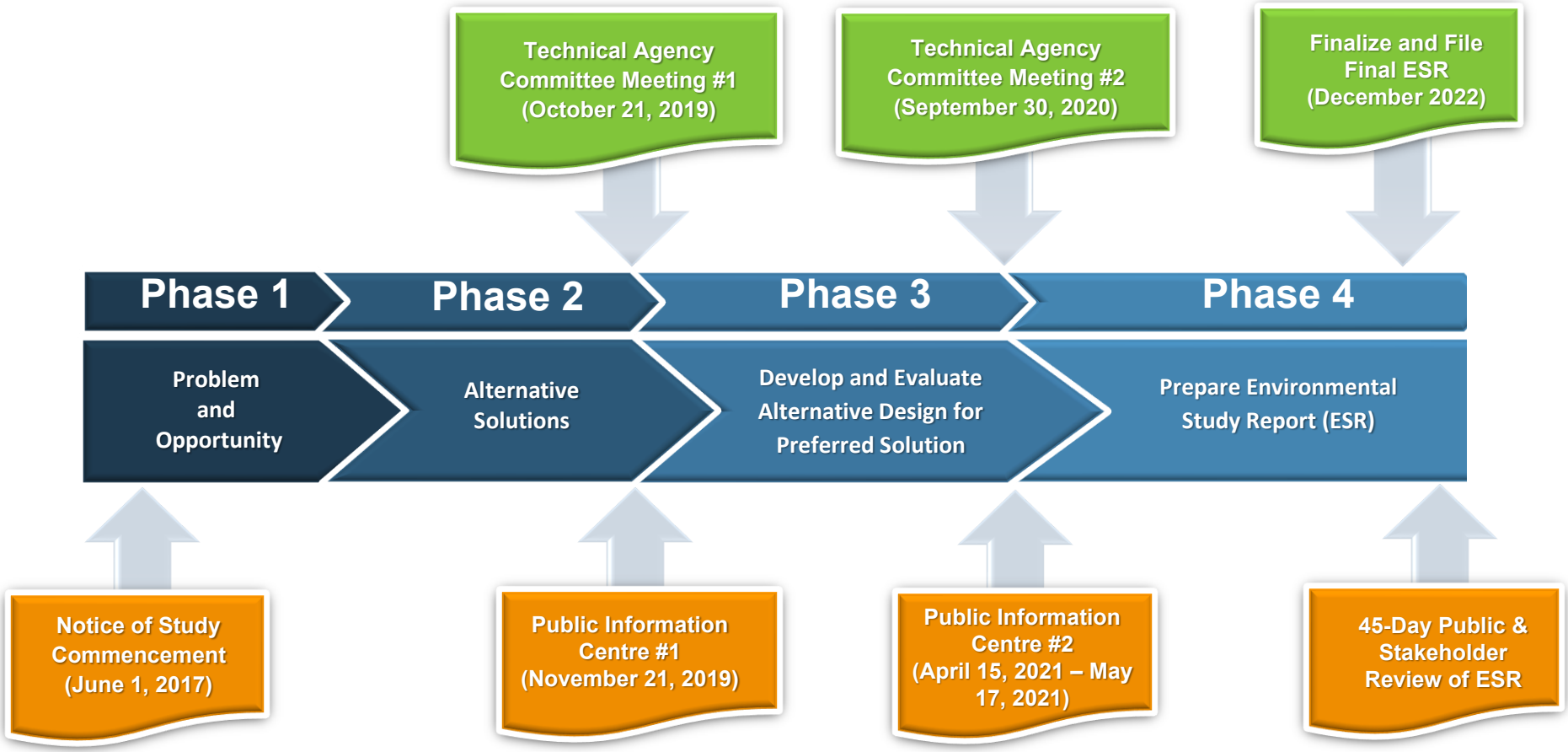


Exhibit 1-4: Study Organization

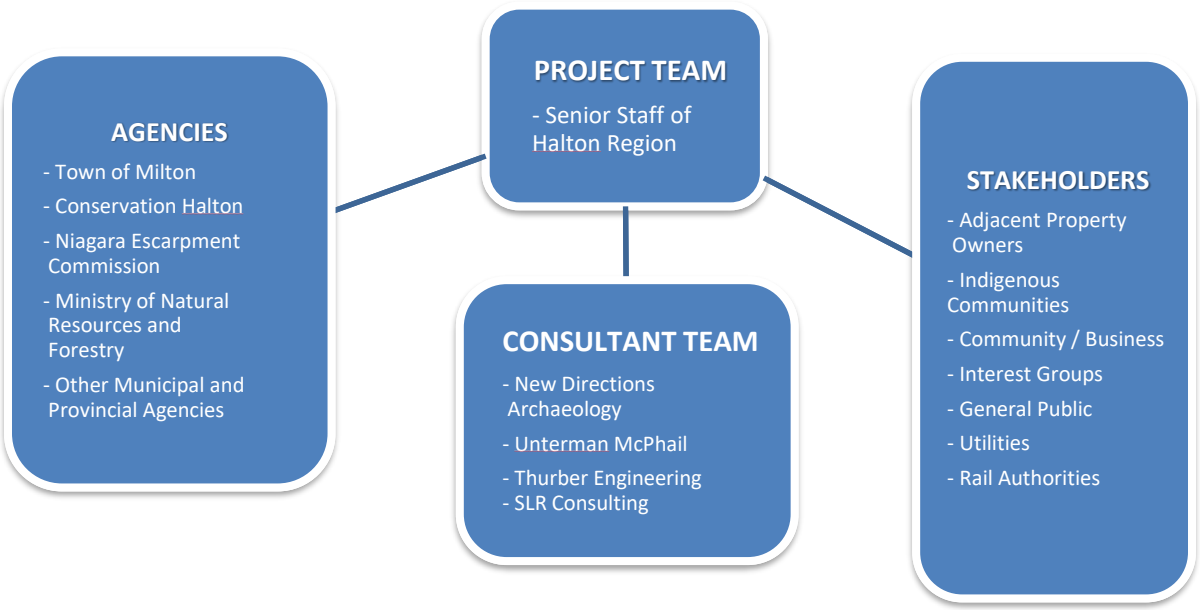
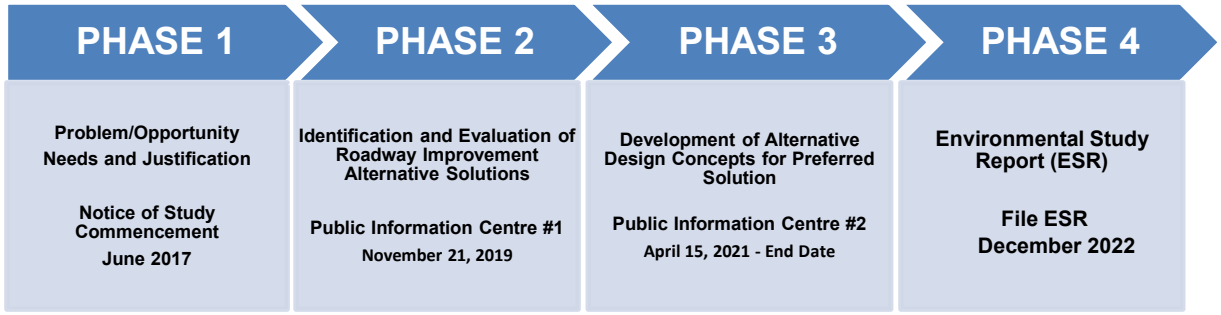


Exhibit 1-5: Key Study Stages



1.5 Consultation Plan

A consultation plan was developed at the onset of the study and was followed throughout the project. The main objective of the consultation plan is to encourage two-way communication with stakeholders, agencies and Regional staff, to aid the development of an acceptable preferred solution.

The Project Team developed a Project Contact List at the outset of the study. This list includes representatives from relevant government and regulatory agencies, utilities, community organizations, interested members of the public (residential and business), landowners, developers, and Indigenous Communities. The mailing list is provided in the correspondence record in **Appendix A**.

The Project Contact List has been maintained and updated by the Project Team throughout the study. Interested individuals responding to the Notice of Study Commencement, Public Information Centres and associated notifications, and the Notice of Study Completion were also added. Given Protection of Privacy Legislation, names, addresses and contact information of stakeholders were not released beyond the Project Team.

1.5.1 Town of Milton

The study area is located within the Town of Milton. As such the Town of Milton has been a key agency throughout the MCEA Study to ensure coordination with other planning in the Town (see **Section 7.2.2**). Town of Milton staff also attended Public Information Centre #1 and the second Technical Agencies Committee meeting. A number of Town Councillors also attended the Public Information Centre #1. A list of meetings that have taken place during the MCEA Study is provided in **Table 1-1** below.

Table 1-1: Summary of Town of Milton Meetings

Date	Purpose
July 31, 2019	Provide an overview of the Steeles Avenue MCEA Study, outline the existing conditions and alternative solutions, and present the preliminary analysis summary for the road corridor alternative design concepts and next steps. Obtain initial input from the Town of Milton.
August 13, 2020	Provide a status update on the Steeles Avenue MCEA Study, outline the design alternatives and evaluation, and present the

Date	Purpose
	preliminary preferred design alternative and next steps. Obtain input from the Town of Milton.

1.5.2 Conservation Halton, Niagara Escarpment Commission, and Ministry of Environment, Conservation and Parks

Recognizing the importance of retaining Natural Heritage Features throughout the study area and ensuring project planning was carried out to minimize impacts, Conservation Halton (CH), the Niagara Escarpment Commission (NEC), and the Ministry of Environment, Conservation and Parks (MECP) were considered to be key agencies and were provided several opportunities to provide input during the study (see **Sections 7.2.1** to **7.2.3**). Representatives from CH, NEC, and MECP also participated in the Technical Agencies Committee Meetings. **Table 1-2** are meetings that took place during this MCEA Study with CH, NEC, and MECP.

Table 1-2: Summary of Conservation Halton, Niagara Escarpment Commission, and Ministry of Environment, Conservation and Parks Meetings

Date	Agencies Involved	Purpose
September 8, 2017	CH, NEC *Note MECP was invited but was unable to attend*	Provide an overview and status update on the Steeles Avenue MCEA Study, present the existing conditions, the study status, the natural environment review, next steps, and obtain input from CH and NEC.
July 5, 2019	CH, NEC, MECP	Provide an overview and status update on the Steeles Avenue MCEA Study and present the existing conditions, alternative solutions, and next steps. Obtain input from CH, NEC, and MECP.
August 23, 2019	CH, NEC, MECP	Provide an overview of the Steeles Avenue MCEA Study, outline the existing conditions and alternative solutions, and present the preliminary analysis summary for the road corridor alternative design concepts and next steps. Obtain input from the CH, NEC, MECP.
November 30, 2021	CH	Update Conservation Halton on the preliminary hydraulic analysis completed since the last meeting and discuss the results. The meeting was facilitated with a presentation.

January 17, 2022	CH	Continue the discussion with Conservation Halton on the preliminary hydraulic analysis completed and to discuss Conservation Halton's comments on the materials presented on November 26, 2021.
May 30, 2022	CH	To discuss the draft ESR and associated draft appendices that was distributed to CH on May 4, 2022.

1.5.3 Canadian Pacific Railway (CP Rail)

There is currently one at-grade rail crossing on Steeles Avenue, which crosses CP Rail west of Peru Drive. Provisions for a grade separated rail crossing at the CP Rail line was a key component of the MCEA Study. As such, CP Rail was provided opportunities to provide input during the MCEA Study in order to ensure the development of horizontal and vertical alternatives and subsequent design was consistent with their internal policies and requirements (see **Sections 7.2.4**). **Table 1-3** outlines the meetings that were held with CP Rail during the MCEA Study process.

Table 1-3: Summary of Canadian Pacific Rail Meetings

Date	Purpose
November 26, 2019	Provide an overview and status update on the Steeles Avenue MCEA Study and present the existing conditions, road corridor alternative design concepts, and road and grade separation design alternatives. Discuss CP Rail operational constraints and other considerations, and next steps. Obtain initial input from CP Rail.
August 14, 2020	Provide a status update on the Steeles Avenue MCEA Study, outline the design alternatives and evaluation, and present the preliminary preferred design alternative and next steps. Obtain input from CP Rail.

1.5.4 Technical Agencies Committee

Technical agencies, including federal, provincial and municipal agencies and utilities, with a potential interest in the study or whose mandate may be affected, were contacted in June 2017 to ascertain whether or not they wanted to participate in the study, the appropriate contact, potential issues and concerns, and requested to provide technical input and to comment on the study's findings. The main points of contact are listed below, and related correspondence and minutes of meetings are provided in the

correspondence record **Appendix A**. **Table 1-4** provides a summary of the TAC meetings held throughout this MCEA Study.

Table 1-4: Summary of Technical Agency Committee Meetings

Date	Purpose
October 21, 2019	Provide an overview and status update on the Steeles Avenue MCEA Study and present the existing conditions, alternative solutions, and next steps. Obtain input from the TAC.
September 30, 2020	Provide a status update on the Steeles Avenue MCEA Study, outline the design alternatives and evaluation, and present the preliminary preferred design alternative and next steps. Obtain input from the TAC.

Government agencies, utilities and Indigenous Communities invited to participate in the study are listed below.

Provincial

- Infrastructure Ontario
- Ministry of Agriculture Food and Rural Affairs
- Ministry of Municipal Affairs and Housing
- Ministry of Northern Development, Mines, Natural Resources and Forestry
- Ministry of Environment, Conservation and Parks
- Ministry of Heritage, Sport, Tourism, and Culture Industries
- Niagara Escarpment Commission

Regional and Local Municipal

- Conservation Halton
- Halton Catholic District School Board
- Halton District School Board
- Halton Region Health Department
- Halton Region Police Service
- Halton Region Student Transportation Services
- Various Town of Milton Departments

Utilities and Rail Authorities

- Rogers Cable Communications Inc.
- Hydro One Networks Inc.
- Allstream
- TransCanada Pipelines
- Trans-Northern Pipelines Inc.
- Inter Provincial Pipeline Ltd.
- Union Gas
- Milton Hydro Distribution
- Canadian Pacific Railway (CP Rail)
- Canadian National Railway (CN Rail)

Indigenous Communities

- Mississaugas of the Credit First Nation
- Six Nations of the Grand River
- Haudenosaunee Confederacy Chiefs Council (consultation deferred through the Haudenosaunee Development Institute (HDI))
- Credit River Metis Council

1.6 Public Consultation

A key component of the EA process is public consultation. For this study, the main points of public consultation were the following:

- To notify the public that the study was commencing;
- To review and receive public input regarding the problem being addressed and discuss issues related to the project including alternative solutions, environmental considerations, conceptual corridors, and evaluation criteria;
- To review and receive public input regarding the design alternatives, evaluation of design alternatives, and identification of the preliminary preferred design alternative;
- To review and receive public input regarding the evaluation of alternatives and the preliminary plan and profile of the preliminary preferred design alternative including proposed mitigation measures; and
- To review the ESR upon filing on the public record.

Consultation events include Public Information Centres which are discussed further under **Section 1.6.1**.

1.6.1 Public Information Centres

Public Information Centres (PIC) are part of the public consultation process and are designed to involve stakeholders early and throughout the study process, to aid in identifying public concerns and to assist in the development of a preliminary preferred design alternative. Two PICs were held as described in **Table 1-5** below.

Table 1-5: Public Information Centre Details

Date	Purpose
November 21, 2019	**Public Information Centre #1** ▶ To provide members of the public with an opportunity to meet the Project Team and discuss issues related to the project, and review the study scope, existing conditions along the Steeles Avenue corridor, proposed typical cross sections, conceptual corridor alignment options, evaluation criteria, and next steps.
April 15, 2021 – May 17, 2021	**Public Information Centre #2*** ▶ To provide members of the public with an opportunity to review the study area and study process, existing conditions along the Steeles Avenue corridor, summarized key material presented at the first PIC and public feedback received, and review the design components and evaluation process, the preliminary preferred design, and next steps.

**Public Information Centre #2 was held virtually due to the ongoing COVID-19 pandemic.*

The comments received from the public are discussed in **Section 7.1.2** of this report. In addition, individual meetings with property owners are also summarized in **Section 7.1.3**.

Materials presented at both PICs can be found in the correspondence record in **Appendix A** and on the project website at: https://www.halton.ca/For-Residents/Roads-Construction/Municipal-Class-Environmental-Assessment-Studies/Steeles-Avenue-Corridor-Study-%E2%80%93-Tremaine-Road-to-I.

1.6.2 Filing of Environmental Study Report

The Environmental Study Report (ESR) for the Steeles Avenue MCEA Study from Tremaine Road to Industrial Drive documents the decision-making process during the

study. The Notice of Study Completion of this MCEA Study (issued on December 15, 2022) notified members of the public, agencies and Indigenous Communities that the ESR was available for public review for a 45-day period. The ESR was made available for public review on the project website (https://www.halton.ca/For-Residents/Roads-Construction/Municipal-Class-Environmental-Assessment-Studies/Steeles-Avenue-Corridor-Study-%E2%80%93-Tremaine-Road-to-I).

2 NEED AND JUSTIFICATION

2.1 Planning Context

This section summarizes the provincial, Halton Region and Town of Milton plans, policies and initiatives that have relevance to the MCEA Study. All aspects of the study including, identifying problems and opportunities, the evaluation of alternatives and the development of the design, were carried out in consideration of the policy framework to ensure that final MCEA recommendations are consistent with the Region's planning and transportation policies and Council's strategic plan.

2.1.1 Provincial Policy Statement (2020)

The Provincial Policy Statement ("PPS"), 2020, is issued under the Planning Act and supports the planning of land uses across the Province of Ontario. The PPS provides policy direction for the use and management of land, as well as infrastructure while protecting the environment and resources and to ensure opportunities for employment and residential development. The section of the PPS that is applicable to the planning of transportation infrastructure is as follows:

Part II Wise Use and Management of Resources – Specifically, *Section 2.1 Natural Heritage* outline policies to conserve biodiversity, and protecting natural heritage, water, agricultural, mineral and cultural heritage and archaeological resources of their economic, environmental and social benefits. The policies state that:

- 2.1.1 Natural features and areas shall be protected for the long term.
- 2.1.2 The diversity and connectivity of natural features in an area, and the long-term *ecological function* and biodiversity of *natural heritage systems*, should be maintained, restored or, where possible improved, recognizing linkages between and among *natural heritage features and areas*, *surface water features* and *ground water features*.
- 2.1.3 Natural heritage systems shall be identified in Ecoregions 6E and 7E, recognizing that natural heritage systems will vary in size and form in settlement areas, rural areas, and prime agricultural areas.
- 2.1.4 *Development* and *site alteration* shall not be permitted in:
    - *Significant wetlands* in Ecoregions 5E, 6E and 7E; and
    - *Significant coastal wetlands*.

- 2.1.5 *Development* and *site alteration* shall not be permitted in:
  - *significant woodlands* in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);
  - *significant valleylands* in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);
  - *significant wildlife habitat*;
  - *significant areas of natural and scientific interest*; …
  - unless it has been demonstrated that there will be no *negative impacts* on the natural features or their *ecological functions*.
- 2.1.6 Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.
- 2.1.7 Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.
- 2.1.8 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.4, 2.1.5, and 2.1.6 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or their *ecological functions*.
- 2.1.9 Nothing in policy 2.1 is intended to limit the ability of *agricultural uses* to continue.

Part III Protecting Public Health and Safety – Specifically, *Section 3.1 Natural Hazards* outlines development shall be directed away from areas of natural or human-made hazards where there is an unacceptable risk to public health or safety or of property damages, and not create new or aggravate existing hazards. Mitigating potential risks to public health or safety or of property damage from natural hazards, including the risks that may be associated with the impacts of a changing climate, will require the Province, planning authorities, and conservation authorities to work together.

- 3.1.1 Development shall generally be directed, in accordance with guidance developed by the Province (as amended from time to time), to areas outside of:
  - Hazardous lands adjacent to river, stream and small inland lake systems which are impacted by flooding hazards and/or erosion hazards; and
  - Hazardous sites.
- 3.1.2 *Development* and *site alteration* shall not be permitted within:

Areas that would be rendered inaccessible to people and vehicles during times of *flooding hazards*, *erosion hazards*, and/or *dynamic beach hazards*, unless it has been demonstrated that the site has safe access appropriate for the nature of the *development* and the natural hazard; …

- 3.1.3 Planning authorities shall prepare for the *impacts of a changing climate* that may increase the risk associated with natural hazards.
- 3.1.7 Further to 3.1.6, and except as prohibited in policies 3.1.2 and 3.1.5, *development* and *site alteration* may be permitted in those portions of *hazardous lands and hazardous sites* where the effects and risk to public safety are minor, could be mitigated in accordance with provincial standards, and where all of the following are demonstrated and achieved:

  a) *Development* and *site alteration* is carried out in accordance with *floodproofing standards, protection works standards*, and *access standards*;

  b) Vehicles and people have a way of safely entering and existing the area during times of flooding, erosion and other emergencies;

  c) No adverse environmental impacts will result.

Part IV Vision for Ontario's Land Use Planning System – The development of land should be optimized to promote efficient use of land, resources and public investment in infrastructure and public service facilities. These land use patterns promote mixed uses including residential, employment, recreation, parks and open space. The supporting transportation infrastructure is to provide choices and promote increased use of active transportation as well as transit before other modes of travel. This is in support of building livable and healthy communities.

Part V Policies – Specifically, *Section 1.6.7 Transportation Systems* and *Section 1.6.8 Transportation and Infrastructure Corridors* outline the policies for infrastructure and public service facilities under transportation systems and policies for transportation and infrastructure corridors. The policies state that:

- "Transportation systems should be provided which are safe, energy efficient, facilitate the movement of people and goods, and are appropriate to address projected needs."
- "As part of a multimodal transportation system, connectivity within and amongst the transportation systems and modes should be maintained and, where possible, improved including connections which cross jurisdictional boundaries."

- "A land use pattern, density and mix of uses should be promoted that minimize the length and number of vehicle trips and support current and future use of transit and active transportation."
- "When planning for corridors and rights-of-way for significant transportation, electricity transmission, and infrastructure facilities, consideration will be given to the significant resources in Section 2: Wise Use and Management of Resources."

2.1.2 A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2020)

A Place to Grow: Growth Plan for the Greater Golden Horseshoe ("A Place to Grow"), 2020, was prepared under the Places to Grow Act (2005) and addresses Provincial interest in building stronger, prosperous communities by managing growth of the Greater Golden Horseshoe to the planning horizon of 2051. The planned growth to horizon year 2051 in Halton Region is allocated based on A Place to Grow.

The Plan enables the provincial government to plan for population growth, economic expansion and the protection of the natural environment, water resources, agricultural lands and other resources in a coordinated and strategic manner. A Place to Grow plans for growth and development in a way that supports economic prosperity, protects the environment, and helps communities achieve a high quality of life.

A Place to Grow envisions an integrated transportation network will allow people choices for easy travel both within and between urban centres throughout the GGH; automobiles will be only one of a variety of effective and well-used choices for transportation, and transit and active transportation will be practical elements of our urban transportation systems.

To ensure sustainable growth, Section 3.2.2 of the *A Place to Grow*, 2020, addresses the infrastructure required to support growth:

- *Transportation system* planning, land use planning, and transportation investment will be coordinated to implement the Growth Plan.
- The *transportation system* within the *GGH* will be planned and managed to:
    - provide connectivity among transportation modes for moving people and for moving goods;
    - offer a balance of transportation choices that reduces reliance upon the automobile and promotes transit and *active transportation*;

- be sustainable and reduce greenhouse gas emissions by encouraging the most financially and environmentally appropriate mode for trip-making and supporting the use of zero- and low-emission vehicles;
- offer *multimodal* access to jobs, housing, schools, cultural, and recreational opportunities, and goods and services;
- accommodate agricultural vehicles and equipment, as appropriate; and
- provide for the safety of system users.

- In the design, refurbishment, or reconstruction of the existing and planned street network, a complete streets approach will be adopted that ensures the needs and safety of all road users are considered and appropriately accommodated.
- Municipalities will ensure that active transportation networks are comprehensive and integrated into transportation planning to provide:
- safe, comfortable travel for pedestrians, bicyclists, and other users of active transportation.
- Lands in the study area located generally from Tremaine Road to the west to Peru Road to the east are located outside of the built boundary / settlement area. Lands in the study area located generally from Peru Road to the west and Industrial Drive to the east fall within the built boundary / settlement area as delineated in A Place to Grow. For the lands located within the settlement area, the PPS is applicable. The applicable policies of the PPS is discussed in **Section 2.1.1**. For lands located outside of outside of the settlement area, the Natural Heritage Systems (NHS) policies from A Place to Grow apply.

Section 4 of A Place to Grow recognizes and supports the role of municipal policy in providing leadership and innovation in developing a culture of conservation and addressing climate change. Applicable NHS policies are discussed below.

Section 4.2.1 of the *A Place to Grow,* 2022, prescribes the following for Water Resource Systems:

3. Watershed planning or equivalent will inform:

    a. the identification of water resource systems;

    b. the protection, enhancement, or restoration of the quality and quantity of water;

    c. decisions on allocation of growth; and

    d. planning for water, wastewater, and stormwater infrastructure.

Section 4.2.2 of the *A Place to Grow,* 2022, prescribes the following for Natural Heritage Systems:

3. Within the Natural Heritage System for the Growth Plan:
    a. New development or site alteration will demonstrate that:
        i. There are no negative impacts on key natural heritage features or key hydrologic features or their functions;
        ii. connectivity along the system and between key natural heritage features and key hydrologic features located within 240 metres of each other will be maintained or, where possible, enhanced for the movement of native plants and animals across the landscape;

Beyond the Natural Heritage System for the Growth Plan, including within settlement areas, the municipality:

- will continue to protect any other natural heritage features and areas in a manner that is consistent with the PPS; and
- may continue to protect any other natural heritage system or identify new systems in a manner that is consistent with the PPS.

Section 4.2.3 of the *A Place to Grow,* 2022, prescribes the following for Key Hydrologic Features, Key Hydrologic Areas and Key Natural Heritage Features:

1. Outside of settlement areas, development or site alteration is not permitted in key natural heritage features that are part of the Natural Heritage System for the Growth Plan or in key hydrologic features, except for:
    a. activities that create or maintain infrastructure authorized under an environmental assessment process.

The planning of Steeles Avenue improvements between Tremaine Road and Industrial Drive is consistent with planning directions in *A Place to Grow*, which is to provide connections between communities in the Town of Milton and across Halton Region, support efficient transit services, support multi-modal uses through provisions to pedestrians and cyclists, increase efficiency and flexibility of the transportation network, reduce delays for residents and businesses, and support transportation needs on arterial roads. It should be noted that the current Halton Region Transportation Master Plan accounts for a planning horizon to 2031 (see **Section 2.1.6**).

2.1.3 Greenbelt Plan (2017)

The Greenbelt Plan (2017) provides a land use planning framework that ensures a sustainable approach to managing future development and growth within the economy, environment, and society to ensure the prosperity of current and future generations. It provides additional ecological protection measures to meet long-term environmental goals that protect our resources and allow for active transportation and transit-supportive communities to offset greenhouse gas emissions.

The Greenbelt Plan (2017) was reviewed in the context of the study area between Tremaine Road and Industrial Drive. A portion of the study area, specifically to the south/west of CP Rail, is designated under the Greenbelt Plan as 'Niagara Escarpment Plan Area', and as such is subject to the Greenbelt Plan. The Sixteen Mile Creek area of the study area is identified as Urban River Valley. The boundary of the Greenbelt Plan area is shown in **Exhibit 3-1** in the following chapter. While the study area is identified as Protected Countryside under the Greenbelt Plan, it is within the Niagara Escarpment Plan (NEP) area and therefore, the NEP (see **Section 2.1.4**) is applicable.

The *Greenbelt Plan* recognizes that infrastructure is required to serve existing settlements and growth in southern Ontario. Section 4.2.1 of the Greenbelt Plan addresses General Infrastructure Policies. It states that existing, expanded or new infrastructure is subject to approval under a number of legislations including the *Environmental Assessment Act*, and that the planning, design and construction practices shall minimize impacts to the Greenbelt, and particularly the Natural Heritage System and Water Resource System, wherever possible.

The following policies are applicable to the Steeles Avenue MCEA Study:

- 4.2.1.2 (a) Planning, design and construction practices shall minimize, wherever possible, the amount of the Greenbelt, and particularly the Natural Heritage System and Water Resource System, traversed and/or occupied by such *infrastructure*;
- 4.2.1.2 (d) New or expanding *infrastructure* shall avoid *key natural heritage features*, *key hydrologic features* or *key hydrologic areas* unless need has been demonstrated and it has been established that there is no reasonable alternative; and
- 4.2.1.2 (e) Where *infrastructure* does cross the Natural Heritage System or intrude into or result in the loss of a *key natural heritage feature*, *key hydrologic feature* or *key hydrologic areas*, including related *landform features*, planning, design and construction practices shall minimize *negative impacts* on and

disturbance of the features or their related functions and, where reasonable, maintain or improve *connectivity*.

For lands falling within the Urban River Valley, the following policies shall apply from 6.2 of the Greenbelt Plan (2017):

3. All existing, expanded or new *infrastructure* which is subject to and approved under the *Environmental Assessment Act*, or which receives a similar approval, is permitted provided it supports the needs of adjacent *settlement areas* or serves the significant growth and economic development expected in southern Ontario and supports the goals and objectives of the Greenbelt Plan.

2.1.4 Niagara Escarpment Plan (2017)

Nearly half of the study area located on the south side of Steeles Avenue, between Tremaine Road and the CP railway, is designated under the Niagara Escarpment Plan, ("NEP"), 2017, as Escarpment Protection Area and a small portion south of CP railways is designated as Escarpment Rural Area. The boundary of the NEP area is shown in **Exhibit 3-1** in the following section.

As described in the NEP, Escarpment Protection Areas are important because of their visual prominence and their environmental significance, including increased resilience to climate change through the provision of essential ecosystem services. Escarpment Rural Areas are considered an essential component of the Escarpment corridor, including portions of the Escarpment and lands in its vicinity. They provide a buffer to the more ecologically sensitive areas of the Escarpment.

Section 2.12 of the NEP addresses the design and location of new and expanded transportation and utility facilities. It states that "*the objective is to design and locate infrastructure so that the least possible impact occurs on the Escarpment environment and to encourage green infrastructure and low impact development, where appropriate.*" The infrastructure should be designed to minimize negative impact on the Escarpment environment. Relevant references in the NEP also include policies in Parts 2.6, 2.7, and 2.8 pertaining to key natural heritage features and water resources as key natural heritage features, including a Provincially Significant Wetland, have been identified adjacent to Steeles Avenue within the study corridor.

Subject to Part 2 Development Criteria of NEP, "development is not permitted in key natural heritage features and water resources with the exception of: I infrastructure,

where the project has been deemed necessary to the public interest and there is no other alternative." The need and justification for improvements on the Steeles Avenue corridor is documented in **Section 2.3** of this Environmental Study Report.

2.1.5 Halton Region Official Plan (Consolidated November 10, 2021)

The Halton Region Official Plan ("Regional Official Plan"), 2021, has evolved over time and the 2021 Interim Office Consolidation of the Regional Official Plan, referred to as Halton Regional Official Plan (2021), incorporates all modifications, subsequent approvals, and approved amendments to the Plan up to and including November 10, 2021.

Section 115.3 of the Regional Official Plan outlines the following policy that is applicable to the Steeles Avenue MCEA Study:

The Regional Natural Heritage System is a systems approach to protecting and enhancing natural features and functions and is scientifically structured on the basis of the following components:

- Key Features, which include:
    - Significant habitat of endangered and threatened species;
    - Significant wetlands,
    - Significant coastal wetlands,
    - Significant woodlands,
    - Significant valleylands,
    - Significant wildlife habitat,
    - Significant areas of natural scientific interest,
    - Fish habitat,
    - Key Features that have been identified are shown on Map 1G.
    - Enhancement to the Key Features including Centres for Biodiversity,
    - Linkages,
    - Buffers,
    - Watercourses that are within a Conservation Authority Regulation Limit or that provide a linkage to a wetland or a significant woodland, and

- Wetlands other than those considered significant under Section 115.3(1)b).

As the study area contains a potion of the Regional Natural Heritage System as shown on Maps 1 and 1G of the Regional Official Plan, Section 116.1 of the Plan is applicable:

- The boundaries of the Regional Natural Heritage System may be refined, with additions, deletions and/or boundary adjustments, through:
  - An individual Environmental Impact Assessment accepted by the Region, as required by this Plan; or
  - Similar studies based on terms of reference applicable by the Region.

Section 117.1 of the Regional Official Plan outlines the following policy that is applicable to the Steeles Avenue Municipal Class Environmental Assessment Study from Tremaine Road to Industrial Drive:

Subject to other policies of this Plan, applicable policies of the Greenbelt Plan and Niagara Escarpment Plan, and applicable Local Official Plan policies and Zoning By-laws, the following uses may be permitted:

9. *essential transportation and utility facilities*

Essential is later defined in Section 233 of the Regional Official Plan as "that which is deemed necessary to the public interest after all alternatives have been considered and, where applicable, as determined through the Environmental Assessment process." The Steeles Avenue MCEA Study is an Environmental Assessment process deemed necessary through Halton Region Transportation Master Plan (2021), which is further discussed in **Section 2.1.6**. The realignment of Steeles Avenue is further reconfirmed as necessary to the public transportation network through the Town of Milton Sherwood Survey Secondary Plan, which is discussed in **Section 2.1.11**. Further, Assessment of Alternative Planning Solutions (i.e. Phase 2 of the MCEA) as discussed in **Section 4.3**, demonstrates that all alternative designs were developed and evaluated to determine a preferred planning solution. Therefore, the realignment of Steeles Avenue may be deemed essential transportation and utility facilities and permitted use in the Regional Natural Heritage System. Additionally, the ROP's Section 118 (2) policies provide further detail on the implementation of the Regional Natural Heritage System policies.

Section 139.3.7 identifies that development or site alteration within the Key Features of the Greenbelt Natural Heritage System is prohibited unless for *essential* transportation and utility facilities (among others). Section 139.3.7 is applicable to the Steeles Avenue

MCEA Study as the study area falls within the Greenbelt Natural Heritage System and the project is considered *essential* as described above.

The Official Plan identifies Steeles Avenue as a Major Arterial Road in Map 3 – Functional Plan of Major Transportation Facilities and Map 4 – Right-of-Way Requirements of Arterial Roads identifies a 35 m right-of-way on Steeles Avenue from Tremaine Road to Industrial Drive.

Section 173 of the Official Plan outlines the following policy that is applicable to the Steeles Avenue MCEA Study:

1. *Adopt a Functional Plan of Major Transportation Facilities, as shown on Map 3 and described in Table 3, for the purpose of meeting travel demands for year 2021 as well as protecting key components of the future transportation system to meet travel demands beyond year 2021.*

The functions of a Major Arterial Road as defined in the Regional Official Plan, Table 3 are:

- Serve mainly inter-regional demands
- May serve as Intensification Corridor
- Accommodate all truck traffic
- Accommodate higher order transit service and high occupancy vehicle lanes
- Connect Urban Areas in different municipalities
- Carry high volumes of traffic
- Distribute traffic to and from Provincial Freeways and Highways
- Accommodate active transportation

The Regional Official Plan also includes policies on transportation under Section 172. Regarding transportation, the objectives of Halton Region are:

- To develop a transportation system that will encourage Regional unity and satisfy inter-regional transportation demands.
- To develop a balanced transportation system that:
- reduces dependency on automobile use;
- promotes active transportation.
- To provide a safe, economic and efficient highway network for both people and goods movements with an acceptable level of service.

2.1.6 Halton Region Transportation Master Plan (2011)

The *Halton Region Transportation Master Plan (to 2031) – The Road to Change,* ("Halton Region TMP"), 2011, was completed and meets Phases 1 and 2 of the *Municipal Class Environmental Assessment* (MCEA) process (October 2000, as amended 2007, 2011, and 2015). The purpose of the study was to develop a strategy that reflects Halton Region's transportation vision to 2031, which would be a dynamic integrated transportation strategy that considers all modes of travel.

The study provides the Region with the strategies, tools and policies needed to manage traffic safely, effectively and cost efficiently, to offer a range of transportation choices to meet the needs of Halton Region residents, to identify and protect future transportation corridors, and to identify the estimated costs and timing of transportation improvements.

Halton Region is responsible for planning, constructing, operating, maintaining, and improving a network of major arterial roads for the transport of goods and people in a safe and efficient manner. The Regional road system connects the Region's rural and urban centres and provides connectivity to the provincial highway system. Steeles Avenue is a primary east west Regional arterial road through Milton and Halton Hills.

The Regional road system consists of approximately 304 centre-line kilometres resulting in approximately 934 lane kilometres of roadway.

The Halton Region Transportation Master Plan identified:

- A 35 m right-of-way for Steeles Avenue between Tremaine Road and Industrial Drive;
- Steeles Avenue to be widened from 2 to 4 shared travel lanes; and,
- The need for a Steeles Avenue grade separation at the CP railway crossing.

2.1.7 Halton Region Active Transportation Master Plan (2016)

The Halton Region Active Transportation Master Plan ("Halton Region ATMP"), 2016, recommends Regional Walking and Cycling Networks to support and encourage people to walk and bike around Halton. Active transportation is any form of human-powered transportation, including walking, cycling, rollerblading, skateboarding, and moving with mobility devices. An active transportation network includes sidewalks, multi-use trails, crosswalks, bike lanes and off-road trails. The objective of the Active Transportation Master Plan is to create a network that will make it easier for people to walk, bike and

roll around Halton. The ATMP was a recommendation of the *Halton Region Transportation Master Plan – the Road to Change to 2031* to facilitate and promote active transportation.

The Halton Region ATMP proposes bike lanes for Steeles Avenue from Tremaine Road to Industrial Drive, as well as a sidewalk and/or multi-use trail. As part of the Steeles Avenue corridor improvements, the MCEA Study considered the proposed features of active transportation which include a bike lane and sidewalk or boulevard multi-use trail.

2.1.8 Mobility Management Strategy for Halton (2016)

The Mobility Management Strategy (MMS) for Halton was completed in 2016 to identify the vision, goals, and strategies to guide the Region's short term and long-term transportation needs considering the significant population and employment growth facing the Region to 2041.

The Strategy was developed based on the principle of "Mobility-as-a-Service" that focuses on an interconnected and multi-modal transportation system.

The MMS provides Halton Region with a network and key inputs that can be further positioned to influence and shape the development of other ongoing multi-modal initiatives, such as the Ministry of Transportation Greater Golden Horseshoe Multi-Modal Transportation Plan, the update to the Metrolinx "Big Move" Regional Transportation Plan, the implementation of the Metrolinx's GO Station Access Plan and Regional Express Rail.

This MCEA Study has regard for the goals and objectives of the Mobility Management Strategy for Halton by considering a range of improvements to facilitate the movement of people and goods, along with improvements to support the multi-modal transportation network.

2.1.9 Town of Milton Official Plan (2008)

The Town of Milton Official Plan, 2008, provides policies with regard to land use planning, and a framework for growth management. Lands adjacent to Steeles Avenue between Tremaine Road and Industrial Drive are part of the Sherwood Survey Secondary Plan, and include the village of Peru which consists of residential houses and local businesses along Steeles Avenue as well as along Peru Road. Future development within Milton Heights as part of the Sherwood Survey Secondary Plan is

planned on the west side of Peru Road. Between Peru Road and Tremaine Road, some lands are designated under the Niagara Escarpment Plan as Escarpment Protection Area and Escarpment Rural Area.

Further, the Town of Milton Official Plan identifies strategic policies under Section 2.6.3.1 for the Town's Transportation System. The applicable policies are extracted below:

The Town's transportation system shall:

- Promote and support traffic movement by walking, cycling and public transit;
- Be planned and developed with a specific emphasis on social, economic and environmental concerns; and,
- Integrate all travel modes: walking, cycling, public transit, trains and the private vehicle.

The Steeles Avenue improvements that are recommended between Tremaine Road and Industrial Drive consider these policies and are consistent with the Town's overall plan and vision for the transportation system.

2.1.10 Town of Milton Transportation Master Plan (2018)

The Town of Milton Transportation Master Plan ("TMP"), 2018, was developed to plan for growth within the community and develop a vision for a well-connected community. The TMP provides an overall direction for Milton to expand its transportation network in an efficient, integrated and multi-modal network that has been planned which includes transportation options such as transit, active transportation, and Transportation Demand Management (TDM) measures to provide viable travel options to the personal automobile. Key travel modes are supported by a series of strategies to address goods movement, traffic safety and traffic calming, road design guidelines and road classification.

2.1.11 Town of Milton Sherwood Survey Secondary Plan (2008)

Overall land use planning in the study area is based on the Town of Milton's Sherwood Survey Secondary Plan (2008), which includes the future development within Milton Heights on the west side of Peru Road. Proposed improvements to the transportation network would support existing and future developments and related growth. Within the study area, lands between the CP railway and Peru Road are part of the future Milton

Heights Neighbourhood. Steeles Avenue had been identified for proposed realignment to the south as part of the Secondary Plan completed in 2008. The Sherwood Survey Secondary Plan also identifies bike lanes for Steeles Avenue between Tremaine Road and Industrial Drive.

2.1.12 Other Related Initiatives and Studies

Extension of Tremaine Road

Other related studies/projects include the extension of Tremaine Road north of Steeles Avenue to Highway 401, including an interchange with Highway 401 as identified in the Halton Region TMP (2011).

The widening and realignment of Tremaine Road (4-lane) to Steeles Avenue was recently completed including a roundabout at Steeles Avenue / Tremaine Road.

Subwatershed Impact Study Areas 1, 2, & 4 (2014)

In 2004, Milton Heights Landowners Group retained consultants to address the environmental, technical and planning issues pertaining the Subwatershed Impact Study (SIS) Areas 1, 2, and 4 located within the northwest portion of the Sherwood Survey Secondary Plan, also known as the Milton Heights Neighbourhood or Milton Phase Two North Urban Expansion Area. The Milton Heights Neighbourhood is generally bounded by Peru Road to the east, Highway 401 to the north, Tremaine Road to the west and the Canadian Pacific Railway (CP Rail) and Steeles Avenue to the south. The final SIS report was completed in 2013 and amended in 2014. In March 2022, an addendum report was completed as a result of the Endangered Species Act (ESA) permit application to relocate the NW-2-G1 tributary.

Urban Milton Flood Hazard Mapping Study, Conservation Halton (on-going)

Conservation Halton is in the process of updating flood risk models for the major tributaries of the west branch of Sixteen Mile Creek within Urban Milton to redefine the watershed flow (hydrology), and water level and velocity (hydraulics) to develop new flood hazard mapping. Updated flood mapping has been provided from Conservation Halton and this has been integrated into the proposed design, however the study was still ongoing at the time the Steeles Avenue MCEA study was completed.

2.2 Traffic Analysis

As part of the Steeles Avenue MCEA Study, a traffic analysis was carried out for Steeles Avenue between Tremaine Road and Industrial Drive for the existing (2017) and future (2031) conditions and is available in **Appendix B**.

The existing conditions and travel demand forecasting modelling results for this traffic analysis are summarized in the following sections, along with CP Rail crossing and existing Steeles Avenue conditions.

2.2.1 Existing Conditions

Steeles Avenue is an existing two-lane rural road with open ditches and posted speed of 60 km/h. Recent improvements include the realignment of Tremaine Road with a roundabout intersection at Steeles Avenue, and the widening of Steeles Avenue from 2 to 4 lanes east of Industrial Drive. There is an at-grade CP Rail crossing on Steeles Avenue west of Peru Road (approximately 17-22 freight trains per day) and there are limited provisions for cyclists and pedestrians (i.e. partially paved shoulders but no sidewalks). Daily travel demand on Steeles Avenue ranges between 400 and 800 vehicles in the peak hours.

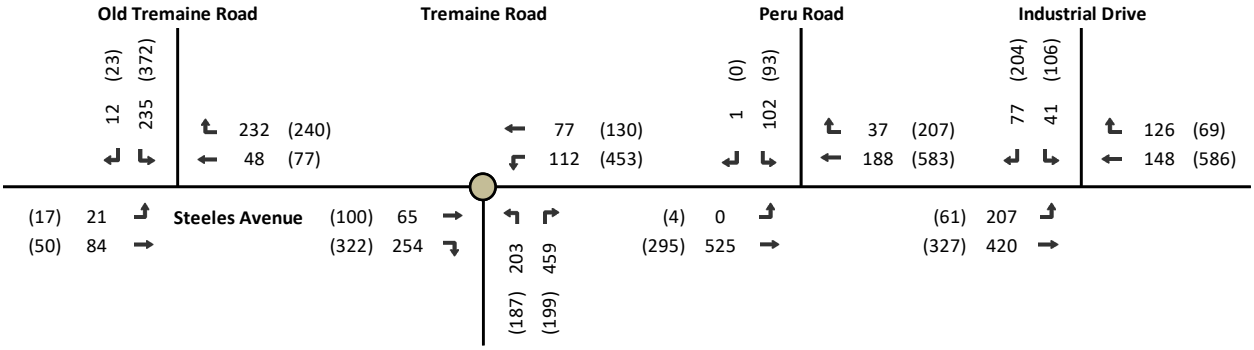
Existing intersections on Steeles Avenue between Tremaine Road and Industrial Drive include:

- Tremaine Road (roundabout)
- Peru Road (stop-controlled access onto Steeles Avenue)
- Industrial Drive (stop-controlled access onto Steeles Avenue)

2.2.2 Travel Demand Forecasting

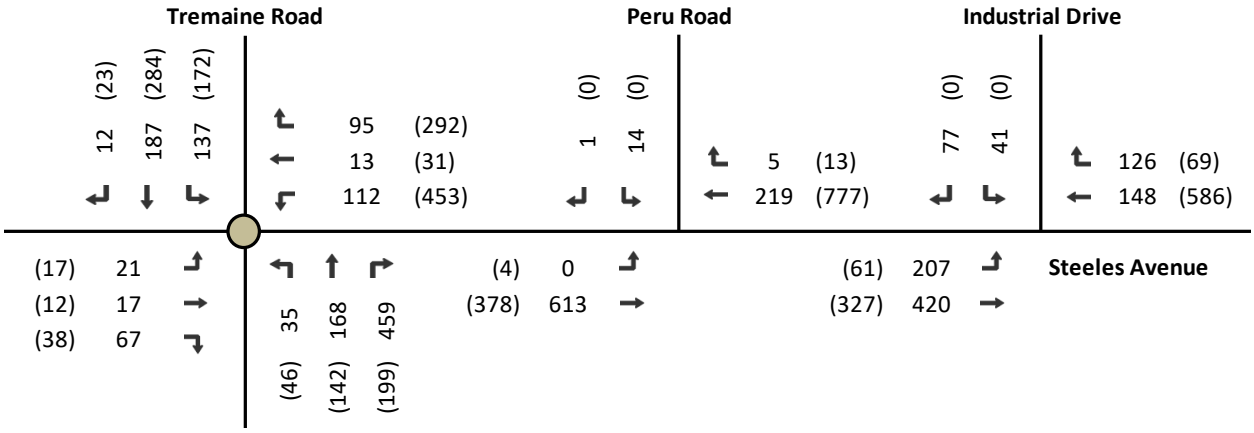
Base-year turning movement volumes were established using the available turning movement data for the Steeles Avenue intersections with Old Tremaine Road, Tremaine Road, Peru Road and Industrial Drive. The 2017 turning movement volumes were balanced across the network to ensure that demand was not under-represented. The weekday morning and afternoon peak hour volumes are summarized below in **Exhibit 2-1**:

Exhibit 2-1: 2017 AM (PM) Peak Hour Traffic Volumes



The existing turning movement volumes were adjusted to reflect the extension of Tremaine Road northerly from the roundabout, as well as the closure of Peru Road at Sixteen Mile Creek. Demand was estimated for the 26 residences on Peru Road south of Sixteen Mile Creek based on the trip rates outlined for *Single-Family Detached Housing* in *Institute of Transportation Engineers (ITE) Trip Generation* guide. These trips were assumed to be distributed along Steeles Avenue according to the current turning movement volume distributions. The balance of the existing Peru Road traffic was reassigned to Tremaine Road via 3rd Sideroad. The resulting 2017 traffic volumes are summarized below in **Exhibit 2-2**:

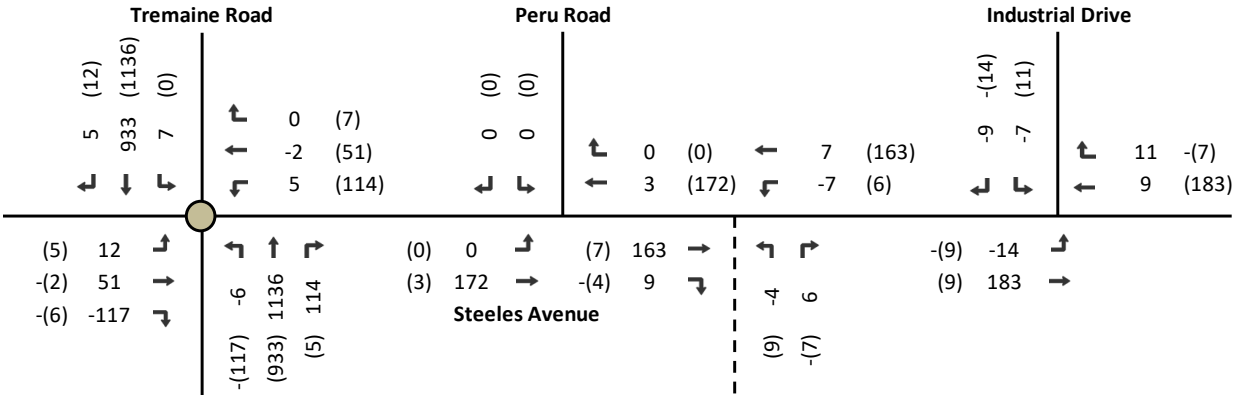
Exhibit 2-2: 2017 AM (PM) Peak Hour Traffic Volumes Reassigned



Each of the 2016 and 2031 afternoon peak hour turning movement volume projections extracted from the Region's travel demand forecasting model for the study area intersections was adjusted to remove the Milton Heights development traffic using select link analysis. The difference between the two *background* turning movement

forecasts was assumed to reflect background traffic growth and is summarized below in **Exhibit 2-3**. Corresponding morning peak hour traffic volumes have been assumed to be the inversion of the modelled afternoon peak hour traffic growth.

Exhibit 2-3: Background AM (PM) Peak Hour Traffic Growth

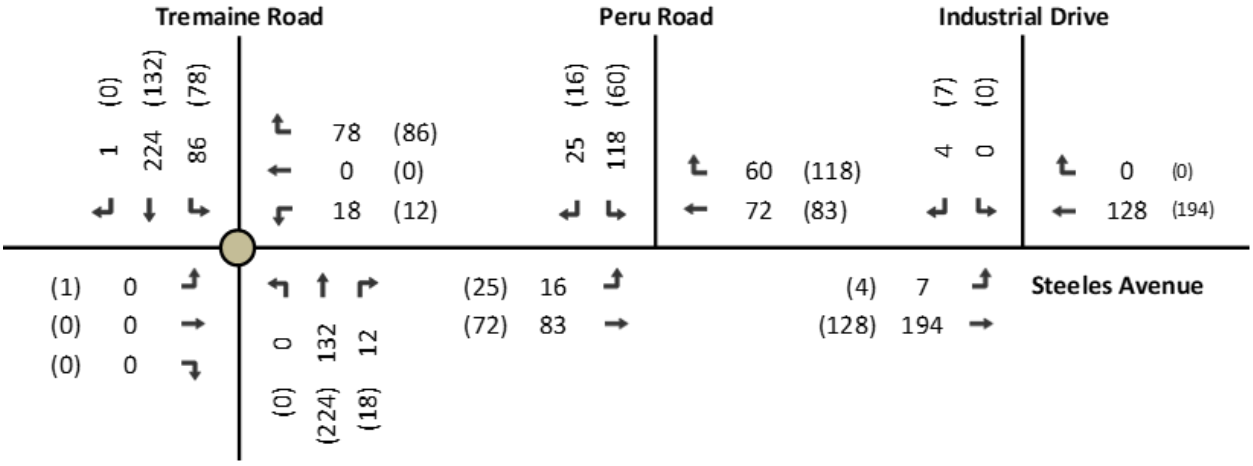


The manual assignment of the afternoon peak hour trips included for the Milton Heights Secondary Planning Area in the Region's 2031 TDM, is summarized in **Exhibit 2-4**. This assignment is based on an assumed development trip distribution derived from a detailed review of travel pattern data available from the *2016 Transportation Tomorrow Survey*[1].

In the same manner that the afternoon peak hour turning movement volumes were inverted to reflect the corresponding morning peak hour travel demand for the background conditions, this same assumption was made to establish the morning peak hour traffic assignment for the Milton Heights Secondary Planning Area.

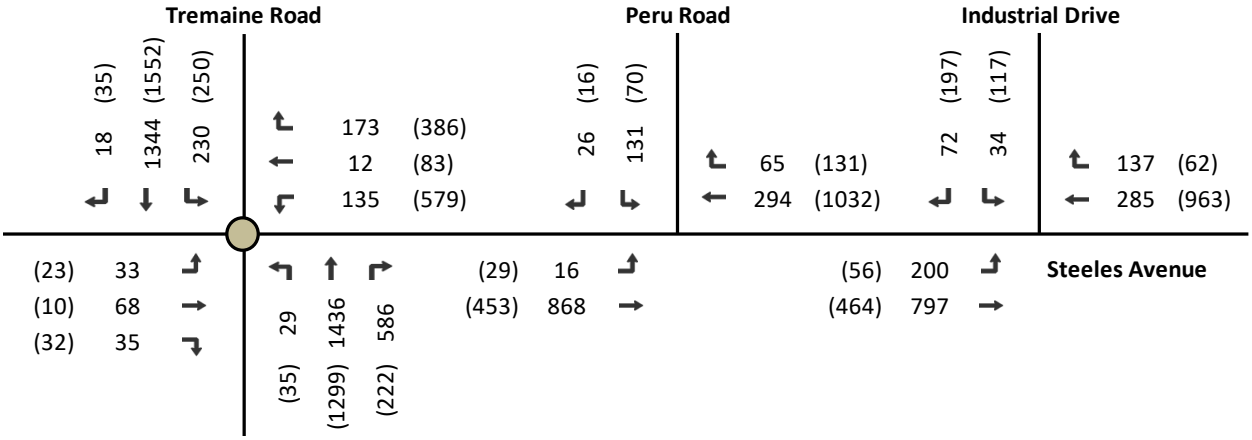
[1] *Transportation Tomorrow Survey*, Data Management Group, University of Toronto, 2016

Exhibit 2-4: 2031 Milton Heights AM (PM) Peak Hour Traffic Volumes



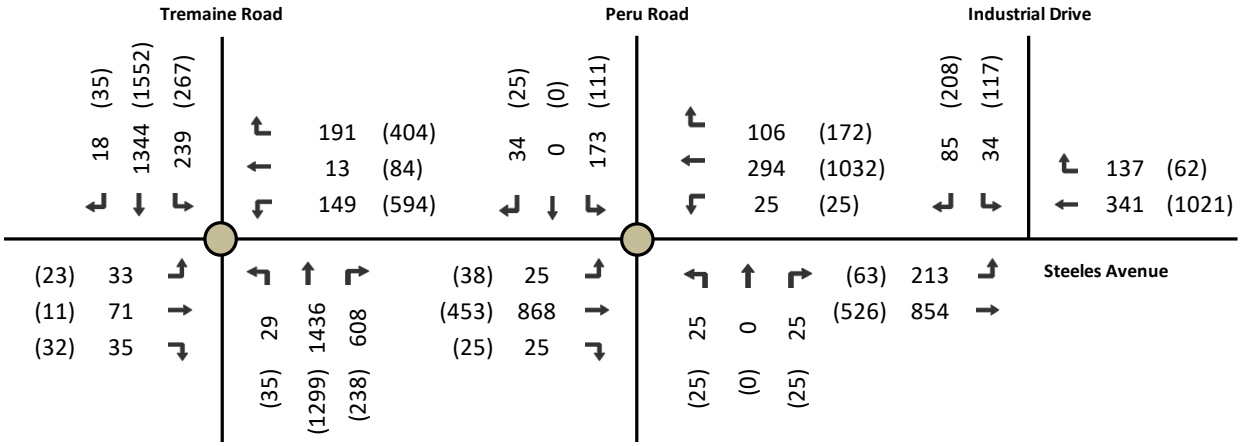
The sum of the 2017 base-year traffic volumes, the background traffic growth to 2031 and the 2031 Milton Heights traffic assignment above, to produce the 2031 Do Nothing Traffic Volume scenario, is summarized below in **Exhibit 2-5**. The forecast reduction in the morning peak hour eastbound right-turn and afternoon peak hour northbound left-turn volumes at the Steeles Avenue intersection with Tremaine Road between 2016 and 2031, based on the summary presented in **Exhibit 2-3** is greater than the corresponding existing volumes illustrated in **Exhibit 2-2**. In addition, Milton Heights does not contribute any growth to these movements, the would offset the modelled reduction in background growth. Accordingly, the morning peak hour eastbound right-turn and afternoon peak hour northbound left-turn volumes were set to 35 vehicles each to be consistent with the other movements entering and departing the intersection on the west approach.

Exhibit 2-5: 2031 AM (PM) Peak Hour Traffic Volumes: 2031 Do Nothing Scenario



The proposed realignment of Steeles Avenue between Tremaine Road and Industrial Drive would facilitate the railway grade separation (further detailed in **Section 2.2.5**). The existing Steeles Avenue alignment east of Peru Road would connect to the realigned Steeles Avenue opposite the entrance to 3090 Steeles Avenue, approximately 340 m eat of Peru Road. All Peru Road traffic would access new Steeles Avenue using this connection. As a result of the realignment of Steeles Avenue, trips generated along existing Steeles Avenue east of Peru Road will also access new Steeles Avenue opposite the entrance to 3090 Steeles Avenue. Trips generated along this section of existing Steeles Avenue and originating from or destined to new Steeles Avenue, have been assumed to be 50 inbound and 50 outbound trips during each to represent weekday peak hours. The traffic analysis also assumes that the demand generated by 3090 Steeles Avenue is the same. This traffic generation was assigned to and from the east and west along Steeles Avenue using the existing turning movement distribution at Peru Road. The assumed trip generation for the uses along Steeles Avenue and for 3090 Steeles Avenue were assumed conservatively to be in addition to the demand assessed as part of the baseline or “Do Nothing” scenario. The resulting turning movement volume forecasts are summarized below in **Exhibit 2-6**.

Exhibit 2-6: 2031 AM (PM) Peak Hour Traffic Volumes: Steeles Avenue Realignment



2.2.3 Traffic Growth Review

The resulting growth rate for Steeles Avenue based on the analysis approach outlined in **Section 2.2.1** was compared to the traffic growth rate identified by the demand model for the adjacent screenline west of Bronte Street, from Steeles Avenue to Britannia Road. A corresponding growth rate was also assessed for the study area segment of Steeles Avenue. The Milton Heights Secondary Planning Area development traffic forecast included in the 2016 demand model output was removed for the purpose of generating the required growth rates given that this development has not yet proceeded. A summary of the screenline and Steeles Avenue growth rates derived from the modelled forecasts to the projections summarized in the previous section under the heading Travel Demand Forecasting, is provided below in **Table 2-1**.

Table 2-1: Traffic Growth Comparison

Analysis Approach	Screenline / Link	Growth	2016 BASE YEAR			2031 PLANNING		
			EB	WB	Comb	EB	WB	Comb
Travel Demand Model Growth (Halton Region Model)	Screenline	Volume Growth Rate	2,509 -	4,941 -	7,450 -	4,153 4.4%	5,695 1.0%	9,848 2.1%
	Steeles Avenue	Volume Growth Rate	363 -	326 -	689 -	650 5.3%	1,058 15.0 %	1,708 9.9%

Analysis Approach	Screenline / Link	Growth	2016 BASE YEAR			2031 PLANNING		
			EB	WB	Comb	EB	WB	Comb
Traffic Analysis Approach	Steeles Avenue	Volume Growth Rate	433 -	655 -	1,088 -	581 2.4%	1,025 4.0%	1,606 3.4%

Establishing growth rates by combining directional screenline forecasts generated from the Region's travel demand forecasting model was considered as an alternative in this analysis. The corresponding growth rate of 2.1% per annum (after accounting for the absence of the Milton Heights development in 2016) is less than the 3.4% per annum Steeles Avenue growth rate resulting from the traffic analysis undertaken based on the approach outlined in the **Section 2.1.1**. Further details on the Traffic Growth Review are available in **Appendix B**.

2.2.4 Level of Service Analysis

Afternoon peak hour traffic volume forecasts for Steeles Avenue reflect 2031 peak direction travel demand of between 1,050 and 1,160 vehicles and the corresponding peak direction forecasts during the morning peak hour range between and 890 and 1,000 vehicles. These demand levels exceed the Region's established link capacity of 850 vehicles per lane for an urban arterial roadway segment.

Future network and intersection operating performance was modelled using *Vissim*, and capacity utilization for the signalized intersection of Steeles Avenue at Industrial Drive was assessed using *Synchro* (see **Appendix B**). The microsimulation confirmed that modifications to the Steeles Avenue roundabout at Tremaine Road may be required to accommodate a westbound approach consisting of a westbound left-turn lane, a shared through/left-turn lane and a dedicated right-turn lane. The modelling also demonstrated the potential requirement for a revised northbound approach, including a shared left-turn/through lane, a through lane and a dedicated right-turn lane.

With the recommended improvements to the westbound and northbound approaches, the level of service analysis identified adequate operating conditions at the roundabout at Tremaine Road. All movements can be expected to operate with a level of service D or better during each of the peak hours with the exception of afternoon peak hour eastbound left turn and through movement levels of service F and a corresponding right-turn level of service E. Operating performance at the Peru Road intersection reflects a level-of-service C or better based on the current lane geometry and traffic

control at this location. Similarly, operating performance at the Steeles Avenue intersection with Industrial Drive reflects a level of service D or better.

The traffic volume on Steeles Avenue is expected to approach the capacity of a 2-lane road (i.e. these demand levels exceed the Region's established link capacity of 850 vehicles per lane for an urban arterial roadway segment). Furthermore, per *Halton Region Transportation Master Plan (2031) – The Road to Change*, Section 3.1.1, Steeles Avenue is the primary east-west Regional arterial road through Towns of Milton and Halton Hills. The section of Steeles Avenue between Bronte Street and Tremaine Road is a major connection to Tremaine Road, which is the westerly limit of the urban boundary in the Town of Milton and will provide a future connection to the Highway 401 / Tremaine Road interchange. From a regional network continuity perspective, Steeles Avenue is proposed to be widened to four-lane cross-section through the project limits.

2.2.5 CP Rail Crossing

Steeles Avenue crosses CP Rail tracks at-grade west of Peru Road. This railway services freight trains and is a main shipping corridor for CP Rail between Toronto and the United States. The justification for a railway grade separation at realigned Steeles Avenue was evaluated on the basis of the existing and projected railway crossing indices. The combined direction peak hour travel demand reflects the 2017 conditions summarized in **Exhibit 2-2**. The estimated afternoon peak hour demand between Tremaine Road and Peru Road (after balancing intersection volumes and reassigning trips resulting from the Peru Road closure at Sixteen Mile Creek) reflects the volume at the future railway crossing.

CP Rail provided an estimate of the daily number of freight trains at the Steeles Avenue crossing in an email in June 2017. This estimate of between 17 and 22 trains has been used to establish the current railway crossing Exposure Index (EI) summarized below in **Exhibit 2-7**. It should be noted that the train volume for CP Rail is expected to change over the years, as well as the potential for future Metrolinx services on the same corridor. For the purpose of this MCEA Study, the above-noted train volume is used as the basis.

The proposed Steeles Avenue/CP Rail grade separation was previously identified in the 2011 *Halton Region Transportation Master Plan (2031) – The Road to Change* as well as the Town of Milton Sherwood Survey Secondary Plan (2008). Furthermore, the need

was confirmed on the basis of the railway crossing exposure index at the onset of the MCEA in June 2017.

Historically, most municipalities and road authorities have considered that a railway grade separation may be warranted once the Railway Crossing Exposure Index reaches 200,000. The summary presented in **Table 2-2** illustrates that the Exposure Index at the Steeles Avenue/CP crossing would exceed this threshold with a value of 230,850 based on the estimated 2017 daily travel demand and the low end of the range in daily train traffic identified by Canadian Pacific Railway. The Exposure Index ranges between nearly 300,000 and 400,000 based on the other assessed conditions.

Table 2-2: CP Rail Crossing Exposure Index

Metric	Volume/Exposure Index
May 2015 Afternoon Peak Hour Traffic Volume May 2015 24-Hour Volume May 2015 Peak Hour to 24-Hour Factor	894 10474 8.535%
2017 PM Peak Hour Volume 2031 PM Peak Hour Volume	1159 1530
2017 24-Hour Volume 2031 24-Hour Volume	13579 17926
2017 Daily Train Volume	17 to 22
2017 Railway Crossing Exposure Index (Rounded) *2031 Railway Crossing Exposure Index (Rounded)*	*230,850 to 298,750* *304,750 to 394,350*

2.2.6 Existing Steeles Avenue Roundabout Screening

A high-level assessment and evaluation of a suitable connection between the realigned Steeles Avenue and existing Steeles Avenue of Peru Road was undertaken to evaluate the suitability of a roundabout at this location. This review was carried out in accordance with Halton Region Report No. *PW-44-12 Guidelines for Consideration of Installing Roundabouts on Regional Roads'* and *Attachment 1 to PW-44-12 Guidelines for the use of Modern Roundabouts on Regional Arterial Roadways*. This review also considered criteria outlined in *NCHRP Report 672 Roundabouts: An Informational Guide, Second Edition*, released by the Transportation Research Board.

The analysis presented in Exhibits 11 and 12 of **Appendix B** demonstrated that operating performance at the junction of realigned Steeles Avenue and existing Steeles

Avenue reflects individual movement levels of service B or better for the roundabout alternative and levels of service D or better for the stop-controlled intersection alternative. In addition, an evaluation of socio-economic environment, transportation network and cost factors was conducted (Exhibit 13, **Appendix B**). Based on the overall evaluation, the benefits of a roundabout configuration at the realigned Steeles Avenue intersection with existing Steeles Avenue outweigh the benefits of a two-way stop-controlled or signalized intersection configuration. The type of intersection control will be confirmed during the future detailed design stage.

2.3 Problem Being Addressed

The following summarizes some of the key points of this section, which articulate the important problems and opportunities for this MCEA Study:

- Without improvements, Steeles Avenue is expected to experience delays during peak periods as travel demand continues to grow by 2031.
- To support future growth and travel demands, improvements to Steeles Avenue are required.
- The improved corridor should support all modes of transportation (i.e. active transportation, transit services inter-regional travel, and goods movement).

Therefore, Halton Region has carried out this study for the improvements on Steeles Avenue corridor to address these requirements in accordance with the MCEA process.

3 EXISTING CONDITIONS

Background information was collected from numerous sources including:

- The review of pertinent background studies and reports;
- Data provided by Halton Region;
- Investigations undertaken as part of this MCEA Study;
- Meetings with the Project Team;
- Correspondence and meetings with participating Technical Agencies, including the Town of Milton, Conservation Halton, NEC; and
- Consultation with key stakeholders, including CP Rail, members of the public, property owners, and local businesses.

The study area focuses on Steeles Avenue from Tremaine Road to Industrial Drive, and is located within the Town of Milton in Halton Region. **Exhibit 1-1** provides a key plan of the study area.

Exhibit 3-1 is an aerial mosaic of the study area identifying existing conditions and Natural Heritage Features which are discussed in the following sections.

3.1 Transportation

3.1.1 Transportation Network

The main components of the existing road network within the study area are described in **Table 3-1** below.

Table 3-1: Existing Road Network

Road	Description
Steeles Avenue	▶ Major Arterial Road, under the jurisdiction of Halton Region ▶ 2-lane rural cross-section with open ditches ▶ Posted speed of 60 km/h ▶ CP Rail at-grade crossing (two tracks) west of Peru Road ▶ One-way stop-controlled intersections at Peru Road and Industrial Drive ▶ Roundabout intersection at Tremaine Road ▶ No existing provisions for cyclists or pedestrians ▶ Limited illumination
Tremaine Road	▶ Major Arterial Road, under the jurisdiction of Halton Region ▶ 4-lane urban cross-section with on-street bike lanes and 3.0 m multi-use trail ▶ Posted speed of 70 km/h ▶ Roundabout intersection at Steeles Avenue
Peru Road	▶ Major Local Road, under the jurisdiction of the Town of Milton ▶ 2-lane rural cross-section ▶ One-way stop-controlled T-intersection at Steeles Avenue ▶ Posted speed of 50 km/h
Industrial Drive	▶ Minor Local Road, under the jurisdiction of the Town of Milton ▶ 2-lane rural cross-section ▶ One-way stop-controlled T-intersection at Steeles Avenue ▶ Posted speed of 50 km/h

3.1.2 Transit

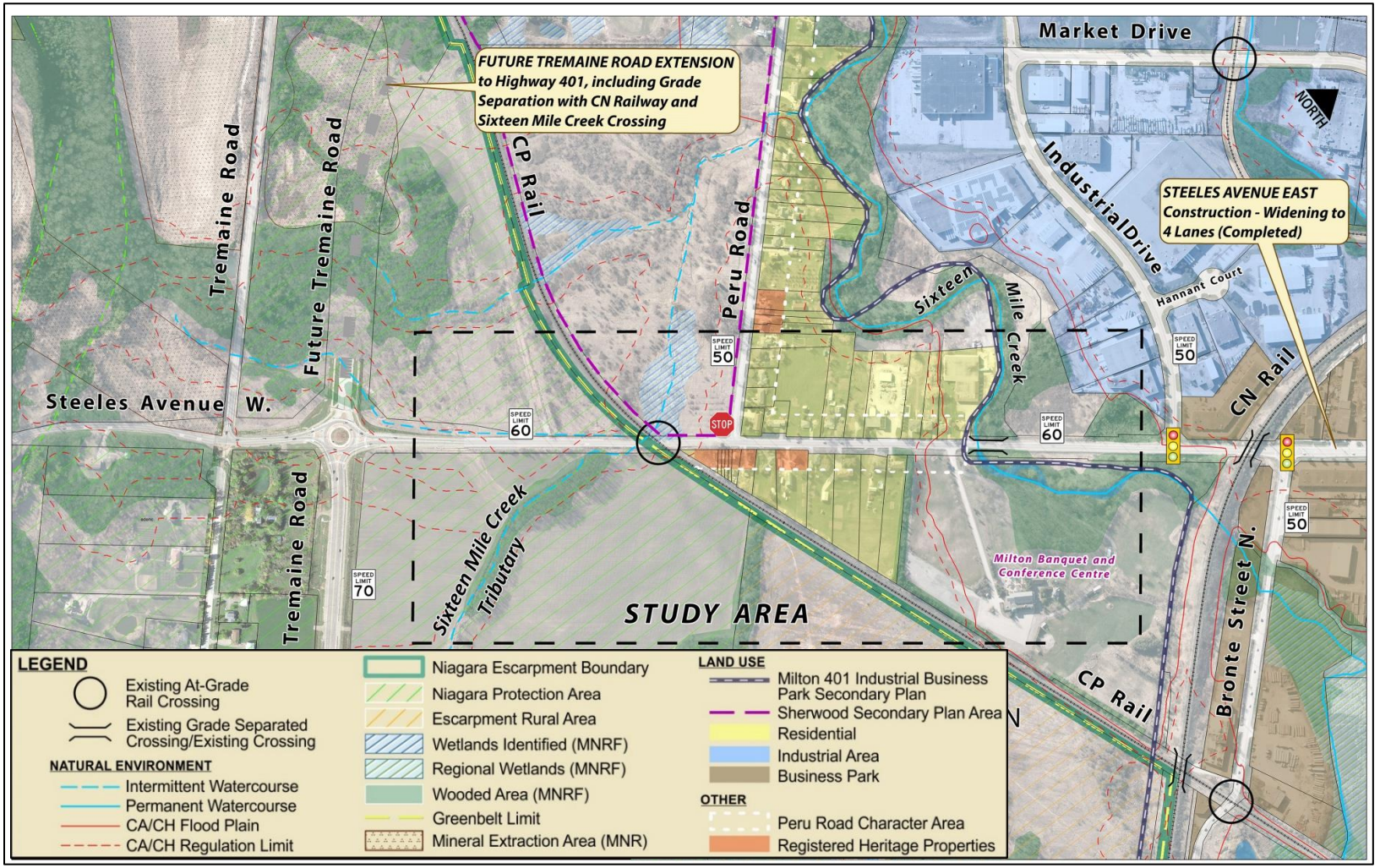
Currently, there are no transit services that operate on Steeles Avenue between Tremaine Road and Industrial Drive. Milton Transit Route 1A and 1B (Industrial) provide services up to Industrial Drive only on Steeles Avenue.

3.1.3 Active Transportation

There are currently no dedicated active transportation facilities along Steeles Avenue between Tremaine Road and Industrial Drive to accommodate cyclists or pedestrians, with the exception of the pedestrian crossings at signalized intersections.

Halton Region has completed an Active Transportation Master Plan Study to create a 20-year network for active transportation in Halton Region. As part of the Steeles Avenue corridor improvements, features of active transportation were considered, such as paved shoulders, on-road bike lanes, multi-use trails, and sidewalks for pedestrians and cyclists.

Exhibit 3-1: Existing Conditions / Natural Heritage Features Plan



3.1.4 Railway Crossings

There is an at-grade crossing of CP Rail on Steeles Avenue west of Peru Road. Current operations range from 17 to 22 trains (freight only) per day.

Delays on Steeles Avenue at this at-grade crossing are expected to rise in the future due to population growth and future development in combination with increased operations by CP Rail.

3.2 Socio-Economic Environment

3.2.1 Existing Land Use

Currently, the character of Steeles Avenue is generally rural within the study area. Existing land uses include the village of Peru which consists of residential houses and local businesses along Steeles Avenue as well as along Peru Road. There are also commercial/industrial land uses on Industrial Drive and north side of Steeles Avenue. Properties along Steeles Avenue have direct full movement access to the road, including 3090 Steeles Avenue.

Between Peru Road and Tremaine Road, lands are designated under the Niagara Escarpment Plan Protection Area (**Exhibit 3-1**) and Greenbelt Plan (**Exhibit 3-1**) which will likely remain undeveloped in the future. There is an existing bridge crossing of the Sixteen Mile Creek east of Peru Road and an at-grade crossing with the CP railway (2 tracks) west of Peru Road.

3.2.2 Future Land Use

The study area falls within the limits of the Town of Milton's Sherwood Survey Secondary Plan (**Exhibit 3-1**), which includes plans for the future development within Milton Heights on the west side of Peru Road (east of the CP Rail). Peru Road is planned to terminate at the Sixteen Mile Creek crossing.

Other Town of Milton growth areas in proximity to the study area include the Boyne Survey Secondary Plan and Milton Education Village.

As outlined in the Region's Official Plan, future land use and infrastructure improvements also include the extension of Tremaine Road north of Steeles Avenue to

Highway 401 which will include a grade separation with CP Rail, Sixteen Mile Creek crossing, and a new interchange with Highway 401.

3.2.3 Noise

As part of the Steeles Avenue MCEA Study, a noise assessment was completed to assess the potential noise impact to adjacent Noise Sensitive Areas (NSAs) within the study area as a result of the proposed improvements. NSAs within the study area include four (4) rural residential properties located along Steeles Avenue. A noise analysis was carried out as part of this MCEA Study (see **Section 8.1.3**).

It should be noted that noise analysis will be prepared for new residential development (i.e. within Milton Heights) on the north side of Steeles Avenue as part of the development site plan approval process. A noise analysis for any potential new residential developments along the Steeles Avenue corridor is not being carried out as part of the MCEA Study.

3.2.4 Pedestrian and Cycling Facilities

As noted in **Section 3.1.3**, Steeles Avenue within the study area is a 2-lane roadway with rural cross-section and no existing active transportation facilities to accommodate cyclists or pedestrians.

3.3 Cultural Environment

Stage 1 Archeological Assessments were carried out in 2019 and 2022 as part of this MCEA Study to assess the area's archaeological potential. A Cultural Heritage Resource Assessment was undertaken for the cultural heritage landscapes and built heritage resources in the study area. The Stage 1 Archeological Assessment reports are provided in **Appendix D** and the Cultural Heritage Resource Assessment report is provided in **Appendix E.** The key findings are summarized in this section.

3.3.1 Archaeological Assessment

A Stage 1 Archaeological Assessment was completed for this MCEA Study by New Directions Archaeology (NDA) in 2019 (NDA, 2019); however, this did not include the full extent of the study area. In 2022, WSP completed a Stage 1 Archaeology

Assessment for the full study area (i.e. extending approximately 155 m to the south beyond the Stage 1 Archaeological Assessment previously completed).

The Stage 1 Archaeological Assessment completed by NDA in 2019 was submitted to the Ministry of Citizenship and Multiculturalism (MCM) for approval and was entered into the Ontario Public Register of Archaeological Reports on March 26, 2019. The Stage 1 Archaeological Assessment completed by WSP in 2022 was submitted to MCM for approval on December 1, 2022.

The Assessments determined that the majority of the study area requires Stage 2 Archaeological Assessment prior to construction as shown in **Exhibit 3-2**. Areas determined to have been previously disturbed include the roadways and associated right-of-way, the Canadian Pacific Railway, and areas of extensive commercial development. Areas required for easements including at key features (including but not limited to structures and watercourse crossings), may be refined during detailed design based on the findings of the technical studies.

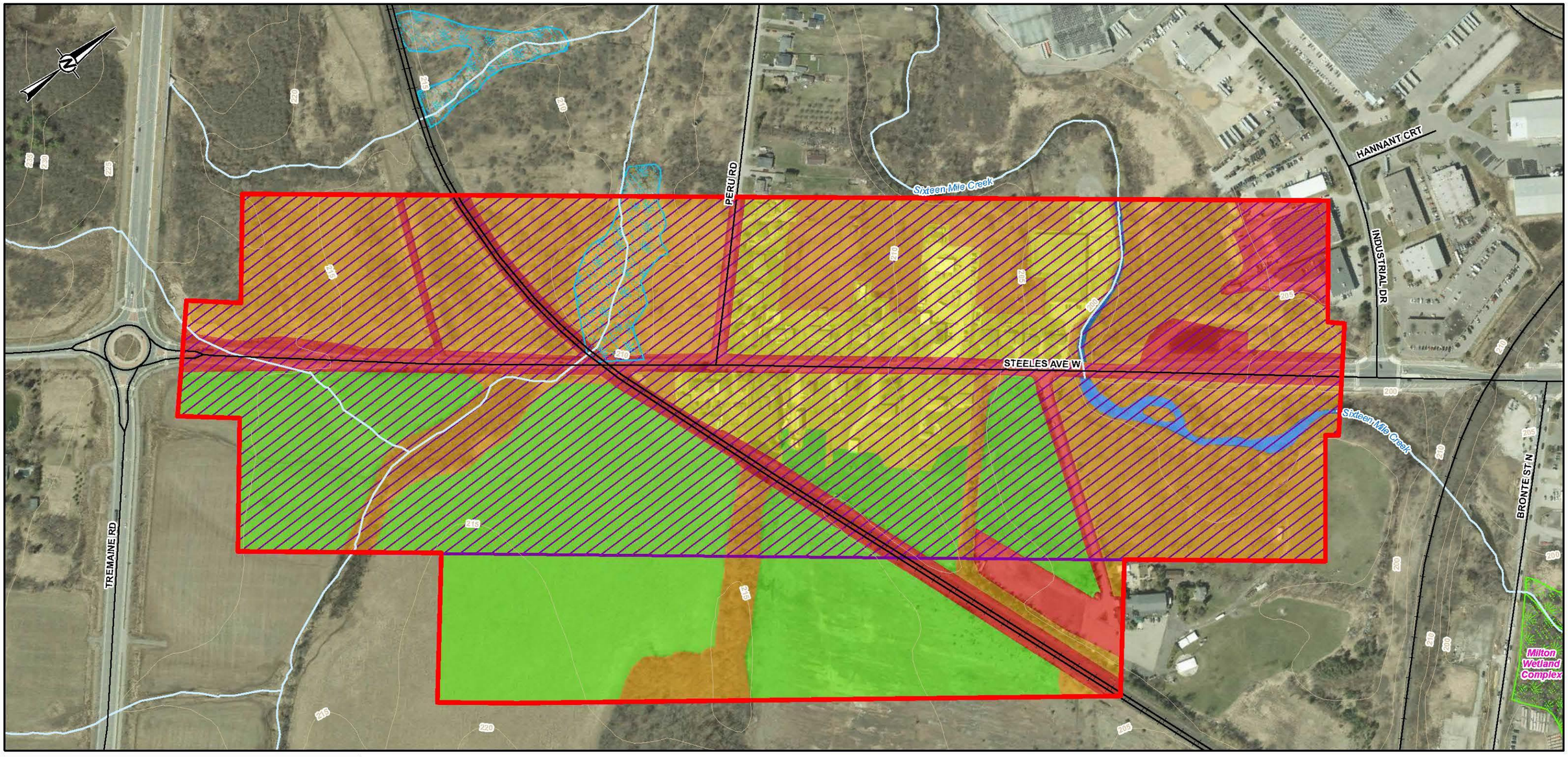
Pre-contact archaeological potential is high given the proximity to Sixteen Mile Creek, its tributaries, and several wetlands which would have served as an important source of food resources and a transportation route. Extensive Indigenous land-use of the Sixteen Mile Creek watershed is also evident from the presence of 12 previously identified Indigenous archaeological sites within 1 km of the study area.

The potential for the presence of Euro-Canadian archaeological resources is also high given the early settlement of the area, the presence of more than a dozen historic homesteads within and near the study area, and the presence of early transportation routes in the study area, specifically present-day Steeles Avenue West and Peru Road.

The Criteria for Evaluating Marine Archaeological Potential (MTCS, 2016) were reviewed to determine if a Marine Archaeological Assessment is required for the section of the Sixteen Mile Creek that is included the study area. Currently, there are no indicators of marine archaeological potential close enough to study area to recommend further Marine Archaeological Assessment. As the section of Sixteen Mile Creek does not have marine archaeological potential, it is determined to be low-lying and wet.

The Stage 2 Archaeological Assessment and subsequent recommendations will be scheduled in advance of any Project activities that may have the potential to disturb archaeological resources. Prior to undertaking the Stage 2 Archaeological Assessment

work, Indigenous communities will be advised and afforded the opportunity to have field liaison representative participation.



LEGEND

- PEDESTRIAN SURVEY AT 5 M INTERVALS
- TEST PIT SURVEY AT 5 M INTERVALS
- TEST PIT SURVEY AT 10 M INTERVALS TO CONFIRM DISTURBANCE
- LOW-LYING AND WET - NO FURTHER WORK RECOMMENDED
- DISTURBED - NO FURTHER WORK REQUIRED
- PREVIOUSLY ASSESSED – FURTHER WORK REQUIRED
- STUDY AREA
- ROADWAY
- RAILWAY
- WATERCOURSE
- TOPOGRAPHIC CONTOUR, metres
- UNEVALUATED WETLAND
- EVALUATED WETLAND (NO SIGNIFICANCE)
- WATERBODY

KEY MAP

SCALE 1:250,000

DRAFT

0 40 80 160

1:4,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. DEVELOPMENT MAP "17M-00979-PLATES-STEELES AVE-OPT B-PREFERRED PLAN-UNDERPASS ROLL PLAN-PROFILE-15 SEPT 2022.PDF"
2. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
3. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
   SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

CLIENT
REGIONAL MUNICIPALITY OF HALTON

PROJECT
STAGE 1 ARCHAEOLOGICAL ASSESSMENT: STEELES AVENUE, TREMAINE ROAD TO INDUSTRIAL DRIVE MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

TITLE
RESULTS OF THE STAGE 1 ARCHAEOLOGICAL ASSESSMENT

CONSULTANT
wsp

YYYY-MM-DD	2022-10-14
DESIGNED	CR
PREPARED	BR
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
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3.3.2 Cultural Heritage

A cultural heritage resource is used to describe cultural heritage landscapes and built heritage resources. A cultural landscape is perceived as a collection of individual built heritage features and other related features that together form farm complexes, roadscapes and nucleated settlements. Built heritage features are typically individual buildings or structures that may be associated with a variety of human activities, such as historical settlement and patterns of architectural development.

A Cultural Heritage Resource Assessment was carried out in support of the MCEA Study and is included in **Appendix D**. Between Tremaine Road and Industrial Drive there are seven (7) Built Heritage Resources (BHR) and three (3) Cultural Heritage Landscapes (CHL). These are listed in the **Table 3-2** below.

Table 3-2: List of Built Heritage Resources and Cultural Heritage Landscapes

Site	Category
13-15 Peru Road, east side (Residential)	BHR
17-19 Peru Road, east side (Residential)	BHR
Peru Road north of Steeles Avenue (Roadscape)	CHL
CP Rail at Steeles Avenue (Railscape)	CHL
Historical Hamlet of Peru	CHL
3220, 3222, 3224, 3226, 3228, and 3230 Steeles Avenue (Residential)	BHR
3216 Steeles Avenue (Residential)	BHR
3198 and 3204 Steeles Avenue (Residential)	BHR
Steeles Avenue Bridge over Sixteen Mile Creek (Transportation)	BHR
3090 Steeles Avenue (Residential)	BHR

3.4 Natural Environment

Ecological surveys were carried out to identify and assess Natural Heritage constraints, including designated Natural Heritage System, terrestrial and aquatic habitats, and

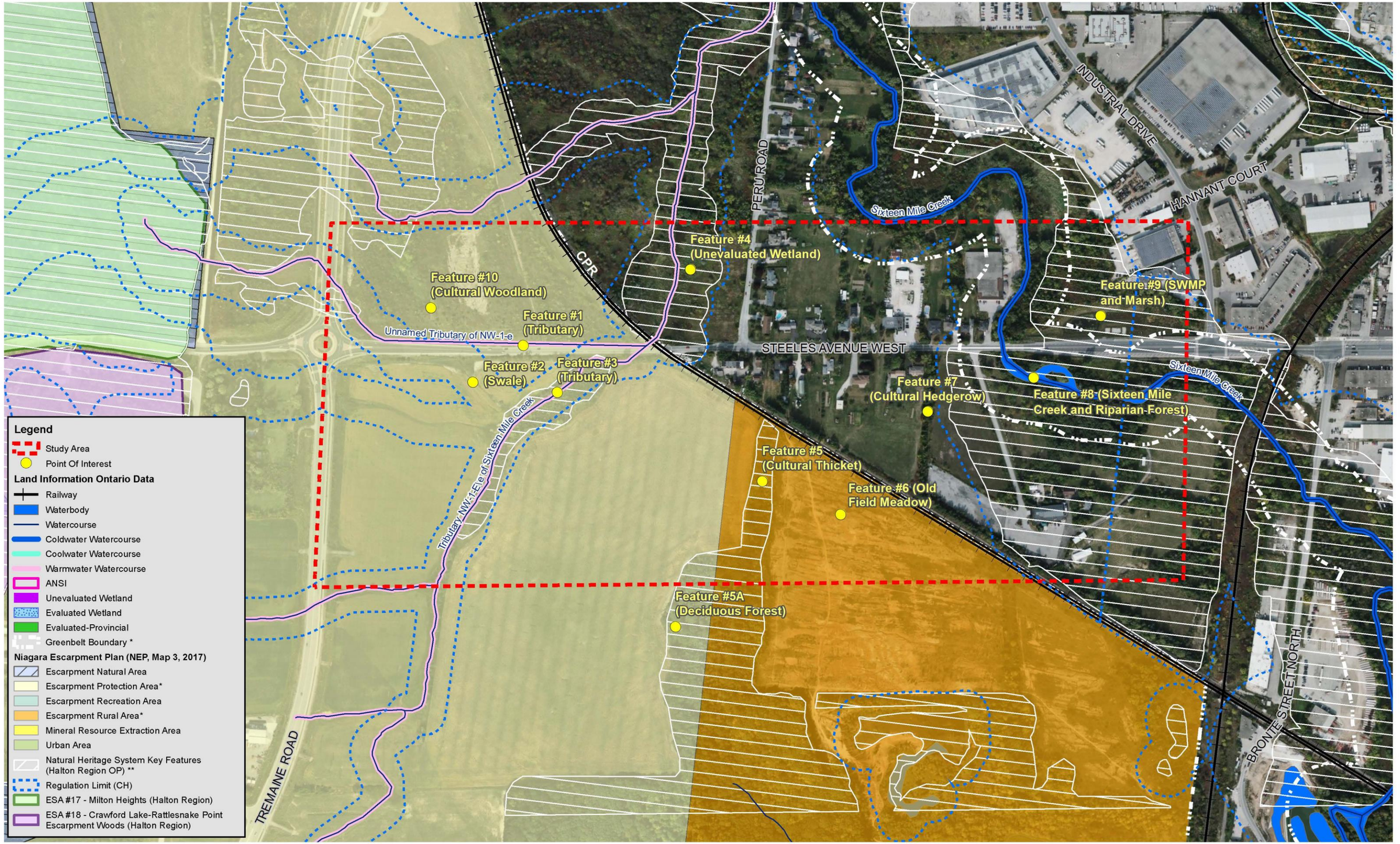
Species of Conservation Concern (SCC)[2]. The findings of this work are presented in this section. Evaluation of the preferred alignment was then completed to determine impacts of the proposed works (see **Section 8**), recommended mitigation measures (see **Section 8**) and any potential permitting requirements based on the Preliminary Design. Existing background information for the study area was incorporated where appropriate.

3.4.1 Designated Areas

The following designated policy areas that pertain to Natural Environment are present within the study area (see **Exhibit 3-3**). These include:

- Niagara Escarpment Plan (2017), Escarpment Rural and Escarpment Protection Area;
- Greenbelt Plan (2017) – Urban River Valley System;
- Regional Natural Heritage System (Regional Official Plan – Interim Office Consolidation November 10, 2021); and
- CH Floodplain, Watercourses, Slope Hazards and Wetlands regulation areas – governed by the Regulation of Development, Interface with Wetlands and Alternatives to Shorelines and Watercourses (Ontario Regulation 160/06 and 162/06, respectively).

[2] **Species of Conservation Concern (SCC)** –The term "species of conservation concern" (SCC) is used to encompass species that are: listed under the federal Species at Risk Act (SARA 2002); listed under Ontario's Endangered Species Act (ESA 2007); provincially rare species (NHIC S-rank of S1 to S3), as well as regionally recognized species (various sources).



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WSP

HALTON REGION – Steeles Avenue Class EA
Natural Heritage System and Natural Features

* - Greenbelt Area includes "Niagara Escarpment Plan Area" (northwest of CPR), "Settlement Areas outside of the Greenbelt Boundary" (Milton, northeast of CPR), and "Urban River Valley" around Sixteen Mile Creek.
** - Natural Heritage System "Key Features" also includes the study area watercourse features. Natural Heritage System includes lands west of the CPR (NEP lands).
*** - Watercourse classification from LIO, 2020

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metres
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Date: April 2022
Project No: 17M-00979-00
Exhibit 3-3

3.4.2 Natural Heritage Features Overview

For the purpose of the assessment, ten 'Natural Heritage Features' were identified within the study area to allow for reference of specific locations within the study area.

The Natural Heritage Features are identified as follows:

- Feature 1 – Unnamed Tributary of NW-1-E
- Feature 2 – Swale Feature
- Feature 3 – Tributary of NW-1-E of Sixteen Mile Creek
- Feature 4 – Unevaluated Wetland
- Feature 5 – Cultural Thicket
- Feature 5a – Deciduous Forest
- Feature 6 – Old Field Meadow
- Feature 7 – Cultural Hedgerow
- Feature 8 – Sixteen Mile Creek and Riparian Forest (and associated swale)
- Feature 9 – Storm Water Management Pond (SWMP) and associated Marsh
- Feature 10 – Cultural Woodland

The study area limits, and locations of these Natural Heritage Features are shown on **Exhibit 3-3**. With regard to **Exhibit 3-3**, other information shown including the 'Natural Heritage System' and 'Natural Heritage System with Key Features' (including 'Enhancement Areas, Linkages and Buffers'), was taken from *Map 1 – Regional Structure* and *Map 1G – Key Features within the Greenbelt and Regional Natural Heritage System* found in the Interim Office Consolidation of the Regional Official Plan (November 10, 2021). The Regulation Limits were provided by CH and the Niagara Escarpment Planning areas were taken from the Niagara Escarpment Plan (2017). Other Natural Heritage Information found on **Exhibit 3-3** (e.g., including watercourse classifications, wetland information, designated areas etc.) was taken from Land Information Ontario (LIO) and Natural Heritage Information Centre (NHIC) websites.

A summary of each feature detailing the existing conditions (with photographs) is found in Table 1 in **Appendix E**.

Natural Environment appendices including the Natural Heritage features summary table noted above, vegetation community tables, species lists, and habitat mapping are provided in **Appendix E**.

WSP undertook a review of all available relevant background materials (discussed below) and conducted a scoped field program (see Approach and Methodology sections in **Appendix E**) to assess the existing natural heritage conditions within the study area.

Halton Region's Official Plan (2021) policies were considered, specifically 117.1(9), 118 (2), and 118 (3.1) of the Official Plan, as they are applicable for development / alteration of the Regional Natural Heritage System found within the study area.

3.4.3 Background Data Collection and Analysis

All relevant background material for the study area and adjacent areas was collected and reviewed.

As part of the background data collection, requests for data/information were submitted to Conservation Halton (CH), Ministry of Natural Resources and Forestry (MNRF – Aurora District) and the Ministry of Environment, Conservation and Parks (MECP). **Appendix E** includes the key sources of information that were reviewed.

These sources were reviewed to assess the general character of the area, provide context for the project-specific assessment, assess general connectivity between Natural Heritage features within the study area to those in the surrounding landscape, identify potential impacts, constraints, sensitivities and mitigation requirements.

This background information was then used to update and describe the existing natural environmental conditions presented below, which in turn provided the basis for assessing the impacts of the preferred alignment and preliminary design.

3.4.4 Physiography and Soils

The Niagara Escarpment, located approximately 500 m west of the study area, is a prominent ridge of mainly dolostone rock with high topographical relief.

Within the study area, one physiographic region is present, the Peel Plain. The Peel Plain has surficial soils of glacio-lacustrine silts and clay. Underlying the surficial deposits is a till comprising large amounts of shale and limestone fragments. The underlying bedrock is of the Queenston Shale formation. The Peel Plain gently slopes to the southeast, towards Lake Ontario (Chapman and Putnam, 1984).

3.4.5 Surface Drainage and Watershed Characteristics

The study area lies within the Sixteen Mile Creek watershed which is located at the western end of Lake Ontario. It drains approximately 372 km² of land within nine distinct sub-watersheds (Dunn and Jamieson Undated). The main branches of the creek originate from wetlands and forested swamps associated with the Niagara Escarpment. Land use within the watershed is predominantly agriculture, with some naturalized areas (woodlands and wetlands), rural residential, and becoming predominantly urban south of the study area as it flows through the Town of Milton and further downstream through the Town of Oakville.

There are three main watercourses that traverse the study area (see Feature #1, #3 and #8 on **Exhibit 3-3**):

- Sixteen Mile Creek (Feature #8) is a sensitive, High Constraint, coldwater stream. In the vicinity of the Steeles Avenue crossing, the watercourse supports coldwater species including Rainbow Trout (*Oncorhynchus mykiss*), Brown Trout (*Salmo trutta*), and Mottled Sculpin (*Cottus bairdii*), as well as a variety of other sportfish and baitfish species.
- Tributary NW-1-E of Sixteen Mile Creek (Feature #3) is a small, permanent watercourse that presently classified as warmwater. This watercourse is designated as High Constraint. Rainbow Trout (a coldwater species) and a variety of other baitfish species were captured by WSP at the Steeles Avenue crossing during a 2017 fisheries inventory.
- Unnamed Tributary of NW-1-E (Feature #1) is a small, warmwater watercourse (likely permanent), designated as Medium to High Constraint. A variety of cool and warm water baitfish species (e.g., Creek Chub [*Semotilus atromaculatus*], Blacknose Dace [*Rhinichthys atratulus*], and Fathead Minnow [*Pimephales promelas*]) were captured by WSP during a 2017 fisheries inventory.

There are also aquatic SCC associated with these watercourses as detailed in **Section 3.4.9**.

Further details on these watercourses are found in **Section 3.4.8** and on Table 1, **Appendix E**.

3.4.6 Vegetation

Land use within the study area is a mix of agricultural land, low-density residential and business development. Transportation infrastructure includes Steeles Avenue, the new alignment of Tremaine Road, Peru Road, Industrial Drive, and the CP Rail line.

Areas of riparian vegetation occur along Sixteen Mile Creek, Tributary NW-1-E of Sixteen Mile Creek, and the Unnamed tributary of NW-1-E.

Vegetation communities are all early to mid-successional communities regenerating from historic clearing for agricultural use (as per a 1954 air photo of the study area), with the exception of a section of the Sixteen Mile Creek riparian forest near the eastern edge of the study area (Unit 1b – Willow Lowland Deciduous Forest), and Unit 11 (Fresh – Moist Bur Oak Deciduous Forest). These communities are comparatively more mature than the other vegetation communities within the study area.

Vegetation communities are mapped on Exhibit 1, **Appendix E** and are further described below. Vegetation communities are also described for each Natural Heritage Feature in Table 1, **Appendix E**. A Vascular Plant List (Table 2) is provided in **Appendix E**. Additionally, evidence of aggregate extraction (clay) is present in Unit 13 (Dry – Moist Old Field Cultural Meadow).

Floristic Inventory

A total of 177 species were recorded within the study area during field surveys as indicated in the Vascular Plant List (Table 2), **Appendix E**. Of these species, 99 (56%) are native, and 78 (44%) are non-native.

Of the native species found in the study area:

> All but five of the native species observed in the study area have S-ranks of S5 (Secure in the province, common). Black Walnut (*Juglans nigra*), Green Ash (*Fraxinus pennsylvanica*) and Rough Avens (*Geum laciniatum*) have a rank of S4 (Apparently Secure, uncommon but not rare) and Virginia Creeper (*Parthenocissus quinquefolia*) has a rank of S4? (Apparently secure but requires further study). Butternut (*Juglans cinerea*) has a rank of S2? (Imperiled, very vulnerable to extirpation).
>
> A Butternut (*Juglans cinerea*) sapling (Endangered [END] under the provincial *Endangered Species Act* [ESA, 2007]) was found in Unit 1b as part of the WSP tree inventory survey on October 29, 2020 (see location on Exhibit 1,

Appendix E. UTM coordinates for this sapling are 17T 588830.22 E, 4818522.82 N.

Regional rarity rankings are as follows:

- Per Oldham 2017 for Ecodistrict 7E-4:
  - Four (4) species are regionally rare: Short-scale Sedge (*Carex deweyana*), Knotted Rush (*Juncus nodosus*), Virginia Creeper (*Parthenocissus quinquefolia*), and Pendulous Bulrush (*Scirpus pendulus*)
  - Six (6) species are regionally uncommon: Swamp Milkweed (*Asclepias incarnata*), Shagbark Hickory (*Carya ovata*), Canada Horseweed (*Erigeron canadensis*), Rough Bedstraw (*Galium asprellum*), Butternut, and Eastern Red Cedar (*Juniperus communis*)
- Per Crins 2006:
  - None (0) are regionally rare
  - Five (5) species are regionally uncommon: Purple-leaved Willow-herb (*Epilobium coloratum*), Knotted Rush, Pendulous Burush, Eastern Red Cedar, and White Spruce (*Picea glauca*). Note that the White Spruce are planted.
  - One (1) species are listed as requiring further review to determine rarity ranking: Virginia Creeper.

  Per Varga 2000 for Halton Region:
  - One (1) species is regionally rare: Eastern Red Cedar – known from five locations in Halton Region.
  - Nine (9) species are regionally uncommon: Shagbark Hickory, Purple-leaved Willowherb, Woodland Strawberry (*Fragaria vesca*), Rough Bedstaw, Yellow Avens (*Geum aleppicum*), Knotted Rush, Virginia Creeper, Pendulous Bulrush, and Panicled Aster (*Symphyotrichum lanceolatum*).

The general locations of these species (per ELC Unit) are found in the Vascular Plant List (Table 2, **Appendix E**) and they are also noted in the Natural Heritage Features Summary table (Table 1, **Appendix E**).

Vegetation Communities

Vegetation communities identified within the study area are outlined below and a detailed description of each is provided in **Appendix E**. The units outlined below correspond with Exhibit E-1 in **Appendix E**.

- Dry – Moist Old Field Cultural Meadow (CUM1-1) – Units 2, 3a, 3b, 5, 8, 13
- Cultural Thicket (CUT1) – Units 7 and 12
- Cultural Woodland (CUW1) – Units 10a, 10b and 16
- Cultural Hedgerow (CUH) – Unit 14
- Manicured Open Space (MOS) – Unit 15
- Fresh – Moist Lowland Deciduous Forest (FOD7) – Unit 9
- Fresh – Moist Willow Lowland Deciduous Forest (FOD7-3) – Units 1a and 1b
    - A Butternut (END under the ESA) sapling was found in Unit 1b as part of the WSP tree inventory survey on October 29, 2020.
- Fresh – Moist Bur Oak Deciduous Forest (FOD9-3) – Unit 11
    - CH's internal mapping indicates the presence of a swamp wetland in the northwest corner of Unit 11. WSP also noted evidence of vernal pooling in this unit (as noted in Section 3.4.10).
- Cattail Mineral Shallow Marsh (MAS2-1) – Units 4b, 4c and 6
- Forb Mineral Shallow Marsh (MAS2-9) – Unit 17

3.4.7 Wildlife

The following sections summarize the avifauna, herpetofauna, mammal and insect observations from the 2017-2018 wildlife field surveys conducted by WSP, as well as comparison with findings from the Milton Heights Neighborhood Subwatershed Impact Study (SIS) (Rand Engineering et al., 2014). In total, 65 wildlife species were recorded during the 2017-2018 field surveys in the study area: 44 bird species, five (5) herpetofauna species, six (6) mammal species and nine (9) insect species.

Avifauna

In total, 44 bird species were recorded within the study area during the 2017-2018 surveys (refer to Table 3a, **Appendix E** for a full list of species). A summary of results, including SAR / SCC observations, is provided below.

Of the 44 species recorded, 41 are considered 'breeding' within the study area (i.e., 'possible', 'probable' or 'confirmed' OBBA breeding evidence). Three species were recorded without breeding evidence (flyovers or foraging habitat only with no suitable nesting habitat in study area): Great Blue Heron (*Ardea herodias*), Turkey Vulture (*Cathartes aura*) and Yellow-bellied Sapsucker (*Sphyrapicus varius*). The following SAR and SCC were recorded:

- One (1) SAR listed as Threatened (THR) provincially and federally, and afforded protection under the ESA (2007) was recorded in the study area: Barn Swallow (*Hirundo rustica*) was confirmed to be nesting (two nests) in the CP Rail culvert at Tributary NW-1-E of Sixteen Mile Creek crossing in 2017; in addition, low numbers of foraging individuals were observed in cultural meadow areas (WSU 4 / ELC Unit 13). Refer to **Section 3.4.9** for further discussion.
- One (1) SAR listed as Special Concern (SC) provincially and federally was recorded in the study area: Eastern Wood-pewee (*Contopus virens*) was recorded with 'possible' breeding evidence in deciduous forest habitat WSU 3 (ELC Unit 1b). See **Section 3.4.9** for further discussion.
- Four (4) Regionally Significant bird species were recorded within the study area, which are all listed as 'Regionally Uncommon' (Halton Region 2006): Northern Mockingbird (*Mimus polyglottos*), Northern Rough-winged Swallow (*Stelgidopteryx serripennis*), Vesper Sparrow (*Pooecetes gramineus*) and Yellow-bellied Sapsucker (no breeding evidence, feeding evidence only).
- Two (2) species listed as Area Sensitive (MNRF 2015) were recorded with breeding species in ELC Unit 13 (cultural meadow):
    - Open Country Area-Sensitive species: Savannah Sparrow (*Passerculus sandwichensis*) and Vesper Sparrow.

*Note, however, that this disturbed cultural meadow area would not be considered candidate or confirmed SWH because it does not meet the size criteria (>30 ha).

Bird species observed are predominantly common, generalist, urban-adapted and agricultural landscape species, with forest and wetland-associated species recorded in appropriate habitats. The avifauna observed and exhibiting breeding evidence in the study area are expected for the site conditions present.

The background review of previous studies can be found in **Appendix E**.

Amphibians and Reptiles

Three (3) amphibians were recorded within the study area during the 2017 calling surveys: Green Frog (*Lithobates clamitans*), Gray Treefrog (*Hyla versicolor*) and Spring

Peeper (*Pseudacris crucifer*), all of which are common (provincial S-Rank of S5) and expected species for the area. **Table 3-3** below outlines the amphibian calling survey results.

High abundances (Level 3 calling) of Gray Treefrog and Green Frog, and a low abundance of Spring Peeper were recorded at station AC5; these species were likely breeding in ELC Unit 17 (marsh habitat with adjacent recently constructed stormwater [SWM] pond). Low abundance of Green Frog was recorded in the marsh habitat northeast of the Tremaine Road roundabout (ELC Unit 4b, incidental observation during the breeding bird surveys).

There is potential for other common anuran species to occur in the study area, including Northern Leopard Frog (*Lithobates pipiens*), American Toad (*Anaxyrus americanus*) and Wood Frog (*Rana sylvatica*).

In total, two (2) reptile species were observed within the study area during the 2017-2018 surveys: a road-killed Midland Painted Turtle (*Chrysemys picta*) was observed along Steeles Avenue southwest of the crossing of Tributary NW-1-E / rail corridor, and a live Eastern Gartersnake (*Thamnophis sirtalis sirtalis*) was observed along the Steeles Avenue roadside northeast of the Tremaine Road roundabout.

Table 3-3: Amphibian Calling Survey Results

Station	Round 1 April 11, 2017	Round 2 May 17, 2017	Round 3 June 22, 2017
1 (ELC Unit 4b)	No Calling	No Calling	No Calling
2 (ELC Unit 9)	No Calling	No Calling	No Calling
3 (ELC Unit 4a)	No Calling	No Calling	No Calling
4 (ELC Unit 1b)	No Calling	No Calling	No Calling
5 (ELC Unit 17)	Spring Peeper – L2 (6)*	Spring Peeper – L1 (2) Grey Treefrog – L3 Green Frog – L3	Grey Treefrog – L2 (8) Green Frog – L1 (3)

* Results are abbreviated as follows: Calling Level 1 = L1, Level 2 = L2, Level 3 = L3; number of individuals indicated in parenthesis.

The background review of previous studies can be found in **Appendix E**.

Mammals

Mammal observations, including sightings and evidence of use (e.g. browse, tracks / trails, scat and burrows) were recorded during all field surveys.

In total, six (6) common and expected mammal species were observed during the 2017-2018 field surveys: Eastern Chipmunk (*Tamias striatus*), Eastern Cottontail *(Sylvilagus floridanus*), Grey Squirrel (*Sciurus carolinensis*), Raccoon (*Procyon lotor*), Red Squirrel (*Tamiasciurus hudsonicus*) and White-tailed Deer (*Odocoileus virginianus*). A complete list of species is found in Table 3a, **Appendix E**.

No federally or provincially designated SAR mammals, or provincially rare species (i.e. S1 to S3 ranked by NHIC) were recorded within the study area.

This area likely supports a range of other common mammals that were not observed during the field surveys but are often found in similar habitats throughout the province, including a number of small mammals that often go undetected (e.g., shrews, voles, mice). Four species of SAR bats have potential to occur in the study area, as discussed in **Section 3.4.8**.

The background review of previous studies can be found in **Appendix E**.

Lepidoptera and Odonata

Three (3) Odonate (damselfly and dragonfly) species and six (6) Lepidoptera (butterfly and moth) species were recorded during the 2017-2018 field surveys within the study area. Of these species, one SCC was recorded within the study area:

- Monarch (*Danaus plexippus*); SC provincially and federally, and designated as END by COSEWIC. One individual was observed foraging / moving along the wetland corridor in WSU 5 (ELC Unit 4a). This species is likely to occur in cultural meadow areas or along the edges of other Natural Heritage Features in the study area.

The remaining species recorded all are considered common and expected for Halton Region.

Four (4) insect species were recorded incidentally during the Milton Heights Neighborhood SIS (Rand Engineering et al., 2014) field surveys, including Monarch and the same Lepidoptera species as those recorded in the 2017-2018 WSP surveys.

Wildlife Movement Corridors

The 2017-2018 field investigations did not indicate any areas of obvious high-use movement corridors for large or medium-sized mammals. Within the study area, large and medium sized mammals such as White-tailed Deer and Coyote will likely follow the edges of agricultural fields, hedgerows and riparian corridors as they move between various habitats. The existing Sixteen Mile Creek bridge has an overbank area along the east abutment, which provides suitable passage opportunity for small-medium sized mammals (e.g., Grey Squirrel, Raccoon) and herpetofauna during lower flow conditions and is also passable (existing bridge has a clear opening span of 10.4 m and an average rise of 2.45 m) for larger mammals including White-tailed Deer.

Although no road mortality 'hotspots' were noted during the 2017-2018 surveys, one road-killed Midland Painted Turtle was observed along Steeles Avenue south of the rail crossing in 2017, and one road-killed Snapping Turtle was also identified near the rail crossing (iNaturalist, June 2020). This is not unexpected as this portion of the roadway is adjacent to Unevaluated Wetlands in WSU 5 and bisects the Tributary NW-1-E riparian corridor; there is potential for other occasional movement of small-medium sized wildlife and White-tailed Deer across this area.

Wildlife movement in the study area is also likely to occur along the rail corridor, which are generally known to act as connecting features on a landscape level. The thicket hedgerow (ELC Unit 12) provides a connection between the rail corridor and the larger woodlot to the southeast (ELC Unit 11).

3.4.8 Fish and Aquatic Habitat

Fisheries and aquatic habitat assessments were completed along the following watercourses within the study area:

- Sixteen Mile Creek (Natural Heritage Feature #8)
- Tributary NW-1-E of Sixteen Mile Creek (Natural Heritage Feature 3)
- Unnamed Tributary of NW-1-E (Natural Heritage Feature #1)
- Agricultural Swale (Natural Heritage Feature #2)

The existing fisheries and aquatic habitat conditions of these features are detailed in Table 1, **Appendix E**.

Further assessment (including aquatic habitat mapping – see **Appendix E**) of Sixteen Mile Creek, Tributary NW-1-E of Sixteen Mile Creek and the Unnamed Tributary of NW-1-E were also completed at the crossing locations (or impacted areas) of the preferred design and along existing Steeles Avenue as shown on Exhibit 1, **Appendix E**. This information is presented below.

Sixteen Mile Creek

Sixteen Mile Creek has been designated as an Urban River Valley pursuant to the *Greenbelt Plan* (2017). Accordingly, *Greenbelt Plan* policies, specifically Section 6.2.3, permits new and expanded infrastructure, supports the needs of adjacent settlement areas and supports the goals and objectives of the *Greenbelt Plan* (as identified in **Section 2.1.3**).

At Proposed Crossing Site of the Preferred Design

The aquatic habitat of Sixteen Mile Creek at the proposed crossing of the preferred design is presented below along with the fishery. The crossing reach was approximately 50 m in length and the aquatic habitat assessment was completed on November 28, 2017. A small footbridge is found within the reach.

A small grass lined swale was also observed back from the north bank (see aquatic habitat mapping in **Appendix E**, and Plate #1 of **Appendix J**). The swale (dry at time of survey) ranged in width from 2-3 m and had a clay / silt substrate. The swale curves in and around the north bank area and is found entirely within the floodplain. It would likely connect to Sixteen Mile Creek during higher flow events above the bankfull channel (the Sixteen Mile Creek north bank is 0.3 m in height at the swale inlet). The Geomorphix Report (2022) refers to the swale as “a remnant avulsion that is likely activated under bankfull conditions” (**Appendix L**). Direct fish use of the swale is unlikely given the habitat (e.g., grass lined with no defined channel, dry at the time of the November 28, 2017 survey, lack of a connection with the bankfull channel of Sixteen Mile Creek).

The wetted width of the Sixteen Mile Creek channel at the time of the survey was approximately 7 m and the bankfull width ranged from 8.3 m to 8.5 m (0.25 m depth). Further upstream of this reach (downstream of Steeles Avenue) the bankfull width was 13.6 m.

Flow depth at the time of survey generally ranged from 0.2 to 0.3 m through the reach (0.6 m depth in a pool). Channel bank heights average around 0.8 m and erosion is low.

The morphology through the reach is riffle dominant with a small pool (1 m width x 2.5 m length x 0.6 m depth). The riffle dominant morphology extends further upstream and downstream of the reach. Substrates through the reach are rubble dominant (ranges from 40% to 60%), with gravel (30% to 40%), sand (5% to 15%) and boulders (5%). Substrates are similar further downstream, and a higher incidence of rubble (75%) is found further upstream of the reach (downstream of Steeles Avenue bridge). Instream cover includes rubble and boulders, and some overhanging woody vegetation along the banks. There is minimal instream vegetation.

In this reach the creek flows through a riparian Willow Lowland Deciduous Forest. Woody bank vegetation consists of Balsam Poplar (*Populus balsamifera*), Ash sp., Willow spp., European Buckthorn, Alder sp., and dense Red Osier Dogwood. There is also some old field species found back from the north bank (grasses, goldenrod and aster species).

At Existing Crossing of Steeles Avenue

The aquatic habitat of Sixteen Mile Creek at the existing crossing of Steeles Avenue is presented below along with the fishery. The crossing reach was approximately 100 m in length (upstream and downstream of the bridge) and the aquatic habitat assessment was completed on July 19, 2017. Sixteen Mile Creek flows through a concrete bridge structure with an approximate 14 span width and 2.75 m rise.

The wetted width of the Sixteen Mile Creek channel at the time of the survey ranged from approximately 9.9 m to 11.6 m throughout the reach. The bankfull width ranged from 6.0 m to 15 m (0.5 m depth) upstream (north) of the bridge to between 8.1 m and 13.6 m (0.6 m depth) downstream.

Flow depth at the time of survey generally ranged from 0.05 to 0.30 m throughout the reach and up to 0.6 m depth and 1.0 m depth found in two pools located upstream and downstream of the bridge respectively. Channel bank heights range from 0.6 m to 1.0 m and erosion is low.

The morphology through the reach is riffle dominant (with the two pools noted above) immediately upstream and downstream of the Steeles Avenue bridge and a run and flat dominant morphology through the structure. Substrates throughout the reach are rubble dominant (ranges from 40% to 75%), with gravel (25% to 35%), boulders (10 to 15%) and sand (5%). Instream cover includes rubble and boulders and some overhanging

woody vegetation along the banks. There is minimal instream vegetation, however a small patch of watercress was observed upstream of the bridge.

In this reach the creek flows through a riparian Willow Lowland Deciduous Forest. Woody bank vegetation consists of Willow spp., Ash sp., Sugar Maple, European Buckthorn, Manitoba Maple, Alder sp., Sumac and Red Osier Dogwood.

Sixteen Mile Creek – Fishery

Sixteen Mile Creek is a permanent watercourse classified as a coldwater. The watercourse is designated 'High Constraint' in the Milton Heights Neighborhood SIS (Rand Engineering et al., 2014). The following cold, cool and warmwater fish species were captured by WSP on July 19, 2017 (upstream of Steeles Avenue structure):

- Rainbow Trout
- Blacknose Dace
- Common Shiner (*Luxilus cornutus*)
- Creek Chub
- Fantail Darter (Etheostoma flabellare)
- Horneyhead Chub (*Nocomis biguttatus*)
- Iowa Darter (Etheostoma exile)
- Johnny or Tesselated Darter (*Etheostoma nigrum*)
- Rainbow Darter (Etheostoma caeruleum)
- Slimy Sculpin (*Cottus cognatus*)

CH provided fisheries data for Sixteen Mile Creek that indicates 23 species of fish were captured at six sampling stations (between 1975 and 2015) in the vicinity of the proposed crossing (see Table 5, **Appendix E**). The species list is comprised of sensitive coldwater species (e.g., Rainbow Trout, Brook Trout [historical 1975 data], Brown Trout [*Salmo Trutta*] and Mottled Sculpin [*Cottus bairdi*]), coolwater species (e.g., darters and dace species), warmwater sport and panfish species.

CH have also indicted that there is confirmed spawning habitat for Rainbow Trout and Brown Trout in the immediate vicinity of the existing bridge and further up and downstream (in the area of the proposed crossing; see correspondence in **Appendix A**).

At the time of the surveys in 2017, the MNRF indicated this watercourse is considered 'Contributing Habitat for Redside Dace' (*Clinostomus elongatus* – END under ESA and SARA) in the vicinity of the Steeles Avenue crossing which was confirmed by MECP. American Eel (*Anguilla rostrata*, END under the ESA) were also recently (2019) found in Sixteen Mile Creek further upstream near Kelso Dam. MECP considers the reach in the vicinity of the crossing as 'Occupied Habitat' for this species.

MNRF also indicated that there are records of Bridle Shiner (*Notropis bifrenatus* – SC under the ESA and SARA) in the vicinity of the study area and MECP indicated that there are historical records of Northern Sunfish (*Lepomis peltastes* – SC under the ESA) in the Sixteen Mile Creek watershed (see correspondence in **Appendix A**). DFO SAR mapping (April 2022) also indicates that Northern Sunfish SARA) is "found (or potentially found)" in the creek.

Tributary NW-1-E of Sixteen Mile Creek

At Proposed Crossing Site of the Preferred Design

The aquatic habitat of Tributary NW-1-E of Sixteen Mile Creek at the proposed crossing of the preferred design as discussed in **Section 4.5**, is presented below along with the fishery. The assessed reach was approximately 50 m in length and the aquatic habitat assessment was completed on November 3, 2017.

The watercourse appears to have been modified historically and resembles a small drain feature (i.e., straightened, flat base) at the crossing location. The wetted width at the time of the survey averaged 2 m and the flow depth ranged from 0.05 m to 0.2 m. The bankfull width ranged from 3.5 m to 4 m with a depth of 0.4 m. Banks range in height from 0.5 m to 0.6 m.

Morphology through this reach is flat. Substrates are a mix of silt, clay and muck. Gravels and sand are mixed in further upstream and downstream. Instream cover and vegetation includes woody debris, some Reed Canary Grass along banks and a few patches of watercress. Erosion is low.

In this reach the creek flows through a riparian Lowland Deciduous Forest. Woody bank vegetation consists of Green Ash, European Buckthorn, Cherry species (*Prunus sp.*), and Honeysuckle species (*Lonicera sp.*). There is also some Reed Canary Grass and some old field species (Goldenrod species [*Solidago sp.*]., and Common Burdock [*Arctium minus*]).

At Existing Crossing of Steeles Avenue

The aquatic habitat of Tributary NW-1-E of Sixteen Mile Creek at the existing crossing of Steeles Avenue is presented below along with the fishery. The reaches were assessed approximately 80 m upstream and downstream on July 14, 2017.

Similar to further upstream at the proposed crossing location noted above, the watercourse appears to have been modified historically in these reaches and resembles a small drain feature (i.e., straightened, flat base) at the existing crossing location. Flow is conveyed under Steeles Avenue through a 0.75 m HDPE pipe that outlets through a 2 m high rock wall (in poor condition) that is found along the road embankment on the north side. Flow from the pipe outlet enters a pool (approximately 7 m long, 2 – 3 m width and 0.4 to 0.6 m depth) that connects to an existing CP Rail culvert (2.4 m width and 1.6 m rise concrete box culvert) approximately 7 m to the east (downstream). This pool is also the outlet point for the Unnamed Tributary of NW-1-E (Natural Heritage Feature #1) that runs east along the Steeles Avenue ditchline on the north side.

Upstream (south of Steeles Avenue) the watercourse flows north (along the edge of a Lowland Deciduous Forest) to Steeles Avenue where is bends 90^{O} east and flows along the ditchline of Steeles Avenue for approximately 75 m before bending 90^{O} north into the culvert. Along this reach the watercourse has a bankfull width ranging from 2.5 m to 4 m, a flat dominant morphology and a mix of fine substates (silt, muck and clay dominant with some gravel). Flow depth ranged from 0.2 m to 0.3 m at the time of the survey. Instream cover and vegetation includes dense cattail within the ditchline along Steeles Avenue, along with Reed Canary Grass and patches of watercress.

Downstream of Steeles Avenue (north) and the CP Rail crossing, the creek flows through an unevaluated wetland (Feature 4 – Cattail Mineral Shallow Marsh). Here the watercourse has a bankfull width ranging from 2.5 to 3 m, flat morphology and mix of gravel and sand substrate. Average flow depth at the time of survey was 0.5 m. Instream vegetation consist of cattail and Reed Canary Grass.

Tributary NW-1-E of Sixteen Mile Creek – Fishery

Tributary NW-1-E Sixteen Mile Creek is classified as warmwater. This watercourse is identified as ‘Intermittent – seasonal habitat’ and designated as ‘High Constraint with Rehabilitation Potential’ in the Milton Heights Neighborhood SIS (Rand Engineering et al., 2014). The following cold, warm and coolwater fish species were captured by WSP on July 19, 2017 in the pool downstream of Steeles Avenue culvert:

- Rainbow Trout (fingerling)
- Blacknose Dace
- Brook Stickleback (*Culaea inconstans*)
- Creek Chub
- Fathead Minnow

This watercourse is considered 'Contributing Habitat' for Redside Dace (END under ESA and SARA) and American Eel (END under the ESA) due to its connection to Sixteen Mile Creek.

MNRF also indicated that there are records of Bridle Shiner (SC under the ESA and SARA) in the vicinity of the study area and MECP indicated that there are historical records of Northern Sunfish (SC) in the Sixteen Mile Creek watershed (see correspondence in **Appendix A**). DFO SAR mapping (April 2022) also indicates that Northern Sunfish SARA) is "found (or potentially found)" in this tributary.

Unnamed Tributary NW-1-E

The Unnamed Tributary of NW-1-E flows parallel to the north side of Steeles Ave. along the ditchline for approximately 400 m and 140 m of this has been realigned and restored in conjunction with the Tremaine Road works to the west.

The aquatic habitat of the realigned section, where the preferred alternative (Option B) comes into contact / encroaches on the tributary (see Plate #1 of **Appendix J** and the aquatic habitat mapping in **Appendix E**), is presented below along with the fishery. The assessed reach was approximately 50 m in length and the aquatic habitat assessment was completed on July 14, 2017.

The wetted width at the time of the survey averaged 1.25 m and the flow depth ranged from 5 cm to 40 cm. The bankfull width averaged 2 m with a depth of 0.4 m. Banks range in height from 0.75 m to 1 m.

There is riffle and pool morphology throughout this reach. Substrates are a mix of gravel and rubble with some sand and boulders. Instream cover and vegetation consists of cattail, Reed Canary Grass and patches of watercress. Erosion is low.

Riparian vegetation consists of old field species (e.g., Goldenrod species [*Solidago sp.*]., and Common Burdock [*Arctium minus*]) along the banks with some cattail. A

Cultural Woodland (ash dominant) is found further back (north) of watercourse and Cattail Marsh is found further upstream.

Unnamed Tributary NW-1-E – Fishery

The Unnamed Tributary of NW-1-E is classified as warmwater. This watercourse is designated as Medium to High constraint (as documented in *Detail Design of Improvements to Tremaine Road, from 300 m South of 14th Sideroad (former Main Street) to 150 m North of Steeles Avenue, Town of Milton, Natural Environment Impact Assessment*, Ecoplans Limited/WSP, 2013).

The following cool and warm fish species were captured by WSP on July 19, 2017 in this section of the watercourse:

- Blacknose Dace
- Brook Stickleback
- Creek Chub
- Fathead Minnow

This watercourse is considered 'Contributing Habitat' for Redside Dace (END under ESA and SARA) and American Eel (END under the ESA) due to its connection to Sixteen Mile Creek.

MNRF also indicated that there are records of Bridle Shiner (SC under the ESA and SARA) in the vicinity of the study area and MECP indicated that there are historical records of Northern Sunfish (SC) in the Sixteen Mile Creek watershed (see correspondence in **Appendix A**). DFO SAR mapping (April 2022) also indicates that Northern Sunfish SARA) is "found (or potentially found)" in this tributary.

3.4.9 Species of Conservation Concern

As noted previously, SCC is used to encompass species that are: listed under the federal Species at Risk Act (SARA 2002); listed under Ontario's Endangered Species Act (ESA 2007); provincially rare species (NHIC S-rank of S1 to S3), as well as regionally recognized species (various sources).

Species at Risk (SAR) are defined as species listed as extirpated, endangered, threatened or special concern by the Committee on the Status of Species at Risk in Ontario (COSSARO) and subsequently added to the provincial *Endangered Species Act*

(ESA); however, only those listed as extirpated, endangered or threatened on the ESA are afforded legal protection under the act. Likewise, only species listed as extirpated, endangered, or threatened on Schedule 1 of the federal SARA are afforded legal protection. Special concern species are not afforded the same legal protection under the ESA and SARA, however confirmed habitat for SCC is considered Significant Wildlife Habitat (SWH) under the Provincial Policy Statement (PPS) and is discussed further in the context of SWH in **Section 3.4.10**.

Recent direction from MNRF/MECP to assess the potential presence of SAR has been to undertake a screening exercise to identify which SAR have potential to be present within a given study area based on known occurrences of the species within the area and habitat present. The screening exercise completed for this EA involved developing a list of SAR known to occur within the vicinity of study area or region from review of various sources including: species indicated by MNRF through correspondence (see correspondence, **Appendix A**, MNRF Letter dated Aug. 28, 2017), NHIC data extracted from online tool, MNRF Species at Risk website regional species list, and DFO SAR mapping. Once the list of species was developed, each species known preferred habitat was then cross-referenced against habitats identified within the study area or adjacent lands. The SAR screening assessment table (Table 4) is provided in **Appendix E**.

Those species identified through the completion of the screening as having potential suitable habitat within the study area and that have reasonable potential to be present are discussed below.

Aquatic SCC Potential

DFO SAR (April 2022) mapping indicates that Northern Sunfish (SC under the ESA and SARA) is “found (or potentially found)” in all the watercourses within the study area (i.e., Sixteen Mile Creek, Tributary NW-1-E of Sixteen Mile Creek, Unnamed Tributary of NW-1-E and the Agricultural Swale). MECP also noted in an email (October 2020 – see correspondence in **Appendix A**) that historical records of this species are found within the Sixteen Mile Creek watershed.

At the time of the surveys in 2017 the MNRF indicated that Sixteen Mile Creek is considered ‘Contributing Habitat for Redside Dace’ in the vicinity of the Steeles Avenue, crossing which has also been confirmed by MECP. Redside Dace is a protected species listed as END under the ESA in Ontario and END under the SARA in Canada. Since the remaining watercourses (Tributary NW-1-E of Sixteen Mile Creek, Unnamed

Tributary of NW-1-E and the Agricultural Swale) also drain or eventually drain to Sixteen Mile creek, they are also considered 'Contributing Habitat'.

American Eel was also recently (2019) found in Sixteen Mile Creek further upstream near Kelso Dam. MECP considers the reach of Sixteen Mile Creek in the vicinity of the crossing as 'Occupied Habitat' for this species. American Eel is a protected species listed as END under the ESA in Ontario. Since the remaining watercourses (Tributary NW-1-E of Sixteen Mile Creek, Unnamed Tributary of NW-1-E and the Agricultural Swale) drain or eventually drain to Sixteen Mile Creek, they are considered 'Contributing Habitat' for this species.

MNRF also indicated that there are records of Bridle Shiner (SC under the ESA and SARA) in the vicinity of the study area. From the Species at Risk in Ontario Website (https://www.ontario.ca/page/bridle-shiner) "Bridle Shiners prefer clear, unpolluted streams, rivers and lakes which have an abundance of aquatic vegetation. These vegetated areas provide suitable spawning habitat and places to feed and hide from predators. Bridle Shiners prefer warm water habitats where the bottom is either sand, silt or organic debris, which is necessary for the establishment of aquatic vegetation." Given the habitat preference for abundant instream vegetation, warmwater habitat and fine substrates, the only potential habitat within the study area is in the Tributary of NW-1-E, downstream (north) of Steeles Avenue and the CP Rail Culvert (see Table 1, **Appendix E**).

The website also indicates that Northern Sunfish are found "in shallow vegetated areas of quiet, slow flowing rivers and streams, as well as warm lakes and ponds, with sandy banks or rocky bottoms. Northern Sunfish prefer to be near aquatic vegetation where they can avoid strong currents." Similar Bridle Shiner, the only potential habitat within the study area is in the Tributary of NW-1-E, downstream (north) of Steeles Avenue and CP Rail Culvert (see Table 1, **Appendix E**).

Given the preference of warmwater habitat for both Bridle Shiner and Northern Sunfish however, Tributary NW-1-E may not provide their preferred habitat since although the tributary is classified as warmwater, WSP found a Rainbow Trout fingerling during their surveys in July 2017, which indicates coldwater habitat in that area.

Terrestrial SCC Potential

Terrestrial SAR were identified in the screening assessment table (Table 4) provided in **Appendix E**. Species assessed as having a reasonable potential (i.e., moderate to high

potential) of occurring in the study area are listed in the tables below. The tables also summarize the results of field studies targeting these species.

SAR – Flora

Findings of the SAR screening indicated that suitable habitat is present within the study area for four (4) plant species. These species are summarized in **Table 3-4** below along with their provincial and federal status.

Table 3-4: Summary of SAR Flora Species with Reasonable Potential (i.e., moderate to high potential) to be Present within the Study Area

Species	S-Rank	COSEWIC	SARO	SARA	Summary of Observations and Presence of Suitable Habitat
American Columbo (*Frasera caroliniensis*)	S2	END	END	END-Schedule 1	Suitable habitat present in upland deciduous forest, thickets and clearings. No observations made during field studies.
Butternut *(Juglans cinerea*)	S2?	END	END	END-Schedule 1	Suitable habitat present within riparian forest along Sixteen Mile Creek, within upland deciduous forest, and within hedgerows. A Butternut sapling was found in Unit 1b (see location of Exhibit 1, **Appendix E**).
Eastern Flowering Dogwood (*Cornus florida*)	S2?	END	END	END-Schedule 1	Suitable habitat present in the forests, edges, hedgerows). No observations made during field studies.
Red Mulberry (*Morus rubra*)	S2	END	END	END-Schedule 1	Suitable habitat present in moist forest. No observations made during field studies.

S-Rank (provincial) (MNRF NHIC 2021)

S2 – imperiled; ? – inexact or uncertain numeric rank–COSEWIC – Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2021)
SARO – Species at Risk in Ontario (MNRF 2021)
SARA – Species at Risk Act (SARA 2021)
END – Endangered
—

Provincially Rare Flora

In addition to the SAR flora listed above, one (1) provincially rare species, Northern Hawthorn (*Crataegus pruinose var. dissona*, S3) has potential to be present in the cultural thicket and hedgerows within the study area.

SAR – Wildlife

Findings of the SAR screening indicated that:

- Five (5) wildlife SAR were confirmed in the study area or adjacent contiguous features: Barn Swallow, Eastern Wood-pewee, Snapping Turtle (only confirmed in iNaturalist records and Milton Heights Neighborhood SIS [Rand Engineering et al., 2014], Midland Painted Turtle and Monarch.
- Moderate potential / suitable habitat is present within the study area for an additional seven (7) wildlife SAR: Bank Swallow, Chimney Swift, Common Nighthawk, Wood Thrush, Yellow-banded Bumblebee, Little Brown Bat, Northern Myotis, and Eastern Milksnake (*Lampropeltis triangulum*).

SAR Bat Habitat

- Four species of SAR bats have potential to occur in the study area: Little Brown Bat, Northern Myotis, Eastern Small-footed Bat (*Myotis leibii*) and Tri-colored Bat. These species are listed as END provincially and as such are afforded protection under the ESA (2007). The potential treed habitat in the study area was assessed through a cavity tree / SAR bat habitat tree survey conducted on November 28, 2017 (leaf-off period). No buildings with potential SAR bat roosting habitat were identified within the proposed impact areas.
- Locations of identified cavity trees / habitat trees are shown on Exhibit 1, **Appendix E**, and detailed descriptions of the trees is provided in Table 3b, **Appendix E**. Potential treed roosting habitat for bats is also discussed in **Section 3.4.10** (Significant Wildlife Habitat).
- The purpose of the bat habitat assessment was to inform the evaluation of alignment alternatives and determine if further targeted bat acoustic surveys were warranted during the detailed design phase.

These species are summarized in **Table 3-5** below along with their locations, and provincial and federal status.

Table 3-5: Summary of SAR and SCC Wildlife Species with Reasonable Potential to be Present within the Study Area

Species	S-Rank	COSEWIC	SARO	SARA	Summary of Observations and Presence of Suitable Habitat
BIRDS					
Bank Swallow (*Riparia riparia*)	S4B	THR	THR	THR- Schedule 1	Not observed. Suitable breeding habitat (soil piles, banks) was not identified in the study area; some potential for occurrences as foraging visitant over wetlands and watercourses in the study area.
Barn Swallow (*Hirundo rustica*)	S4B, SZN	THR	THR	THR- Schedule 1	Foraging individuals observed in WSU 4 (ELC Unit 13); confirmed nesting in the CP Rail culvert at Tributary NW-1-E of Sixteen Mile Creek crossing.
Chimney Swift (*Chaetura pelagica*)	S4B	THR	THR	THR- Schedule 1	Not observed. Suitable breeding habitat (uncapped chimneys) is not present within the proposed alignments; some potential for occurrences as foraging visitant over wetlands and watercourses in the study area.
Common Nighthawk (*Chordeiles minor*)	S4B	SC	SC	THR- Schedule 1	Not observed (targeted crepuscular bird surveys were not completed). Potentially suitable habitat is present in the disturbed / regenerating cultural meadow area in WSU 4 (ELC Unit 13) (this species is known to prefer areas with sparse vegetation).
Eastern Wood-peewee (*Contopus virens*)	S4B	SC	SC	SC- Schedule 1	Possible breeding evidence recorded in WSU 3 (ELC Unit 1b) and WSU 8 (ELC Unit 11); no other areas of potentially suitable breeding habitat were identified.

Species	S-Rank	COSEWIC	SARO	SARA	Summary of Observations and Presence of Suitable Habitat
Wood Thrush (*Hylocichla mustelina)*	S4B	THR	SC	THR- Schedule 1	Not observed. Moderate potential for breeding habitat in woodland habitat in WSU 8 (ELC Unit 11).
REPTILES					
Eastern Milksnake (*Lampropeltis triangulum*)	S3	SC	NAR	SC- Schedule 1	Not observed. This species is a habitat generalist and there is potential for occurrences in a variety of Natural Heritage Features or surrounding semi-rural buildings.
Midland Painted Turtle (*Chrysemys picta*)	S4	SC	NAR	SC- Schedule 1	On road-killed individual observed along Steeles Avenue southwest of the crossing of Tributary NW-1-E / rail corridor. Potential habitat in wetland areas, including WSU 1 (ELC Unit 17 / SWMP) and WSU 5 (ELC Unit 4a).
Snapping Turtle (*Chelydra s. serpentina*)	S3	SC	SC	SC- Schedule 1	Not observed. One adult was observed along Tributary NW-1-E, west of the rail crossing culvert during the SIS; and a road mortality was reported in iNaturalist (2020 near Steeles Avenue rail crossing). Potential for occurrences in study area in watercourses and wetland features.
MAMMALS					
Little Brown Bat (*Myotis lucifuga*)	S4	END	END	END- Schedule 1	Not observed. Bats have potential to roost in cavity trees within the study area. Targeted bat acoustic surveys were not completed, but potentially suitable cavity trees were identified in ELC Units 1a, 1b, 9, 10a, 11, 12 and 14.

Species	S-Rank	COSEWIC	SARO	SARA	Summary of Observations and Presence of Suitable Habitat
Northern Myotis (*Myotis septentrionalis*)	S3	END	END	END- Schedule 1	Not observed. Bats have potential to roost in cavity trees within the study area. Targeted bat acoustic surveys were not completed, but potentially suitable cavity trees were identified in ELC Units 1a, 1b, 9, 10a, 11, 12 and 14.
INSECTS					
Monarch (*Danaus plexippus*)	S4	END	SC	SC- Schedule 1	One individual observed foraging / moving along the edge of the Unevaluated Wetland (ELC Unit 4a). Suitable habitat is present wherever nectar sources (wildflowers) or the host plant (Milkweed) are present, which was observed in cultural meadow areas in the study area.
Yellow-banded Bumblebee (*Bombus terricola*)	S3S5	SC	SC	SC- Schedule 1	A forage and habitat generalist and suitable habitat is present within the study area (open habitat such as farmland and urban areas). 2021 iNaturalist record of a Yellow-banded Bumblebee 1.7 km west of the study area.

S-Rank (provincial) (NHIC 2021)
S3 – Vulnerable
S4 – Apparently Secure
S4B – Apparently Secure (Breeding)
S5B – Secure (Breeding)
SZN – Non-breeding migrants/vagrants
COSEWIC – Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2021)
SARO – Species at Risk in Ontario (MECP 2021)
SARA – Species at Risk Act (SARA 2021)
END – Endangered
SC – Special Concern

3.4.10 Significant Wildlife Habitat

A general assessment of the potential for Significant Wildlife Habitat (SWH) within the study area was completed using the definitions provided below based on guidance from *Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E* (MNRF 2015).

The following are considered *candidate* SWH:

- Seasonal Concentration Areas:
  - **Waterfowl Stopover and Staging Areas (Terrestrial and Aquatic)** – potentially suitable vegetation communities (i.e., cultural meadow, cultural thicket, and marsh units) are present within/adjacent to WSU 4 and 5. Large tracts of agricultural lands are also present within the study area. Spring season surveys to evaluate this type of habitat were not completed for this MCEA; however, based on the available background information records (including MNRF, the SIS and eBird.org records), and the size of the features, this type of habitat is unlikely to occur.
  - **Raptor Wintering Area** – a combination of woodland (ELC Unit 11) and upland (ELC Unit 13 and adjacent un-numbered CUM1 and CUT1 units) habitat totaling >20 ha is present in WSU 4 and 8 (including lands adjacent but contiguous with the study area). The cultural meadow in ELC Unit 13 is a regenerating historically disturbed area with areas of bare ground, which may not provide suitable raptor foraging habitat.
  - **Bat Maternity Colonies** – based on the findings from the cavity tree surveys (see Exhibit 1 and Table 3b in **Appendix E**):
    - Deciduous forest with >10 cavity trees / ha is present in WSU 6 (ELC Unit 9); however, this area was primarily dead/dying Ash trees with loose bark or small cavities, which are unlikely to support large numbers of bats (more likely to be used as occasional day-roosting habitat).
    - Six cavity trees were also identified along the Sixteen Mile Creek riparian corridor (ELC Units 1a, 1b); however, four of these trees had a decay class of 4-5, which do not meet the criteria for SWH.
    - Two mature Sugar Maple cavity trees were noted in ELC Unit 11; this area was not surveyed in detail as it was beyond the ‘alignment alternatives’ footprints, however, based on general assessment of

the maturity, size and ELC community, this unit is the most suitable area for bat maternity roost SWH in the study area.

- **Turtle Wintering Areas** – potentially suitable marsh communities are present within ELC Units 4a and 17; there is also potential in deeper pools (>0.5 m) along Sixteen Mile Creek and Tributary NW-1-E that may provide overwintering habitat for turtles. No turtles were observed using these features during the 2017-2018 field surveys; however, Midland Painted Turtle and Snapping Turtle have been confirmed in the study area, and additional spring / fall season surveys would be required to confirm this type of habitat.

- Specialized Wildlife Habitats:
  - **Waterfowl Nesting Area** – Potentially suitable habitat within the study area is located in upland habitats adjacent to marsh communities in ELC Units 4a and 17; however, none of the criteria waterfowl species were recorded during the 2017-2018 surveys and based on the size of the features and background records review, this type of SWH is unlikely to occur in the study area.
  - **Amphibian Breeding Habitat (Woodland)** – Potentially suitable habitat may be present within ELC Unit 11 (deciduous forest). This forest may contain vernal pools in the spring as pockets of wetland vegetation were present at the time of the ELC surveys on November 28, 2017 and June 11, 2018; however, there was no standing water at these times, indicating the pools likely do not provide sufficient hydroperiods for suitable amphibian breeding habitat.

  Habitats for Species of Conservation Concern:

  - **Shrub/Early Successional Bird Breeding Habitat** – Potentially suitable habitat may be present in the cultural thicket and cultural woodland units within/adjacent to ELC Units 10a / 10b (extending with contiguous habitat beyond the study area). One of the criteria species, Willow Flycatcher, was recorded in ELC Unit 3a / 4a (adjacent to candidate cultural woodland) in the SIS (Rand Engineering et al., 2014), and complete coverage for this area was not available at the time of the 2017-2018 breeding bird surveys.
  - **Special Concern and Rare Wildlife Species** - See **Section 3.4.9** for a list of all SCC that have potential to occur within the study area if suitable

habitat is present and there is a reasonable likelihood the species may occur.

Confirmed SWH:

- Specialized Wildlife Habitats:
  - **Amphibian Breeding Habitat (Wetland)** – During the 2017 amphibian calling surveys, Level 3 calling for two of the criteria species, Green Frog and Gray Treefrog, was recorded at AC5 (likely associated with breeding habitat in ELC Unit 17). This category of SWH is typically isolated from woodland habitats; however, this wetland should meet the criteria because a predominantly aquatic species was recorded (Green Frog), and the adjacent woodland habitat consists of disturbed Cultural Woodland to the west, and the FOD unit to the southeast, which is functionally separated by a berm and Steeles Avenue.
- Animal Movement Corridors:
  - **Amphibian Movement Corridors** – This type of habitat is associated with the amphibian breeding SWH, connecting breeding and summer habitats. The corridor would be limited to connections with the Cultural Woodlands (ELC Unit 16) to the west.
- Habitats for Species of Conservation Concern:
  - **Special Concern and Rare Wildlife Species** - The following SCC were recorded in the study area; however, delineation of the critical habitat (e.g., nesting / reproduction sites) has not been confirmed:
    - **Eastern Wood-pewee** – Possible breeding evidence was recorded in ELC Unit 1b and 11.
    - **Midland Painted Turtle** – Observed as a roadkill along Steeles Avenue southwest of the rail crossing, possibly associated with habitat in the Unevaluated Wetland (ELC Unit 4a).
    - **Monarch** – Observed as foraging / migrant individual along the edge of the Unevaluated Wetland (ELC Unit 4a).

3.4.11 Significant Woodland Evaluation

Significant Woodlands are a *Key Feature* within the ROP, however individual *Key Features* are not mapped separately on Map 1G of the ROP, rather all *Key Features* are delineated together. The ROP definition of *Significant Woodlands* is provided in Policy

277 (ROP 2021). This definition was reviewed and applied to the woodlands within the study area to determine whether any woodlands meet the definition. Per Policy 277, the criteria to meet the definition of a *Significant Woodland* are:

> A *Woodland* that is 0.5 ha or larger that meets one or more of the four following criteria:

The *Woodland* contains forest patches over 99 years old,

The patch size of the *Woodland* is 2 ha or larger if it is located in the Urban Area, or 4 ha or larger if it is located outside the Urban Area but below the *Escarpment Brow*, or 10 ha or larger if it is located outside the Urban Area but above the *Escarpment Brow*,

The *Woodland* has an interior core area of 4 ha or larger, measured 100m from the edge, or

The *Woodland* is wholly or partially within 50m of a *major creek or certain headwater creek* or within 150m of the *Escarpment Brow*.

According to the ROP, a *Woodland* is:

> *WOODLAND means land with at least: 1000 trees of any size per ha, or 750 trees over 5 cm in diameter per ha, or 500 trees over 12 cm in diameter per ha, or 250 trees over 20 cm in diameter per ha but does not include an active cultivated fruit or nut orchard, a Christmas tree plantation, a plantation certified by the Region, a tree nursery, or a narrow linear strip of trees that defines a laneway or a boundary between fields. For the purpose of this definition, all measurements of the trees are to be taken at 1.37 m from the ground and trees in regenerating fields must have achieved that height to be counted.*

According to the ROP, a *Tree* is:

> *TREE means any species of woody perennial plant, including its root system, which has reached or can reach a height of at least 4.5m above ground at physiological maturity.*

Based on the above criteria and the ROP definition of a *Woodland*, the *Woodland* communities south of the existing Steeles Avenue have been evaluated in **Table 3-6**. Three of the four communities meet the criteria for *Significant Woodland* designation,

Unit 1b / Feature 8, Unit 9 / Feature 3 and Unit 11 / Feature 5a. If the Cultural Thicket community (Unit 12 / Feature 5) meets the definition of a *Woodland*, it would meet the *Significant Woodland* Criteria when combined with Unit 11 / Feature 5a. A basal area assessment is required to determine if it meets the *Woodland* criteria, outlined above.

Unit 15 is a Candidate Significant Woodlot. At detailed design, Unit 15 will be further assessed in the field to re-evaluate if the criterion for a Woodland and Significant Woodland is met.

Table 3-6: Regionally Significant Woodland Evaluation

Unit / Feature	Community Description / Woodland Criteria	1) Age Criteria	2) Size Criteria	3) Interior Area Criteria	4) Creek Criteria	Conclusion
Unit 1b / Feature 8	Willow Lowland Deciduous Forest (FOD7-3) along Sixteen Mile Creek. Dominated by Willow, Silver Maple, Black Alder and Bur Oak. Woodland is ~ 1.8 ha **CRITERION MET**	Some riparian vegetation is present in 1954 aerial (68 years ago) however imagery unclear therefore presence of trees > 31 years cannot be determined in order to confirm that portions are >99 years old. **CRITERION MAY BE MET**	Woodland ~1.8 ha therefore does not meet the 2 ha patch size criterion on its own. **CRITERION NOT MET**	Woodland is <80 m wide at its widest point therefore there is no interior habitat. **CRITERION NOT MET**	Woodland is located either side of a regulated watercourse. **CRITERION MET**	Woodland meets the size and creek criteria. **SIGNIFICANT WOODLAND**
Unit 9 / Feature 3	Fresh-Moist Lowland Deciduous Forest (FOD7). Dominated by dead Green Ash in the canopy and a sub-canopy dominated by Manitoba Maple and European Buckthorn Woodland is ~1.76 ha therefore it meets the minimum size of 0.5 ha. **CRITERION MET**	No forest patches > 99 years old **CRITERION NOT MET**	Woodland ~1.76 ha therefore does not meet the 2 ha patch size criterion on its own. **CRITERION NOT MET**	Woodland is <70 m wide at its widest point therefore there is no interior habitat. **CRITERION NOT MET**	Woodland is located either side of a regulated watercourse. **CRITERION MET**	Woodland meets the size and creek criteria. **SIGNIFICANT WOODLAND**

Unit / Feature	Community Description / Woodland Criteria	1) Age Criteria	2) Size Criteria	3) Interior Area Criteria	4) Creek Criteria	Conclusion
Unit 11 / Feature 5a	Fresh-Moist Bur Oak Deciduous Forest (FOD9-3). Comprised of mature Bur Oak, do-dominate with mid-aged ash, suggestive of disturbance such as historic livestock grazing or logging. Some regeneration of late-successional species including Bitternut Hickory, Shagbark Hickory and White Pine. Woodland is ~19.6 ha therefore it meets the minimum size of 0.5 ha. **CRITERION MET**	Portions of this woodland are present in 1954 aerial (68 years ago). These areas are therefore estimated to be >99 years old. **CRITERION MET**	Woodland is ~19.6 ha, therefore meets the minimum 2 ha size criterion. **CRITERION MET**	Interior habitat is < 4ha **CRITERION NOT MET**	According to CH online mapping, this woodland is not within 50m of a regulated watercourse. **CRITERION NOT MET**	Woodland meets the size and age criteria. **SIGNIFCANT WOODLAND**
Unit 12 / Feature 5	Mineral Cultural Thicket (CUT1) dominated by Hawthorn, Staghorn Sumac, European Buckthorn and Wild	No forest patches > 99 years old **CRITERION NOT MET**	Woodland is ~0.81 ha therefore does not meet the 2 ha patch size criterion on its own.	Woodland is <50 m wide at its widest point therefore there is no interior habitat.	Woodland is not within 50 m of a *Major creek or certain headwater creek*	Not Significant on its own, but when combined with Unit 11, it is part of a larger

Unit / Feature	Community Description / Woodland Criteria	1) Age Criteria	2) Size Criteria	3) Interior Area Criteria	4) Creek Criteria	Conclusion
	Red Raspberry with scarce Bur Oak, Manitoba Maple and Ash in the canopy. *Basal Area assessment not completed to determine whether community meets the definition of a *Woodland*. For the purposes of this assessment, it is assumed to meet this definition. Woodland is ~0.81 ha therefore it meets the minimum size of 0.5 ha. **CRITERION MET**		**CRITERION NOT MET** (individually) **CRITERION MET** (in combination with Unit 11)	**CRITERION NOT MET**	**CRITERION NOT MET**	woodland that is significant. The Cultural Thicket community would need a basal area assessment to confirm that it meets the definition of a *Woodland* **MAY BE SIGNIFICANT WOODLAND**

3.4.12 Significant Wetland Evaluation

According to Policy 267.5 of the ROP, *Significant Wetlands* means:

> For lands within the Niagara Escarpment Plan Area, *Provincially Significant Wetlands* and *wetlands* as defined in the Niagara Escarpment Plan that make an important ecological contribution to the Regional Natural Heritage System;
> For lands within the Greenbelt Plan Area but outside the Niagara Escarpment Area, *Provincially Significant Wetlands* and *wetlands* as defined in the Greenbelt Plan;
> For lands within the Regional Natural Heritage System, but outside the Greenbelt Plan Area, *Provincially Significant Wetlands* and *wetlands* that make an important ecological contribution to the Regional Natural Heritage System; and
> Outside the Regional Natural Heritage System, *Provincially Significant Wetlands*.

According to Policy 293, Wetlands means:

"*lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case, the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic or water tolerant plants. The four major types of wetlands are swamps, marshes, bogs and fens. Periodically soaked or wet lands being used for agricultural purposes which no longer exhibit wetland characteristics are not considered to be wetlands for the purposes of this definition. Within the Greenbelt Plan Area, wetlands include only those that have been identified by the Ministry of Natural Resources or by any other person, according to evaluation procedures established by the Ministry of Natural Resources, as amended from time to time*."

Based on the above criteria and the ROP definition of a *Wetland*, the *Wetland* communities within the study area have been evaluated in **Table 3-7**. Two of the five wetland communities meet the criteria for *Regionally Significant Wetland*, Unit 4a / Feature 4, and Unit 17 / Feature 9.

Table 3-7: Regionally Significant Wetland Evaluation

Unit / Feature	Community Description	Niagara Escarpment Plan Area?	Greenbelt Plan Area?	Regional Natural Heritage System?	Provincially Significant Wetland?	Evaluation and Conclusion
Unit 4a / Feature 4	Cattail Mineral Shallow Marsh (MAS2-1) located on either side of Tributary of NW-1-E of Sixteen Mile Creek. Community dominated by cattail species.	No	No	Yes	No	Criteria 1, 2 and 4 not applicable. Criterion 3 applies if Unit 4a makes an important ecological contribution to the Regional NHS. Riparian floodplain wetland that provides and/or contributes to fish habitat, and habitat for SCC (Monarch and Barn Swallow observed foraging in this wetland and road killed Midland Painted Turtle observed nearby). Therefore, Unit 4a makes an important ecological contribution to the Regional NHS. **REGIONALLY SIGNIFICANT WETLAND**
Unit 4b / Feature 10	Cattail Mineral Shallow Marsh (MAS2-1) dominated by Narrow-leaved Cattail. Located along the Steeles Avenue	Yes	No	Yes	No	Criteria 2 and 4 not applicable. Criteria 1 and 3 apply if Unit 4b makes an important ecological contribution to the Regional NHS.

Unit / Feature	Community Description	Niagara Escarpment Plan Area?	Greenbelt Plan Area?	Regional Natural Heritage System?	Provincially Significant Wetland?	Evaluation and Conclusion
	ditch line and Unnamed Tributary of NW-1-E.					No SCC observed in this unit, however as a riparian wetland, this community provides flood attenuation and and/or contributes to fish habitat. Therefore, Unit 4b makes an important ecological contribution to the Regional NHS. **REGIONALLY SIGNIFICANT WETLAND**
Unit 4c	Cattail Mineral Shallow Marsh (MAS2-1) located in the ditch line of Steeles Avenue.	No	No	Yes	No	Criteria 1, 2 and 4 not applicable. Criterion 3 applies if Unit 4c makes an important ecological contribution to the Regional NHS. No SCC observed and Unit 4a is a small roadside wetland, without a direct watercourse connection. **NOT SIGNIFICANT**
Unit 6	Cattail Mineral Shallow Marsh (MAS2-1) dominated by a mix of Narrow-	Yes	No	No	No	Criteria 2, 3 and 4 not applicable. Criterion 1 applies if Unit 6 provides an important

Unit / Feature	Community Description	Niagara Escarpment Plan Area?	Greenbelt Plan Area?	Regional Natural Heritage System?	Provincially Significant Wetland?	Evaluation and Conclusion
	leaved Cattail, Reed Canary Grass and European Common Reed. Located along the Steeles Avenue ditch line and small, agricultural field swale					ecological contribution to the Regional NHS. No SCC observed and Unit 6 is a small roadside wetland with a small extension along an agricultural swale **NOT SIGNIFICANT**
Unit 17 / Feature	Forb Mineral Shallow Marsh (MAS2-9) dominated by Purple Loosestrife	No	No	Yes	No	Criteria 1, 2 and 4 not applicable. Criterion 3 applies if Unit 4a makes an important ecological contribution to the Regional NHS. Unit 17 has been confirmed as SWH (Amphibian Breeding Habitat - Wetland) and as potential Turtle Overwintering Habitat. Therefore Unit 17 makes an important ecological contribution to the Regional NHS. **REGIONALLY SIGNIFICANT WETLAND**

3.4.13 Natural Heritage Constraint Analysis

The Milton Heights Neighborhood Subwatershed Impact Study (SIS; Rand Engineering et al., 2014) adopted the constraint levels which were taken from the Indian Creek/Sixteen Mile Creek, Sherwood Survey Subwatershed Management Study (Philips Engineering et al., 2004). The Subwatershed Management Study characterized the aquatic and terrestrial natural heritage features of the subwatershed on the basis of the level of environmental "constraint" they pose to future development. This involved the application of a hierarchical system, comprised of three levels of constraint: high, medium and low, defined on a relative scale.

The Subwatershed Management Study assigned one of these constraint levels to all natural and semi-natural terrestrial features within the Milton Heights study area based on a combination of their biophysical attributes (e.g., species composition, size, age, etc.) and functions (proximity to other habitat blocks, linkages, etc.). The study identified a number of criteria to define high, medium and low constraint levels for natural heritage features.

For the purpose of this report, these criteria have been applied to each ELC community and the watercourses within the study area (see Exhibit 1, **Appendix E**). **Tables 3-8 and 3-9** below identify the criteria that apply to each ELC community and watercourse. In cases where an individual polygon met criteria for both high and medium or medium and low, it was assigned the higher rating. It should be noted that any area that falls within the Sixteen Mile Creek Valley is, by default, considered a high constraint since the valley is part of the Regional Natural Heritage System identified in the Region of Halton's Official Plan (2021 Office Consolidation). For example, where the limit of the valley passes through a polygon that would otherwise be a low or medium constraint feature due to its ecological attributes, that portion of the polygon within the valley receives a high constraint rating. However, where there are lands within the valley that are presently subject to anthropogenic processes, such as residential lawns and actively cultivated agricultural fields, these areas were not assigned any constraint rating.

Terrestrial Features

High constraint terrestrial features are defined in Philips Engineering et al., (2004) as:

- Patches of natural habitat > 4.0 ha in size;

- All Provincially Significant Wetlands and all wetlands >2.0 ha in size (including unevaluated wetlands);
- Lands within areas designated ESA's, ANSIs, or the Regional Natural Heritage System (which includes Escarpment Plan Areas), as mapped on Map 1 of the Region of Halton Official Plan, 2018 Office Consolidation);
- Habitats of any size that support more than one of the following attributes: mature to old growth vegetation, high species richness, complex structure, steep slopes, poorly drained soils or seepage/groundwater discharge conditions;
- Significant wildlife habitat or significant vegetation communities;
- Natural habitats that support populations of Species At Risk in Canada (i.e. species federally listed as Endangered, Threatened or Vulnerable) or in Ontario (i.e. species provincially listed as Endangered, Threatened or Special Concern) or that support species that are considered nationally, provincially or regionally rare; and
- Natural habitats that are contiguous with a primary or secondary linkage feature (Sixteen Mile Creek is an example of a secondary linkage).

High constraint terrestrial features within the study area are detailed in **Table 3-8** below, shown on Exhibit 1, **Appendix E** and examples include the following:

- Sixteen Mile Creek valley (Regional Natural Heritage System);
- Large (>4.0 ha) patches of natural habitat;
- Wetlands >2.0 ha;
- Habitats that support Species At Risk; and
- All ELC units and agricultural fields west of the CP Rail line (part of the Regional Natural Heritage System due to EPA and ERA designations).

The Subwatershed Management Study states that **high constraint areas are to be retained and fully protected**.

Medium constraint terrestrial features include:

- Patches of natural/semi-natural habitats >2.0 ha in size;
- Wetlands <2.0 ha in size (including evaluated non-provincially significant wetlands and unevaluated wetlands);
- Habitats of any size that support more than one of the following attributes: mid-aged communities, moderate levels of native species richness, intermediate habitat structure, moderate slopes and imperfect drainage conditions); and
- Habitats of any size that are contiguous with tertiary linkage features.

Medium constraint features within the study area are detailed in **Table 3-8** below, shown on Exhibit 1, **Appendix E** and examples include the following:

- One small (<2.0 ha) wetland area (east edge of CP Rail line south of Steeles Avenue West)
- Cultural Thicket communities, and Cultural Meadow communities (between the CP Rail line and Peru Road)

The Subwatershed Management Study states that **medium constraint areas should be protected and enhanced where possible** subject to the findings of an SIS.

Any medium constraint features to be removed by development require replacement, preferably elsewhere within the study area, with the overall objective of achieving a "net environmental gain."

Low constraint terrestrial features include:

- Patches of semi-natural/natural habitat <2.0 ha in size;
- Habitats supporting immature or successional communities with low native species richness, poor habitat structure and gentle to flat slopes; and
- Habitats of any size that are contiguous with quaternary linkage features.

Low constraint features are detailed in **Table 3-8** below, shown on Exhibit 1, **Appendix E** and examples include the following:

- Small (<2.0 ha) patch of Cultural Hedgerow south of Steeles Avenue West

The Subwatershed Management Study states that low constraint areas should be "replaced and enhanced", also preferably within the study area and as part of achieving a "net gain" of habitat.

Areas that do not meet any of the Subwatershed Management Study (Philips Engineering et al., 2004) constraint criteria (e.g. residential lawns) are unconstrained from a natural heritage perspective.

Table 3-8: Terrestrial Habitat Type and Constraint Rating (refer to Exhibit 1, Appendix E)

ELC Unit/Habitat	Constraint Level	Criteria
Units 1a: FOD7-3	**HIGH**	▶ Regional Natural Heritage System (Key Feature: Significant Woodland) ▶ Urban River Valley System (Greenbelt)
Units 1b: FOD7-3	**HIGH**	▶ Regional Natural Heritage System (Key Feature: Significant Woodland) ▶ Urban River Valley System (Greenbelt) ▶ Known to support Species At Risk (Eastern Wood-pewee)
Unit 2: CUM1-1	**HIGH**	▶ Regional Natural Heritage System ▶ Urban River Valley System (Greenbelt)
Unit 3a/3b: CUM1-1	**MEDIUM**	▶ Patch of natural/semi-natural habitat (>2.0 ha in size) when considered in conjunction with adjacent habitat ▶ Partially mapped within the Regional Natural Heritage System ▶ *Mapped as medium constraint in 2014 SIS
Unit 4a: MAS2-1	**HIGH**	▶ Regional Natural Heritage System (Key Feature: Regionally Significant Wetland) ▶ Known to support Species At Risk (Monarch, Barn Swallow, Midland Painted Turtle)
Unit 4b: MAS2-1	**HIGH**	▶ Regional Natural Heritage System (Key Feature: Regionally Significant Wetland)
Unit 4c: MAS2-1	**MEDIUM**	▶ Small wetland (< 2.0 ha in size)
Unit 5: CUM1-1	**HIGH**	▶ Regional Natural Heritage System
Unit 6: MAS2-1	**HIGH**	▶ Regional Natural Heritage System ▶ Niagara Escarpment Protection Area
Unit 7: CUT1	**HIGH**	▶ Niagara Escarpment Protection Area

ELC Unit/Habitat	Constraint Level	Criteria
Unit 8: CUM1-1	**HIGH**	▶ Niagara Escarpment Protection Area
Unit 9: FOD7	**HIGH**	▶ Regional Natural Heritage System (Key Feature: Significant Woodland) ▶ Niagara Escarpment Protection Area
Unit 10a: CUW1	**HIGH**	▶ Regional Natural Heritage System ▶ Niagara Escarpment Protection Area
Unit 10b: CUW1	**MEDIUM**	▶ Patch of natural/semi-natural habitat (>2.0 ha in size) when considered in conjunction with adjacent habitat ▶ *Mapped as medium constraint in 2014 SIS
Unit 11: FOD9-3	**HIGH**	▶ Regional Natural Heritage System (Key Feature: Significant Woodland) ▶ Large patch of natural habitat (>4.0 ha in size when considered at a landscape level) ▶ Niagara Escarpment Protection Area and Rural Area
Unit 12: CUT1	**HIGH**	▶ Regional Natural Heritage System (Key Feature: Significant Woodland) ▶ Known to support Species At Risk (Eastern Wood-pewee) ▶ Niagara Escarpment Rural Area
Unit 13: CUM1-1	**HIGH**	▶ Niagara Escarpment Rural Area
Unit 14: CUH1	**LOW**	▶ Small patch of natural/semi-natural habitat (< 2.0 ha in size) ▶ Immature or successional community with low native species richness, poor habitat structure and gentle to flat slopes
Unit 15: MOS	**HIGH**	▶ Regional Natural Heritage System
Unit 16: CUW1	**HIGH**	▶ Regional Natural Heritage System

ELC Unit/Habitat	Constraint Level	Criteria
Unit 17: MAS2-9	**HIGH**	▶ Regional Natural Heritage System (Key Feature: Regionally Significant Wetland) ▶ Significant Wildlife Habitat (Amphibian Breeding Habitat – Wetland)

Aquatic Features

The three constraint levels for aquatic features are defined in the Subwatershed Management Study as follows:

- **High Constraint** – applied to permanently flowing streams. These have diverse fish communities and well-defined channels with a range of substrates. Some reaches within these streams have been altered to the point where they provide little or no fish habitat; however, these are included as a high level constraint based on their potential value as a migration route or for future enhancement. For these streams, groundwater recharge/discharge areas have been identified and will be protected. The channels will be retained in their natural states, except where opportunities exist to mitigate or reverse past damage. The valleys will be retained as natural heritage corridors, and the enhancement of riparian vegetation in some areas will contribute to improved habitat conditions, including reduced temperatures in some cases. Stormwater management facilities will be built and mitigation measures will be taken to cool discharge temperatures where appropriate.
- **Medium Constraint –** applied to intermittent streams which, based on the presence of a defined channel with sorted substrates, were considered to flow for extended periods. Generally, these watercourses often contained simple fish communities, which are commonly maintained by the existence of isolated refuges.
- **Low Constraint –** applied to watercourses which are ephemeral or intermittent, have either poorly defined channels with no sorting of substrate or no defined channels, and where no fish were captured.

The four watercourses present in the study area represent a variety of habitat types and fish communities. Habitat varies from complex, with diverse in-stream cover and complex morphological features, to simple, with no defined channel and intermittent or ephemeral flows. The fish communities range from diverse coldwater and coolwater assemblages supporting a provincially Endangered species (e.g., Redside Dace, American Eel) to warmwater baitfish communities.

Accordingly, constraints ratings have been applied to each watercourse to reflect the habitat features/functions they provide and the character/sensitivity of the fish communities that inhabit them. **Table 3-9** below provides the constraint ratings that have been assigned to each watercourse within the study area, based on the constraint definitions above and the existing conditions noted in Table 1 (**Appendix E**) and **Section 3.4.8**.

Table 3-9: Aquatic Habitat Type and Constraint Rating

Watercourse	Constraint Level		
	High	Medium	Low
Sixteen Mile Creek (Feature #8)	X		
Tributary NW-1-E of Sixteen Mile Creek (Feature #3)	X		
Unnamed Tributary of NW-1-E (Feature #1	X	X	
Agricultural Swale (Feature #2)			X

As noted in **Section 8.4.3.1**, the small swale feature associated with the Sixteen Mile Creek crossing area, will be further assessed at the detailed design stage to determine the appropriate constraint level (e.g., low or medium).

3.5 Drainage and Watershed Characteristics

A Drainage and Stormwater Management Report was prepared in support of the Steeles Avenue MCEA Study (see **Appendix F**). The existing drainage conditions within the Steeles Avenue MCEA study area were derived from the following documents and data:

- Milton Heights Neighbourhood, Sherwood Survey Secondary Plan Area, Subwatershed Impact Study (SIS) Area 1, 2 and 4, Final Report, Revised Feb 2014, prepared by Rand Engineering et al.;
- Stormwater Management, Indian Creek/Sixteen Mile Creek/Sherwood Survey, Subwatershed Planning Study, Town of Milton, Dec 2004, prepared by Phillip Engineering Ltd.; and
- HEC-RAS models of Sixteen Mile Creek Main Channel and its tributary.

- Shape files of Approximate Regulation Limit (ARL), Floodplain Hazard Limit, Estimated Meander Belt, Wetland, Headwater Floodplain Limit, etc. received from Conservation Halton

The Steeles Avenue MCEA study area is located within Sub-catchment 2 of Sixteen Mile Creek Subwatershed. A portion of Sub-catchment 2 – north of Steeles Avenue between CP Rail and Peru Road falls on Phase 2 SIS Area 4. There are three existing culverts (C1, C3 and C4) and a bridge over Sixteen Mile Creek within the study limit that cross Steeles Avenue. Culvert C2 is located on CP Rail immediately downstream of Culvert C1. Culvert C3 is approximately 430 m north-east from Culvert C1. Culvert C4 is located east of Sixteen Mile Creek, while the bridge over the creek is located approximately 400 m west of Industrial Drive. The existing conditions drainage mosaics are provided in **Exhibit 3-4**.

Culvert C1 is a 750 mm diameter HDPE culvert, corrugated inside and is in good condition. This culvert drains over 125 ha of drainage area that includes a watercourse that is a tributary of Sixteen Mile Creek. According to the HEC-RAS model, the 5-year storm event overtopped Steeles Avenue. The flood depths over Steeles Avenue are approximately 0.15 m and 0.85 m for the 100-year storm event and Regional Storm event, respectively. Immediately downstream of Culvert C1, there is a box culvert at CP Rail, Culvert C2, with a 2.4 m wide span and a 1.6 m rise that is in poor condition. It was found that the Regional Storm event overtops CP Rail as well. Downstream of Culvert C2, the floodplain is very wide, more than 100 m for the Regional Storm. Culvert C2 overtops CP Rail during the Regional Storm event by approximately 0.10 m. There is a water pool between Culverts C1 and C2 where fish were observed during the site visit.

Culvert C3 is a 300 mm diameter CSP culvert that drains the roadside ditch only. Culvert C4 is a 2 x 600 mm diameter concrete pipe and is an outlet culvert for a stormwater management (SWM) pond.

As per the HEC-RAS model, the existing Sixteen Mile Creek Bridge at Steeles Avenue has a clear opening of 10.4 m span and an average 2.45 m rise. The flows overtopped Steeles Avenue from the 10-year storm event. **Table 3-10** shows the modelled flows and modelled approximate flow depth over Steeles Avenue at the Sixteen Mile Creek Bridge.

Table 3-10: Modelled Flows and Modelled Approximate Flow Depth over Steeles Avenue at Sixteen Mile Creek Bridge

Storm Event	Modelled Flows (m^3/s)	Modelled Flow depth above Steeles Avenue (m)
10-year	35.94	0.16
25-year	46.22	0.63
50-year	55.80	0.81
100-year	63.32	0.88
Regional	339.91	4.45

The existing conditions hydrologic assessment for the existing road corridor and tributary watercourse was completed. The drainage mosaic for Tributary NW1-E on the west side of Tremaine Road was matched with the drainage mosaic prepared as part of the Tremaine Road design and construction (ongoing). The drainage mosaic is shown in **Exhibit 3-4** and further described in Stormwater Management Report found in **Appendix F**.

LEGEND

CATCHMENT BOUNDARY

DIRECTION OF FLOW

TRANSVERSE CULVERT

C4 — TRANSVERSE CULVERT ID

C4 / 52.0ha — SUBCATCHMENT No. / SUBCATCHMENT AREA

Metric Scale

100m 0 200m

1 : 7,000

TREMAINE RD

CPR

TRIBUTARY NW1E

16 MILE CREEK

STEELES AVE. W

C1 C2 C3

100 / 85 ha

101 / 38.4 ha

105 / 25 ha

107 / 13.0 ha

110 / 2.85 ha

115 / 1.58 ha

120 / 1.05 ha

120 / 1.04 ha

122 / 14.6 ha

125 / 0.68 ha

125 / 0.28 ha

145 / 0.70 ha

160 / 0.77 ha

180 / 0.7 ha

DRAWING NAME: \\CORP.PBWAN.NET\CA\CAKTC100\COMMON\MIS\DRAWINGS\WATERRES\2017\17M-00979-00 STEELES AVE EA, MILTON\DRAWINGS\17M-00979-00 STEELES AVE EA_EXISTING DRAINAGE MOSAIC_FINAL_JULY [illegible] Oct. 17, 2022 3:58 PM

wsp

EXISTING CONDITIONS DRAINAGE MOSAIC

STEELES AVENUE EA, HALTON REGION

EXHIBIT

3-4

A Visual OTTHYMO based hydrologic model was developed to estimate localized runoff generated from the roadway pavements and from the external areas draining to the roadway under existing conditions. The existing conditions hydrological assessment was carried out using the Visual OTTHYMO hydrologic model by using the Town of Milton's Intensity-Duration-Frequency (IDF) data with Chicago 24-hour storm distribution. Hydrological parameters were determined by using the land use information from aerial / Google map and soil information from Ontario Soil Survey data. **Table 3-11** provides a summary of the hydrological modelling results.

Table 3-11: Summary of the Existing Hydrological Modelling Results

Catchment / HYD ID	Area (ha)	Flow (m^3/s)						
		2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
100	85.0	1.04	1.90	2.55	3.44	4.13	4.84	9.09
101	36.4	0.68	1.15	1.49	1.94	2.28	2.63	4.00
500	121.4	1.71	3.04	4.04	5.38	6.41	7.46	13.08
102	14.6	0.27	0.49	0.65	0.86	1.02	1.18	1.69
505	136.0	1.98	3.51	4.65	6.18	7.37	8.58	14.73
120	1.04	0.10	0.15	0.19	0.24	0.27	0.31	0.15
125	0.58	0.04	0.07	0.09	0.12	0.13	0.15	0.08
510	137.62	1.99	3.53	4.67	6.22	7.41	8.62	14.90
105	25.0	0.42	0.78	1.07	1.45	1.76	2.07	3.09
107	13.0	0.32	0.57	0.77	1.03	1.23	1.44	1.76
515	38.0	0.71	1.32	1.79	2.43	2.92	3.43	4.81
110	2.85	0.13	0.20	0.25	0.35	0.41	0.48	0.40
520	40.85	0.76	1.42	1.93	2.60	3.13	3.67	5.18
115	1.86	0.08	0.14	0.18	0.24	0.28	0.33	0.27
525	42.71	0.81	1.51	2.04	2.75	3.32	3.90	5.42

Catchment / HYD ID	Area (ha)	Flow (m^3/s)						
		2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
130	1.65	0.04	0.08	0.10	0.14	0.16	0.19	0.22
530	44.36	0.86	1.59	2.14	2.89	3.48	4.09	5.64
535	181.98	2.58	4.63	6.16	8.23	9.83	11.46	19.67
135	0.33	0.03	0.05	0.06	0.08	0.09	0.10	0.05
540	182.31	2.59	4.63	6.17	8.24	9.84	11.47	19.70
140	0.77	0.07	0.11	0.13	0.17	0.19	0.22	0.11
145	0.70	0.08	0.12	0.15	0.18	0.21	0.24	0.10
545	1.47	0.15	0.23	0.28	0.35	0.40	0.46	0.21

3.6 Hydrogeology

A Hydrogeology Report was prepared in support of the Steeles Avenue MCEA Study (see **Appendix G**). Background information was gathered, and site visits were conducted on December 1st, 2017 and August 26th, 2018.

There are approximately 64 Ministry of Environment, Conservation and Parks (MECP) water well records (WWR) within the study area, over a time span of 1951 to 2016. Recorded well uses include water supply wells, test holes, monitoring wells, observation wells, and water well abandonments. These WWRs indicated the depth to bedrock ranging from 0-23 m below ground surface within the site vicinity. The locations of MECP WWRs and locations of surveyed domestic wells (gathered as part of the hydrogeological assessment study for the Tremaine Road extension from Main Street to Steeles Avenue [Ecoplans, June 2013]) are shown in Figure 5 of **Appendix G**.

There is one active MECP Permit to Take Water (PTTW) in the site vicinity (within 500 metres), which is for construction dewatering associated with construction of the new Tremaine Road between Steeles Avenue and No. 3 Side Road. MECP mapping indicates several approved Environmental Activity and Sector Registry (EASRs) and Environmental Compliance Approvals (ECAs) within the study area north of Steeles Avenue, as shown in Figures 6 and 7 of **Appendix G**.

The study area lies within the Halton Region Source Protection Area (SPA). Based on a review of the Halton Region SPA Assessment Report (2015), the study area includes the following:

- Sixteen Mile Creek West Branch is indicated to be a cold-water creek;
- The study area is located within an area with Moderate monthly surface water stresses, with 34% total water demand for the entire subwatershed;
- Annual groundwater stress is low, with 1% demand for the entire subwatershed;
- The study area is located within the Tier 3 Study Area;
- The intrinsic groundwater susceptibility index within the study area is Medium;
- The study area is not located within a Highly Vulnerable Aquifer;
- Significant Groundwater Recharge Area (SGRA): Within the study area, the Sixteen Mile Creek West Branch creek corridor (area of alluvial deposits) is classified as an SGRA along with several other smaller isolated pockets. Most of the study area is not an SGRA;
- Significant Groundwater Recharge Area Vulnerability: The portion of the study area classified as SGRAs are indicated to have Medium vulnerability; and
- The study area does not pass through any municipal wellhead protection areas (WHPAs).

The SPA Assessment Report indicated that areas located below the Niagara Escarpment, which includes the Steeles Avenue MCEA study area, typically have limited infiltration due to the presence of till and shale. The calculated groundwater recharge rate for areas below the escarpment was approximately 115 mm per year.

Through the hydrogeology investigations, a total of eleven (11) areas of potential environmental concern (APEC) were identified as potential sources of soil and groundwater contamination and are ranked as high, moderate, or low potential concern (refer to Table 3.1 of **Appendix G**). These include railway crossings, an industrial / commercial plaza and several industrial businesses. The areas of potential environmental concern are classified based on the below characteristics, according to *Ontario Regulation 153/04*, as amended:

- Areas of high potential concern are classified as areas corresponding to locations where land uses consist of commercial/industrial operations that could impact soil and/or groundwater quality within the study area;
- Areas of moderate potential concern are classified as locations where land uses consist of commercial/light industrial operations, suspected of using chemical

compounds of performing activities that could impact soil and/or groundwater quality within the study area; and

- All other areas with land use features are considered to have a low potential for site contamination. These areas are generally classified as natural areas, open space, or residential land use, which are not suspected of using chemical compounds harmful to the environment or human health.

3.7 Source Water Protection

Protecting municipal sources of drinking water from becoming contaminated or overuse will ensure a sufficient supply of clean, safe drinking water. The *Clean Water Act* 2006 (CWA) is intended to protect existing and future sources of municipal drinking water as part of the Province's overall commitment to protecting human health and the environment. The CWA sets out a framework for source protection planning including the designation of Source Protection Areas and the establishment of Source Protection Committees, who are responsible for the development Source Protection Plans (SPPs) in their respective areas. SPPs contain policies to protect municipal drinking water sources from provincially prescribed activities that may negatively impact the quality and quantity of drinking water sources within the following Vulnerable Areas: Wellhead Protection Areas, Intake Protection Zones, Significant Groundwater Recharge Areas, and Highly Vulnerable Aquifers. Applicable SPPs illustrate the location of Vulnerable Areas.

The Steeles Avenue MCEA study area is located within the Halton-Hamilton Source Protection Region and therefore the applicable SPP in the study area is the Halton-Hamilton Source Protection Plan, 2017, (www.protectingwater.ca). Review of the vulnerable areas mapping and related policies in the Halton-Hamilton SPP indicates that the Steeles Avenue MCEA study area is not located within any wellhead protection areas, intake protection zones, or significant groundwater recharge areas, and does not contain any highly vulnerable aquifers.

3.8 Utilities

The following utility companies were contracted as part of the study:

- Union Gas
- Hydro One Networks Inc.

- Zayo Canada Inc.
- Trans-Northern Pipelines Inc.
- Milton Hydro Distribution
- Rogers Cable Communications Inc.

At the time of ESR filing, only Zayo Canada Inc. provided confirmation that their plant would not be impacted by the Preferred Design Plan. The ownerships, the existing utility locations and municipal services and associated impacts are to be confirmed in detailed design.

4 ALTERNATIVE PLANNING SOLUTIONS

As discussed in **Section 2**, Phase 1 of the MCEA process involves the identification of the transportation problems and opportunities to be addressed by the study and Phase 2 involves the identification and evaluation of a range of possible solutions or 'planning alternatives'.

Section 2 of this ESR sets out the transportation problems and opportunities by providing the planning / policy context and the analysis of existing and future traffic conditions to identify the transportation deficiencies and overall project opportunities. **Section 2.3** of this ESR provides a summary of these aspects. It is recognized that in addition to the planning / policy review and traffic analysis, problems and opportunities have also been identified through direct consultation with stakeholders. These are captured in **Section 7** (Consultation), and have been incorporated into both the planning and design components of the study.

Based on this work, a clear problem and opportunity statement was developed to guide the study.

4.1 Problem and Opportunity Statement

Without improvements, Steeles Avenue is expected to experience delays during peak periods as travel demand continues to grow by 2031. Halton Region's TMP, in conformity with Provincial Plans, identifies the widening of Steeles Avenue between Tremaine Road and Industrial Drive. To support future growth and travel demand, and provide network continuity, improvements to the Steeles Avenue corridor are required. A grade separation at CP Railway between Tremaine Road and Peru Road is recommended. The improved corridor should support all modes of transportation (i.e. active transportation).

4.2 Alternative Planning Solutions

The following alternative planning solutions were identified for consideration at the planning level to address the problems and opportunities identified for this study:

- "Do Nothing"

- Limit Development
- Travel Demand Management (TDM) Measures
- Improved Transit Services (Milton Transit and GO Transit) / Other Modes of Transportation
- Intersection and / or Operational Improvements
- Improvements to Other Roadways Beyond Planned Program
- Improvements to Steeles Avenue

A brief description of each of the alternative planning solutions is outlined below; this applies to the study area of Steeles Avenue between Tremaine Road and Industrial Drive.

4.2.1 Do Nothing

The *Do Nothing* alternative involves maintaining the status quo. The existing corridor would be retained in its present form through this section with no improvements to traffic capacity and operations, active transportation facilities, or rail crossing operations.

4.2.2 Limit Development

Under this scenario, there would be more limits placed on land use development. Projections of future travel demands are based on the approved future urban area (Halton Region Official Plan, and Town of Milton Official Plan in accordance with the *Places to Grow*). Limiting development would reduce future travel demands and require fewer infrastructure improvements to be completed.

4.2.3 Travel Demand Management (TDM) Measures

Travel Demand Management (TDM) measures include measures to reduce the number of vehicles during the peak hours, e.g. carpooling, staggered work hours, etc. These are currently part of Halton Region's overall transportation strategy, and can help manage the rate of growth in travel demand when considered in tandem with other alternatives.

4.2.4 Improved Transit Services (Milton Transit and GO Transit) / Other Modes of Transportation

This alternative would consider all planned improvements to Milton Transit and GO Transit services as well as provision of facilities for active transportation to

accommodate pedestrians and cyclists. For example, expansion of Milton Transit services on Steeles Avenue and on the Milton Line (i.e. service beyond the Milton GO Station and the potential for future GO Station). Provision of active transportation facilities would be consistent with the Halton Region Active Transportation Master Plan.

4.2.5 Intersection and / or Operational Improvements

Intersection improvements include the addition of traffic signals, auxiliary lanes (e.g. right turn and left turn lanes), additional lanes through intersections and the consideration of roundabouts. Operational improvements may include modifications to signal timing plans, traffic signal interconnect systems, and road user information systems.

4.2.6 Improvements to Other Roadways Beyond the Planned Program

This alternative would widen other roadways in the immediate proximity to the study area beyond planned improvements.

4.2.7 Improvements to Steeles Avenue

Improvements to the Steeles Avenue corridor to address future corridor requirements would include proposed widening from two to four general purpose lanes (along existing Steeles Avenue alignment or a realigned/bypass route), provision for active transportation, and the consideration of a grade separation with CP Rail.

Evaluation of Alternative Planning Solutions

The alternative planning solutions were assessed for their ability to reasonably address the problems and opportunities. Criteria were developed to guide the assessment process so that transportation planning, technical and environmental (i.e. socio-economic environment, cultural environment, natural environment) conditions were all factored into the recommendation.

The factors considered in the assessment are listed in **Table 4-1**.

Table 4-1: Factors Considered in the Alternative Planning Solutions Evaluation

Factors for Analysis	Considerations
Socio-Economic Environment	▶ Consistency with Land Use Plans and Policies ▶ Supports future planned growth ▶ Potential property requirements ▶ Impacts to residents and business operations (direct impacts and access) ▶ Local community character and mobility ▶ Provision for pedestrians and cyclists ▶ Noise and Air Quality
Cultural Environment	▶ Archeological Resources ▶ Cultural Heritage Resources ▶ Peru Road Character Area
Natural Environment	▶ Niagara Escarpment Plan area and associated policies ▶ Designated Natural Heritage Features and environmentally sensitive areas ▶ Potential impacts to terrestrial and aquatic species and habitats (including opportunity for mitigation) ▶ Potential impacts to Species at Risk and their habitat
Surface Water and Groundwater	▶ Management of road runoff ▶ Protection of surface water features and watercourse crossings ▶ Floodplain storage ▶ Protection of groundwater resources
Transportation & Technical	▶ Addresses future capacity requirements ▶ Consistency with transportation planning and policy documents ▶ Improves multi-modal network connectivity ▶ Improves traffic operations ▶ Road design requirements and construction constraints/complexity

Factors for Analysis	Considerations
	▶ CP Rail grade separation design requirements
Preliminary Cost Estimate	▶ High level cost estimate for comparative purposes only

4.3 Assessment of Alternative Planning Solutions

The assessment (i.e. analysis and evaluation) of the alternative solutions can be found in **Table 4-2**. Please note, the assessment is intended to reflect a high-level consideration of solutions and is based on the information available at this stage of the project.

Table 4-2: Assessment of Alternative Planning Solutions

	ALTERNATIVE PLANNING SOLUTIONS						
Factors	**1: Do Nothing**	**2: Limit Development**	**3: Travel Demand Management (TDM) Measures**	**4: Improved Transit Service / Other Modes of Transportation**	**5: Intersection and/or Operational Improvements**	**6: Improvements to Other Roadways Beyond the Planned Program**	**7: Improvements to Steeles Avenue**
Socio-Economic Environment							
Property Impacts / Existing Land Use / Community Effects	• No direct impact to adjacent properties and existing land use	• No direct impact to adjacent properties and existing land use	• No direct impact to adjacent properties and existing land use	• Would likely have some property impact due to the implementation of transit and active transportation related improvements (e.g. bus bays, transit stops, intersection reconstruction, bike lanes, multi-use trailways, etc.)	• Would likely have some property impact particularly for properties in close proximity to the intersections • Minimal impact to overall existing land use	• Improvements on other roadways have already been identified as part of the Region and local Transportation Master Plans. Highway 401 is also being widened by the Ministry of Transportation. • Impact to existing properties would be determined based on respective EA studies; however, it is expected that widening beyond planned program improvements would have direct impact to properties along corridors parallel to Steeles Avenue such as Highway 401 and Main Street	• Property impact to properties adjacent to Steeles Avenue. • Greater potential for direct impacts to properties in close proximity to CP Rail crossing to accommodate potential grade separation. • Connection to Peru Road and some existing accesses on Steeles Avenue may be impacted to accommodate improvements • Potential realignment of Steeles Avenue to accommodate improvements and grade separation would impact properties
Consistency with Planning Policies (Official Plan, Transportation Master Plan, Active Transportation Plan)	• Not consistent with the Halton Region Transportation Master Plan • Not consistent with Region and Town's objective to promote Active Transportation	• Not consistent with the planned population and employment growth identified by Halton Region and Town of Milton (Official Plans and Sherwood Survey Secondary	• Consistent with the Region and Town's objectives to manage travel demand • However, this is not consistent within the Region and Town's need to provide	• Consistent with the Region and Town's vision to increase modal share of transit and other transportation methods	• Will not fully address transportation needs in the future	• Improvements on other roadways have already been identified as part of the Region and Town Transportation Master Plans. The Ministry of Transportation is	• Consistent with the Region Transportation Master Plan and Official Plans to provide additional capacity within the Steeles Avenue corridor

	ALTERNATIVE PLANNING SOLUTIONS						
Factors	**1: Do Nothing**	**2: Limit Development**	**3: Travel Demand Management (TDM) Measures**	**4: Improved Transit Service / Other Modes of Transportation**	**5: Intersection and/or Operational Improvements**	**6: Improvements to Other Roadways Beyond the Planned Program**	**7: Improvements to Steeles Avenue**
	• Not consistent with Halton Region and Town of Milton Official Plan, as well as the Sherwood Survey Secondary Plan in providing the infrastructure required for future land use	Plan) in conformance with the Provincial Growth Plan	additional capacity within the Steeles Avenue corridor as identified in the Halton Region Transportation Master Plan			also widening Highway 401 • Widening beyond planned program would be inconsistent with existing Regional planning	• Will provide additional infrastructure required to support planned growth identified in the Halton Region and Town of Milton Official Plan and Sherwood Survey Secondary Plan
Impacts to Future Development	• Would not provide the transportation network improvements required (e.g. additional capacity) to support future developments and population growth	• Not consistent with the planned population and employment growth identified by Halton Region and the Town of Milton	• No direct physical impact to future development; however, on its own may not provide the transportation network improvements required (e.g. additional capacity, network connectivity)) to support future developments and population growth	• No direct physical impact to future development; however, on its own may not provide the transportation network improvements required (e.g. additional capacity, network connectivity)) to support future developments and population growth	• No direct physical impact to future development; however, on its own may not provide the transportation network improvements required (e.g. additional capacity, network connectivity)) to support future developments and population growth	• Future developments will have to coordinate with the Region and Town to integrate with proposed additional roadway improvements (additional land would be required beyond what is identified as the right-of-way in planning documents) • On its own may not provide the transportation network improvements required (e.g. additional capacity, network connectivity) to support future developments and population growth	• Future developments will coordinate with the Region and Town to integrate with proposed Steeles Avenue improvements • Additional capacity on Steeles Avenue corridor will support future travel demand generated from future developments

	ALTERNATIVE PLANNING SOLUTIONS						
Factors	**1: Do Nothing**	**2: Limit Development**	**3: Travel Demand Management (TDM) Measures**	**4: Improved Transit Service / Other Modes of Transportation**	**5: Intersection and/or Operational Improvements**	**6: Improvements to Other Roadways Beyond the Planned Program**	**7: Improvements to Steeles Avenue**
Noise / Air Quality	• Some potential increase in noise level and air quality due to increased traffic near receptor locations adjacent to Steeles Avenue when compared to existing conditions	• Likely no significant impact to existing receptor locations adjacent to Steeles Avenue	• Likely no significant impact to existing receptor locations adjacent to Steeles Avenue	• Minimal change in noise level and air quality from new transit services	• Minimal change in noise level and air quality due to localized improvements	• Potential increase in noise level and air quality to receptor locations adjacent to the roadways that are being widened beyond planned program	• Potential increase in noise level to noise sensitive areas adjacent to Steeles Avenue; however, air quality will likely not be impacted as additional roadway improvements will support alternate mode of transportation such as active transportation
Cultural Environment							
Archaeological Resources	• Two Stage 1 Archaeology Assessments were completed for the study area (2019 and 2022). It was determined that additional archaeological assessment is required for areas of the study area impacted by the preferred design that appear undisturbed and contain archaeological potential and will require a Stage 2 Archaeological Assessment prior to construction as shown in **Exhibit 3-2** (**Section 3.3.1**).						
Built Heritage Resources / Cultural Heritage Landscapes	• A built heritage resources and cultural heritage landscapes review was completed. Within the study area there are 8 municipal addresses on the Town of Milton Heritage List (November 2016) as registered heritage properties, and no Provincial Heritage Properties. The heritage features are listed the Cultural Heritage Resource Assessment report.						
	• No impacts to cultural heritage landscapes			• Implementation of transit and/or active transportation facilities (e.g. bus bays and bike lanes) may have minor impacts to features located directly adjacent to the roadway.	• Likely limited impact to built heritage features.	• May have impact to other built heritage features along those roadways.	• Design will be modified to minimize impact to built heritage features where possible. Mitigation measures will be reviewed as required.
Natural Environment							
Fisheries and Aquatic Habitat	• No net loss of fish habitat • Potential minor impact on fish habitat quality through increased traffic demand and	• No net loss of fish habitat	• No net loss of fish habitat	• No net loss of fish habitat • Incremental effects on fish habitat may be experienced to accommodate transit initiatives	• No net loss of fish habitat • Incremental effects on fish habitat may be experienced to accommodate intersection and/or	• Potential fish habitat effects associated with culvert replacements / extensions for road widening – dependent on nature	• Potential fish habitat effects associated with culvert replacements / extensions for road widening – dependent on nature

	ALTERNATIVE PLANNING SOLUTIONS						
Factors	**1: Do Nothing**	**2: Limit Development**	**3: Travel Demand Management (TDM) Measures**	**4: Improved Transit Service / Other Modes of Transportation**	**5: Intersection and/or Operational Improvements**	**6: Improvements to Other Roadways Beyond the Planned Program**	**7: Improvements to Steeles Avenue**
	resulting incremental contaminant runoff from existing roads			such as new stations, etc. These effects will depend on nature of improvements relative to watercourse features	operational improvements. These effects will depend on nature of improvements relative to watercourse features	of undertaking and agency liaison • Increased contaminant runoff volumes may be generated with widened pavement surface and will be mitigated	of undertaking and agency liaison • Increased contaminant runoff volumes may be generated with widened pavement surface and will be mitigated • No net loss of fish habitat through improvements to existing corridor, however some impacts may result if a bypass alignment is constructed to the south of the existing corridor.
Surface Water Quality and Quantity	• Potential minor impact on surface water quality through increased traffic demand and resulting incremental contaminant runoff from existing roads	• No direct impact to surface water quality and quantity	• No direct impact to surface water quality and quantity	• Incremental effects on surface water resources may be experienced to accommodate transit initiatives such as new stations, etc. These effects will depend on nature of improvements relative to watercourse features	• Potential impact on surface water quality through increased traffic demand and resulting incremental increase in contaminant runoff from existing roads	• Potential water quality effects through widening at existing water courses (short term impact due to construction, long term impact due to increased runoff), however some of these impacts may be minimized during detailed design	• Potential water quality effects through widening at existing water courses (short term impact due to construction, long term impact due to increased runoff), however some of these impacts may be minimized during detailed design
Vegetation (Wetland and Upland)	• No physical impacts to vegetation • Possible incremental contaminant drift with increased traffic	• No physical impacts to vegetation	• No physical impacts to vegetation	• Incremental effects (such as vegetation / wetland intrusion) may occur to accommodate	• Potential for physical removal of vegetation in localized areas where	• Potential for physical removal where road widening borders existing vegetation / wetlands or where	• Potential for physical removal where road widening borders existing vegetation / wetlands or where

	ALTERNATIVE PLANNING SOLUTIONS						
Factors	**1: Do Nothing**	**2: Limit Development**	**3: Travel Demand Management (TDM) Measures**	**4: Improved Transit Service / Other Modes of Transportation**	**5: Intersection and/or Operational Improvements**	**6: Improvements to Other Roadways Beyond the Planned Program**	**7: Improvements to Steeles Avenue**
	demand – localized vegetation stress			various transit initiatives. These effects will depend on nature and location of improvements	improvements are made. Anticipated that these would be relatively minor	vegetation / wetlands features extend into right-of-way • Typically results in edge effects rather than fragmentation	vegetation / wetlands features extend into right-of-way • Typically results in edge effects rather than fragmentation • Potential for fragmentation with alternative alignments.
Wildlife	• No physical impacts to wildlife and wildlife habitats	• No physical impacts to wildlife and wildlife habitats	• No physical impacts to wildlife and wildlife habitats	• Potential for incremental habitat removal / intrusion to accommodate various transit initiatives. These effects will depend on nature and location of improvements	• Potential for physical habitat impact in localized areas where improvements are made. Anticipated that these would be relatively minor, if any	• Potential for habitat removal where road widening borders existing vegetation / wetlands or where vegetation / wetland features extend into right-of-way • Existing drainage crossing structures used by wildlife may require lengthening • Potential for reduced quality in habitat adjacent to the widened roadway (increased noise, light)	• Potential for habitat removal where road widening borders existing vegetation / wetlands or where vegetation / wetland features extend into right-of-way • Potential for reduced quality in habitat adjacent to the widened roadway (increased noise, light) • Improved passage at Sixteen Mile Creek
Transportation							
Ability to Accommodate Future Traffic Demand and Network Connectivity	• Would not provide capacity and infrastructure or network connectivity required for future transportation demand on Steeles Avenue	• Steeles Avenue will approach operating capacity based on planned future development and the at grade crossing at CP Rail will begin to	• Would help to reduce and optimize transportation demand • Would require significant changes to travel behaviour	• Provides choice for mobility needs of population (reduces auto dependency); potential for reduction of traffic congestion	• Localized improvements would not be sufficient to accommodate transportation demand generated by scale of planned development	• Needs for improvements to other roads to support future transportation demand generated for planned development have	• Supports transportation demand for population growth adjacent to the corridor and surrounding area

	ALTERNATIVE PLANNING SOLUTIONS						
Factors	**1: Do Nothing**	**2: Limit Development**	**3: Travel Demand Management (TDM) Measures**	**4: Improved Transit Service / Other Modes of Transportation**	**5: Intersection and/or Operational Improvements**	**6: Improvements to Other Roadways Beyond the Planned Program**	**7: Improvements to Steeles Avenue**
		experience delays and in the future as traffic volumes grow (i.e. exposure index will exceed desirable levels). Would not improve network connectivity.	to achieve improved levels of service • Would not provide the required additional capacity in the transportation network or improve network connectivity	• Would not provide the required additional capacity in the transportation network or improve network connectivity	• Would not provide the required additional capacity in the transportation network or improve network connectivity	been established and identified in the Halton Transportation Master Plan • Would not improve network connectivity along Steeles Avenue	and improves network connectivity
Provision for Active Transportation	• Would not support provision for active transportation per Region and Town's active transportation master plans	• Would not support provision for active transportation per Region and Town's active transportation master plans	• TDM measures promote active transportation but would not provide new facilities per Region and Town's active transportation master plans	• Would encourage the use of alternative modes of transportation over driving but would not provide new active transportation facilities per Region and Town's active transportation master plans	• Enhanced active transportation facilities/features within intersections would encourage active transportation	• Right-of-way restrictions may limit ability to provide/ enhance active transportation facilities	• Consistent with Region's active transportation master plans
Costs							
Order of Magnitude Cost (Construction Costs)	N/A	N/A	$	$$	$$	$$$$$$	$$$$$
SUMMARY	• Do Nothing would not support future approved development and would not address future transportation needs.	• Projections of future travel demands are based on the approved future urban area as shown in the Halton Region and Town of Milton Official Plans, which are consistent with the growth projection in the Provincial Growth Plan. Limiting	• While these are part of Halton Region's overall transportation strategy, on their own they do not address the need for additional capacity on Steeles Avenue.	• The increased use of transit (such as those provided by Milton Transit and GO Transit) is part of the overall transportation strategy and it is expected that services will be improved through planning by local transit authorities.	• They would not fully address the identified problem but are required as part of the overall improvement strategy.	• These are required as part of the overall transportation strategy in addition to improvements to the Steeles Avenue corridor and will be subject to separate studies • Widening beyond planned program improvements will not be consistent	• Improvements to Steeles Avenue are required in order to address future corridor requirements (i.e. additional capacity and grade separation), and support future developments and implementation of multimodal

	ALTERNATIVE PLANNING SOLUTIONS						
Factors	**1: Do Nothing**	**2: Limit Development**	**3: Travel Demand Management (TDM) Measures**	**4: Improved Transit Service / Other Modes of Transportation**	**5: Intersection and/or Operational Improvements**	**6: Improvements to Other Roadways Beyond the Planned Program**	**7: Improvements to Steeles Avenue**
		development was not considered to be reasonable in isolation.		Improvements to Steeles Avenue will assist in achieving and implementing Halton Region's Transportation Master Plan by providing additional lanes and infrastructure to support future transit services and provide for a multi-modal corridor.		with overall transportation network and land use planning.	transportation strategies.
Recommended to be Carried Forward	**NO –** for comparison purposes only	**NO –** Not consistent with Provincial *Growth Plan*	**YES –** but within the overall strategy	**YES –** but within the overall strategy	**YES –** but within the overall strategy	**NO –** however, planned improvements would be under separate studies	**YES – carried forward as the preferred alternative planning solution**

4.3.1 Do Nothing

This alternative involves maintaining status quo and would not address any of the identified problems and opportunities. The existing roadway and at-grade crossing at CP Rail would be retained in their present configuration and operational problems and safety concerns would continue to deteriorate. The lack of cycling and pedestrian facility improvements would limit active transportation connectivity and access to transit.

Overall, this alternative would provide no appreciable improvement to traffic capacity and operations and is not consistent with Region transportation policies. While this alternative is not considered to be a reasonable alternative, it is carried forward as part of the MCEA process and used for comparison purposes.

4.3.2 Limit Development

Projections of future travel demands are based on the approved future urban area as shown in the Halton Region Official Plan which is in conformance with the Provincial *Growth Plan*. Limiting development was not considered to be reasonable in isolation, and therefore was not carried forward for further consideration as part of this study.

4.3.3 Travel Demand Management (TDM) Measures

Travel Demand Management (TDM) measures include measures to reduce the number of vehicles during the peak hours, e.g. carpooling, staggered work hours, etc. While these are part of Halton Region's overall transportation strategy and may help manage the rate of growth in travel demand, these measures would not fully address future capacity needs on Steeles Avenue, as travel demand continues to increase with ongoing growth and development. Therefore, this alternative is carried forward for further consideration as part of the overall transportation strategy.

4.3.4 Improved Transit Services (Milton Transit and GO Transit) / Other Modes of Transportation

Planned upgrades to GO Transit services on the Milton Line and provision of facilities for active transportation to accommodate pedestrians and cyclists are part of the overall transportation strategy but do not address the problem on their own. Widening of Steeles Avenue would assist in achieving and implementing Halton Region's Transportation Master Plan by providing additional infrastructure to support potential

future transit service provided by Milton Transit and GO Transit, as well as active transportation facilities. Therefore, this is carried forward for further consideration as part of the overall transportation strategy.

4.3.5 Intersection and / or Operational Improvements

Intersection improvements include the addition of traffic signals, auxiliary lanes (e.g. right turn and left turn lanes), additional lanes through intersections and the consideration of roundabouts. They would not fully address the identified problem but are required as part of the overall improvement strategy.

Operational improvements may include modifications to signal timing plans, traffic signal interconnect systems, and road user information systems. They would not fully address the identified problem but would be considered as part of the overall improvement strategy.

4.3.6 Improvements to Other Roadways Beyond the Planned Program

Improvements to other roadways have been identified as part of the Halton Region Transportation Master Plan, as well as other local improvements by the Town of Milton. These are required as part of the overall transportation strategy in addition to improvements in the Steeles Avenue corridor and will be subject to separate studies.

Widening of other Regional roadways in the immediate study area beyond planned improvements would not be consistent with the Halton Region Transportation Master Plan, as well as other local improvements by the Town of Milton. This would lead to impacts beyond the planned rights-of-way and would not address the problems and opportunities for Steeles Avenue.

4.3.7 Improvements to Steeles Avenue – Recommended

Improvements to the Steeles Avenue corridor are required in order to address future corridor requirements. In the Halton Region Transportation Master Plan, Steeles Avenue was identified as requiring additional capacity and widening from two to four general traffic lanes to support future growth. Provision for active transportation (e.g. walking and cycling) and potential grade separation at CP Rail are included as part of the improvements. Therefore, this is carried forward for further consideration as part of the overall improvement strategy.

4.4 Preliminary Preferred Planning Solution

Based on the results of the evaluation, Alternative Planning Solution #7, Improvements to Steeles Avenue, is preferred because it fully addresses the problems and opportunities identified for this study by:

- Addressing the needs identified in Halton Region Transportation Master Plan and Active Transportation Master Plan to support future growth;
- Providing for active transportation facilities; and,
- Creating a grade separation at the CP Rail crossing.

Table 4-2 illustrates that Do Nothing (Alternative Planning Solution 1) does not address any of the Problems and Opportunities. Limiting Development (Alternative Planning Solution 2) was not considered to be reasonable in isolation, and does not contribute to a fine-grained street network that supports community growth, improved pedestrian options and access to transit. Improvements to other roadways beyond the planned program (Alternative Planning Solution 6) would require separate studies and widening beyond the planned program will not be consistent with the overall transportation network and land use planning.

5 DESIGN ALTERNATIVES

Having established the need for improvements on the Steeles Avenue corridor (**Section 2**) and selected a recommended planning alternative (**Section 4**), the next phase involved the development and evaluation of alternative designs (Phase 3 of the MCEA).

5.1 Approach to Developing Alternative Design Concepts

In developing the design alternatives for Steeles Avenue, a number of key constraints and design elements have been considered, including but not limited to:

Steeles Avenue Design Alternatives

Natural Environment:

- Niagara Escarpment and policy areas;
- Regional Natural Heritage System (including Key Features such as wetlands, significant woodlands, fish habitat, etc.)
- Watercourse crossings of Sixteen Mile Creek and its tributaries; and,
- Stormwater conveyance, management and outlets.

Socio-Economic Environment:

- Impacts to businesses and residential properties
- Existing and future communities.

Cultural Environment:

- Built heritage resources, cultural heritage landscapes and archaeology resources.

Geometric Design:

- Planned overall road right-of-way width of 35 m, consistent with Region's Transportation Master Plan; and,
- Provision of active transportation facilities consistent with the Regional Active Transportation Master Plan.

CP Rail Grade Separation (see Section 5.6 for the Grade Separation Type Design Alternatives)

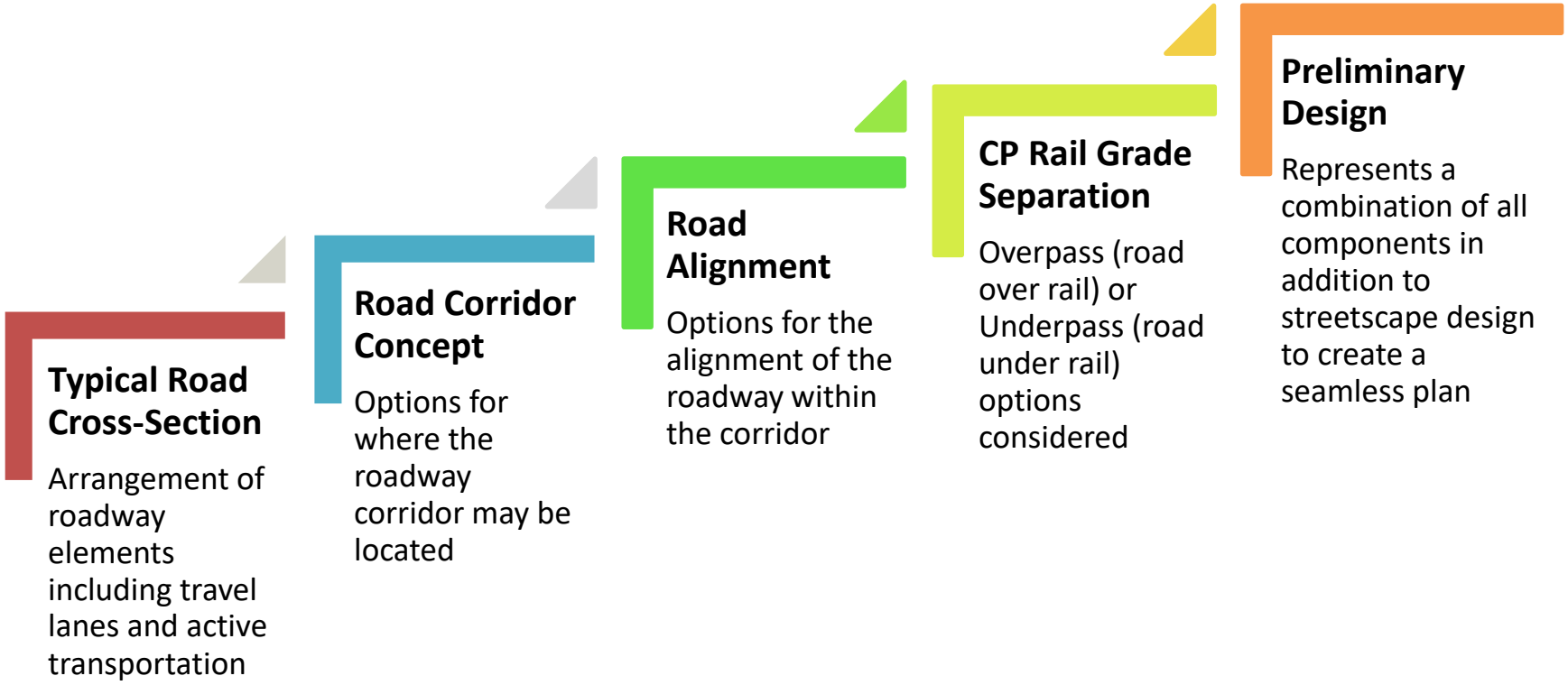
- Structure Type (Overpass or Underpass);
- Design requirements (clearance, drainage, access, accommodation for active transportation);
- Construction staging and rail detour requirements; and,
- Visual aesthetics relative to the Niagara Escarpment Plan area and surrounding community.

The development of the design alternatives has been an iterative process and consists of the following stages:

- Development of road cross section (see **Section 5.2**);
- Evaluate and identify preferred road corridor concept (i.e. corridor to the north, south or along existing alignment) (see **Section 5.4**);
- Develop and evaluate road design alternatives within the preferred road corridor concept, and identify preferred road alignment (see **Section 5.5**);
- Compare and identify preferred CP grade separation type (i.e. overpass vs. underpass) (see **Section 5.6**); and,
- Prepare preliminary design of preferred design alternative (see **Section 5.9**).

The process for developing and evaluating design alternatives is graphically depicted in **Exhibit 5-1**.

Exhibit 5-1: Process for Developing and Evaluating Design Alternatives



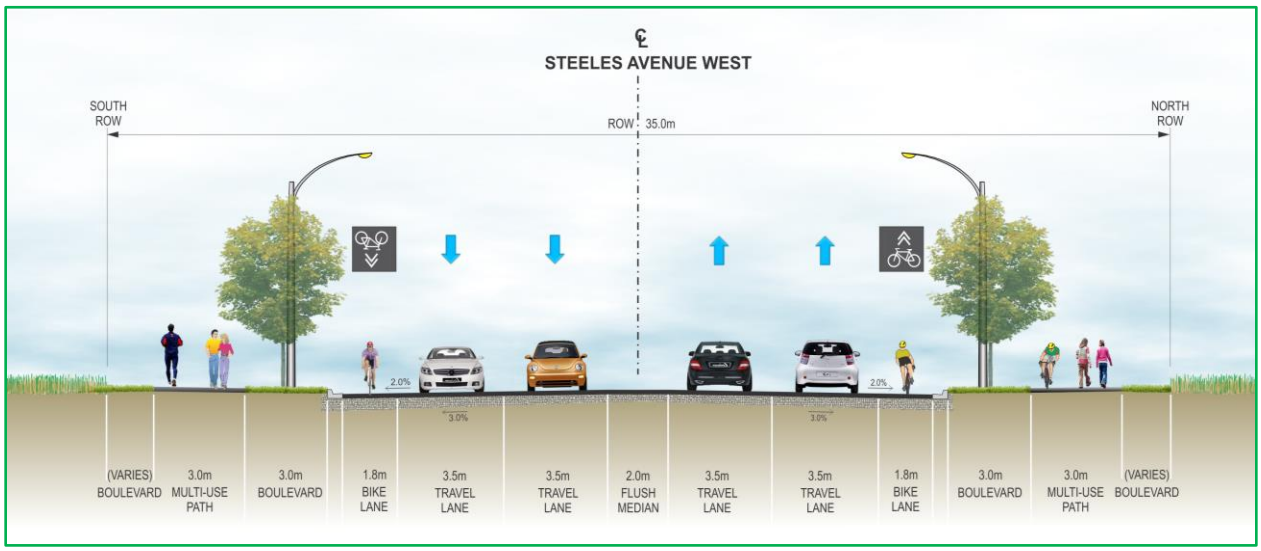
5.2 Typical Cross Section

The typical cross-section for the proposed 4-lane Steeles Avenue has been developed based on the planned overall right-of-way width of 35 m, which is consistent with the Halton Region Transportation Master Plan – The Road to Change (2011), as well as the Region's Active Transportation Master Plan (2016) and the Official Plan.

The typical cross section of the future Steeles Avenue corridor is shown in **Exhibit 5-2**. It is proposed that the typical cross section will consist of two 3.5 m vehicle travel lanes in each direction. On-road bike lanes (1.8 m) and multi-use trails (3.0 m) will be provided on both sides of the road to accommodate cyclists, pedestrians and users of mobility devices.

It should be noted that, during detailed design, there may be minor adjustments to the typical cross section at approaches to intersections to accommodate operational requirements and in constrained areas to reduce localized impacts to adjacent land uses where feasible. Following the confirmation of the Preferred Design, the Ontario Traffic Council (OTC) and the Ministry of Transportation of Ontario (MTO) released an update to Ontario Traffic Manual Book 18: Cycling Facilities (OTM Book 18). The new OTM Book 18 provides updated active transportation guidelines. In terms of Steeles Avenue from Tremaine Road to Industrial Drive, new OTM Book 18 recommends at a minimum buffered separated bike lanes preferably with separation and desirably cycle tracks above the curb. Based on a preliminary review of the preferred design and the new OTM Book 18 guidelines, the current proposed cross-section, which includes 1.8 m for a bike lane plus the boulevard provides enough room to make any required adjustments to the AT facilities to meet OTM Book 18 guidelines. A further review of the active transportation facilities will be completed in detailed design.

Exhibit 5-2: Proposed Typical Cross Section



5.3 Factors Considered in the Assessment and Evaluation Process

Subsequent to the development of the typical cross section, the next phases of the design process are the development and evaluation of road corridor concepts and road design alternatives.

The following factors outlined in **Table 5-1** were considered when evaluating the road corridor concepts and road design alternatives.

Table 5-1: Factors Considered in the Assessment and Evaluation Process of the Road Corridor Concepts and Road Design Alternatives

Grouping	Factors
Socio-Economic Environment	▶ Consistency with Land Use Plans and Policies ▶ Supports future planned growth ▶ Potential property requirements ▶ Impacts to residents and business operations (direct impacts and access) ▶ Local community character and mobility ▶ Provision for pedestrians and cyclists

Grouping	Factors
	▶ Noise and Air Quality
Cultural Environment	▶ Archeological Resources ▶ Cultural Heritage Resources ▶ Peru Road Character Area
Natural Environment	▶ Niagara Escarpment Plan area and associated policies ▶ Designated Natural Heritage Features and environmentally sensitive areas ▶ Potential impacts to terrestrial and aquatic species and habitats (including opportunity for mitigation) ▶ Potential impacts to Species at Risk and their habitat
Surface Water and Groundwater	▶ Management of road runoff ▶ Protection of surface water features and watercourse crossings ▶ Floodplain storage ▶ Protection of groundwater resources
Transportation	▶ Addresses future capacity requirements ▶ Consistency with transportation planning and policy documents ▶ Improves multi-modal network connectivity ▶ Improves traffic operations ▶ Road design requirements and construction constraints/complexity ▶ CP Rail grade separation design requirements
Preliminary Cost Estimate	▶ High-level cost estimate for comparative purposes only

5.3.1 Description of Grouping and Factors

Socio-Economic Environment – This grouping addresses effects of the alternatives on the existing properties. It also assesses whether the alternatives support the future

land use of the adjacent properties. The factors within the grouping are defined as follows:

- **Consistency with Land Use Plans and Policies** – Identifies consistency / compatibility with Regional and Town Official Plans, Transportation Master Plans and approved land use plans
- **Supports future planned growth** – Identifies consistency to the Halton Region Official Plan and Transportation Master Plan that plan for Regional population and employment growth and identify the need for improvements to Steeles Avenue
- **Potential property requirements** – Identifies the total number of properties intersected by corridor and potential number of residence and business building displacements
- **Qualitative assessment of impacts to business operations** – Identifies the impacts to business operations
- **Impacts to residents and business operations (direct impacts and access)** – Identifies the nature of property impacts
- **Local community character and mobility** – Identifies compatibility with existing and planned land uses, the potential to create physical barriers or perceived barriers within and between communities, the impacts to aesthetic elements and quantity / quality of natural and man-made aesthetic elements and the impacts or improvements to community mobility
- **Provision for pedestrians and cyclists** – Identifies opportunities to accommodate pedestrian facilities and cyclist facilities
- **Noise and Air Quality** – Identifies impacts to noise and air quality

Cultural Environment – This grouping addresses effects of the alternatives on the historical and archaeological components of the environment. This grouping is a measure of the cultural effects on community features. The factors within the grouping are defined as follows:

- **Archeological Resources** – Identifies potential impact to archaeological resources in the study area.
- **Cultural Heritage Resources** – Identifies impact to cultural heritage resources in the study area.
- **Peru Road Character Area** – Identifies impact the Peru Road Character Area.

Natural Environment – This grouping addresses effects of the alternative on the natural environmental features. The factors within the grouping are defined as follows:

- **Niagara Escarpment Plan area and associated policies** – Identifies impacts to designated Niagara Escarpment Plan environmental features / areas.
- **Designated Natural Heritage Features and environmentally sensitive areas** – Identifies impacts to natural features and natural environmental sensitive areas.
- **Potential impacts to terrestrial and aquatic species and habitats (including opportunity for mitigation**) – Identifies physical impacts to terrestrial and aquatic species and habitats, as well as impacts to their migration.
- **Potential impacts to Species at Risk (SAR) and their habitat** – Identifies the magnitude and nature of potential impacts on Significant Wildlife Habitat (SWH) and known or potential habitat for wildlife Species at Risk (SAR), as well as the potential for ESA Permitting requirements.

Surface Water and Groundwater – This grouping addresses effects of the alternative on the potential impact of surface water and groundwater. The factors within the grouping are defined as follows:

- **Management of road runoff** – Identifies the ability to manage stormwater.
- **Protection of surface water features and watercourse crossings** – Identifies the qualitative assessment of potential impacts to natural channel processes considering the siting of watercourse crossings and the potential need for watercourse realignment.
- **Floodplain storage** – Identifies floodplain storage and flood conveyance implications.
- **Protection of groundwater resources** – Identifies the groundwater vulnerability based on the number/extent/location of Highly Vulnerable Aquifers (HVA) and other sensitive source protection areas.
- **Flood protection design criteria** – Based on the MTO Drainage Design Standards for Water Crossings, which includes the following design standards:
    - Design Flow Storm: 100-year;
    - Top of Road Freeboard (Min.): >1.0 m (Design Flow Water Surface Elevation – top of road low point);
    - Top of Road Freeboard (Desired): >1.0 m (Design Flow Energy Grade Line Elevation – top of road low point);
    - Relief Flow (Max. Depth over roadway): Max. depth over roadway should not exceed 0.3 m for Regulatory Storm;
    - Relief Flow (Velocity x Depth): Velocity x Depth should not exceed 0.8 m^2/s for Regulatory Storm;

- Soffit Clearance: Design Flow Water Surface Elevation – Soffit Elevation ≥ 1.0 m
- Flood Depth:
  - Culvert with diameter or rise <3.0 m HW/D <= 1.5
  - Culvert with diameter or rise 3.0 to 4.5 m HW <= 4.5 m
  - Culvert with diameter or rise > 4.5 m HW/D <= 1

Transportation – This grouping identifies the extent to which an alternative can provide reasonable transportation services. The factors within the grouping are defined as follows:

- **Addresses future capacity requirements** – Identifies ability to accommodate future travel demand.
- **Consistency with transportation planning and policy documents** – Identifies the alternatives consistency to Provincial and Regional plans and policies.
- **Improves multi-modal network connectivity** – Identifies opportunities to support provision for active transportation per Region and Town's active transportation master plan Improves traffic operations
- **Road design requirements and construction constraints / complexity** – Identifies compatibility with geometric design standards. Assessment of design challenges
- **CP Rail grade separation design requirements** – Identifies the design requirements and compatibility with geometric design standards of the CP Rail grade separation alternatives.

Preliminary Cost Estimate – This grouping identifies the order of magnitude cost required to build the alternative.

- **High level cost estimate for comparative purposes** only – Estimated capital costs considering construction of roads, intersection, structures, rail track realignment, cut/fill requirements, utilities, stormwater management etc.

5.3.2 Road Corridor Concept Alternatives

Within the study limits between Tremaine Road and Industrial Drive, three road corridor concept alternatives were considered (see **Exhibit 5-3**):

- **Corridor Concept 1:** Improvements along the **existing** right-of-way
- **Corridor Concept 2:** New corridor to the **south** of existing right-of-way

- **Corridor Concept 3:** New corridor to the **north** of existing right-of-way

Exhibit 5-3: Road Corridor Concepts

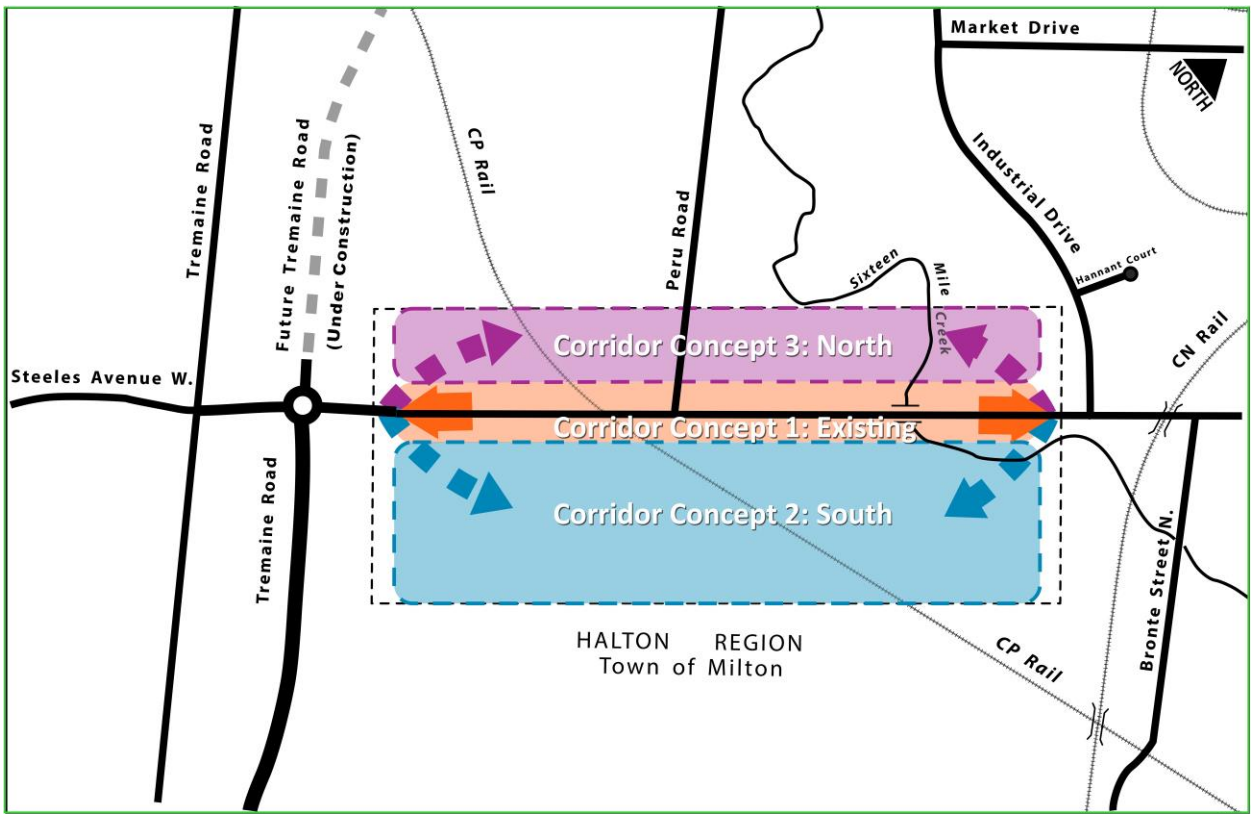


Table 5-2 provides the analysis of the corridor concepts.

Overall, the south corridor concept is considered to be preferred as it would be consistent with the Town's and Region's planning policies and would not directly impact the historic hamlet of Peru and Character Area located along Peru Road north of existing Steeles Avenue. While the south corridor crossing may result in a greater natural environment footprint associated with the new Sixteen Mile Creek crossing, the new crossing would provide opportunities to mitigate flooding concerns through design, as well as opportunity for a more perpendicular water crossing (which is generally preferred by conservation authorities). From a transportation perspective, the south corridor concept would also be considered to be significantly simpler to construct as it could be staged within existing greenfield sites. It would also provide greater spatial separation between CP Rail line and watercourses. The existing Steeles Avenue under the south corridor concept would continue to provide connection to local access.

Table 5-2: Assessment of Road Corridor Alternatives

CATEGORY	CONCEPT 1 Widening Existing Steeles Avenue	CONCEPT 2 New Corridor to the South	CONCEPT 3 New Corridor to the North
Socio-Economic Environment	• Not consistent with Town of Milton Official Plan. • Impacts to frontage of existing properties along Steeles Avenue. • Substantial visual intrusion if grade separation is an overpass.	• Consistent with Town of Milton Official Plan. • Possible impacts to properties on south side of Steeles Avenue. • Visual intrusion if grade separation is an overpass.	• Not consistent with Town of Milton Official Plan. • Significant impacts to existing properties on north side of Steeles Avenue. • Substantial visual intrusion if grade separation is an overpass.
Cultural Environment	• Edge impacts to numerous registered properties on Steeles Avenue and Peru Road, within the Peru Road Character Area. • Two Stage 1 Archaeology Assessments were completed for the study area (2019 and 2022). It was determined that additional archaeological assessment is required in areas of the study area impacted by the preferred design that appear undisturbed and contain archaeological potential will require a Stage 2 Archaeological Assessment prior to construction as shown in Section 3.3.1.	• Preserves the historic hamlet of Peru and Character Area. • Some potential for impacts to built heritage resources. • Two Stage 1 Archaeology Assessments were completed for the study area (2019 and 2022). It was determined that additional archaeological assessment is required in areas of the study area impacted by the preferred design that appear undisturbed and contain archaeological potential will require a Stage 2 Archaeological Assessment prior to construction as shown in Section 3.3.1.	• Significant impacts to the historic hamlet of Peru and Character Area. • Several registered heritage properties would be directly impacted. • Two Stage 1 Archaeology Assessments were completed for the study area (2019 and 2022). It was determined that additional archaeological assessment is required in areas of the study area impacted by the preferred design that appear undisturbed and contain archaeological potential will require a Stage 2 Archaeological Assessment prior to construction as shown in Section 3.3.1.
Natural Environment	• May limit opportunities to mitigate impacts to Niagara Escarpment Protection (NEP) areas. • Generally has less impact to natural features than a new corridor. • Utilizes existing Sixteen Mile Creek crossing location. • Relatively lower impacts to potential bat habitat, but will impact barn swallows at CP Rail culvert.	• New corridor within NEP areas. • Potentially greater impact on natural environment and wildlife habitat. • Creates new crossings, including Sixteen Mile Creek • Impacts to lowland deciduous riparian forest and cultural thicket communities. • However, crossings of natural features are discreet with opportunity for mitigation to maintain ecological functions.	• Least impact to NEP areas. • Results in substantial removal of riparian wetland. • Creates a new crossing of Sixteen Mile Creek. • Opportunities for mitigation may be limited by other constraints (technical, socio-economic).
Surface Water and Groundwater	• A potential CP Rail overpass would result in substantial fill within regulated area. • A potential CP Rail underpass would require a major creek realignment. • Limited potential at Sixteen Mile Creek bridge to improve overtopping of Steeles Avenue under Regional storm event.	• New watercourse crossings including Sixteen Mile Creek and tributary – opportunities to mitigate flooding concerns through design.	• A potential CP Rail overpass would result in substantial fill within regulated area. • A potential CP Rail underpass would require a major creek realignment and may require a permanent pumping station. • Deficiencies at Sixteen Mile Creek bridge downstream could impact design of a new upstream crossing.
Transportation and Technical	• Addresses future growth and travel demand to 2031; opportunities for active transportation limited. • Substantial disruption and lengthy closures during construction. Highly complex traffic staging, utility relocation, etc. • CP Rail grade separation challenging with potentially significant impacts.	• Addresses future growth and travel demand to 2031, including active transportation. • Significantly simpler to construct and stage within greenfield. • Greater separation between CP Rail line and watercourses simplifies design. • Existing Steeles Avenue would serve local access only.	• Addresses future growth and travel demand to 2031, including active transportation. • Construction is complicated by impacts to properties, utilities, drainage, etc. • CP Rail grade separation challenging with potentially significant impacts.

LEGEND

Red = *least preferred* Yellow = *moderately preferred* Green = *most preferred*

CATEGORY	CONCEPT 1 Widening Existing Steeles Avenue	CONCEPT 2 New Corridor to the South	CONCEPT 3 New Corridor to the North
	• Existing Peru Road / Steeles Avenue intersection would likely be realigned.		• Existing Steeles Avenue would serve local access only.
Preliminary Cost Estimate	• Greater capital cost to construct	• Lower overall capital cost to construct	• Greater overall capital cost to construct
Overall Summary	**Moderately Preferred**	**Most Preferred**	**Least Preferred**

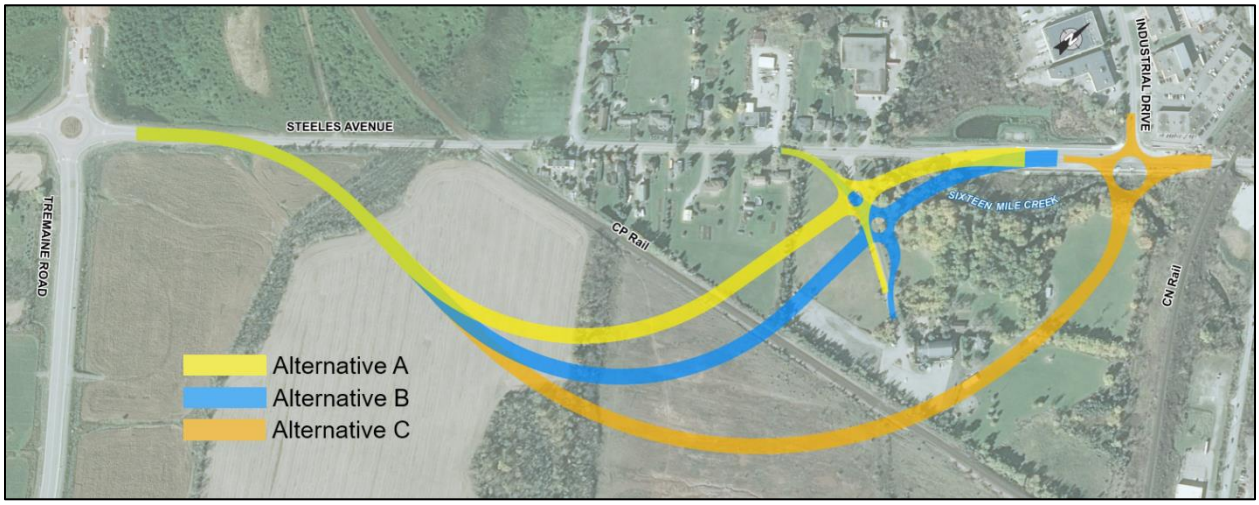
LEGEND

Red = *least preferred* Yellow = *moderately preferred* Green = *most preferred*

5.4 Alignment Alternatives

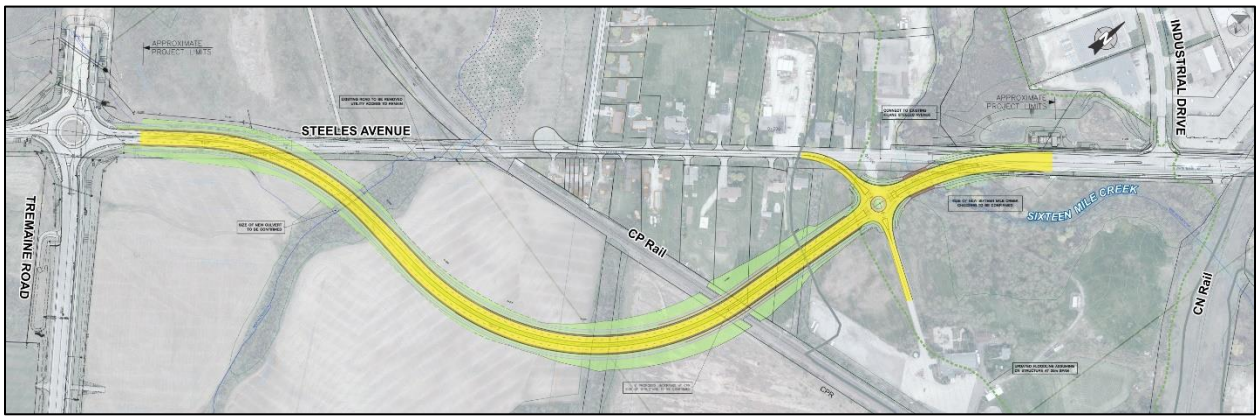
Three design alternatives have been developed for the realignment of Steeles Avenue within the south corridor concept, namely, Alternative A, Alternative B and Alternative C. See **Exhibit 5-4** for an overlay of the three alignment alternatives.

Exhibit 5-4: Road Alignment – All Alternatives



Alternative A (see **Exhibit 5-5**) is the shortest road and ties into existing Steeles Avenue sooner than the other alternatives. However, this option crosses the CP Rail line on a pronounced angle. This Alternative also has greater impact on residential backyards. The crossing of Sixteen Mile Creek is located on a bend in the creek, which is less desirable in terms of minimizing impacts to the creek and valley.

Exhibit 5-5: Road Alignment – Alternative A



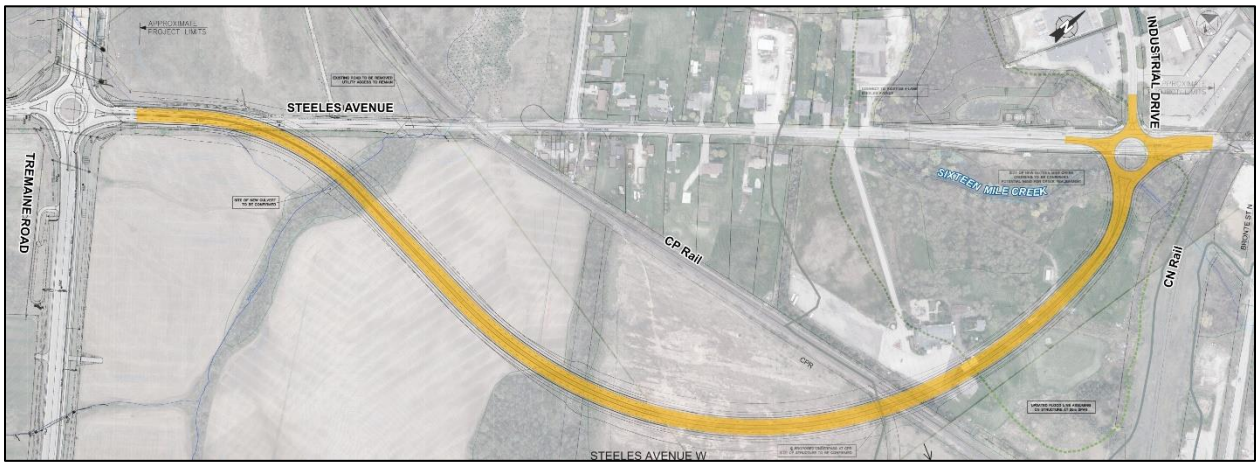
Alternative B (see **Exhibit 5-6**) has a larger horizontal curve than Alternative A. The crossing with CP is more perpendicular compared to the other Alternatives. The Sixteen Mile Creek crossing is less intrusive to the creek and valley because it is located on a straight section of the creek. This option also has slightly less impact on residential backyards compared to Alternative A.

The alignment of Alternative C (see **Exhibit 5-7**) is furthest away from the residential area. However, this is the least direct and longest route. A large portion of the roadway

Exhibit 5-6: Road Alignment - Alternative B

lies within the Sixteen Mile Creek floodplain and therefore certain flood protection design criteria cannot be met. This Alternative has a poor crossing angle at the CP Rail line and the greatest impact on the Sixteen Mile Creek and valley due to the location of the roundabout or intersection at Industrial Drive. This option also has a much greater impact on an existing business, as the new road would be in close proximity to the building.

Exhibit 5-7: Road Alignment – Alternative C



The detailed assessment and evaluation table, shown in **Table 5-3**, provides an assessment and evaluation of the three road alignment alternatives, which took into consideration all of the factors under socio-economic environment, natural environment, surface water and groundwater, cultural environment, transportation and technical consideration, as well as estimated capital cost (per **Section 5.3**).

Table 5-3: Evaluation of Road Alignment Design Alternatives

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
Socio-Economic and Land Use					
Property and Access					
a	Property	- Total number of properties intersected by corridor (and approximate ha.). - Potential number of residence and business building displacements. - Qualitative assessment of the nature of property impacts. - Qualitative assessment of impacts to business operations.	- Total of **seven (7) properties** are impacted, including Halton Region property: - **All measurements in hectares (ha)** (35 m ROW / Grading Easement / Remnant) o 7649 Tremaine Road (1.59 / 0.26 / 3.57) o Town of Milton Property (0.55 / 0.42 / 0.59) o 3190 Steeles Avenue (0 / 0.002 / 0) o 3170 Steeles Avenue (0.04 / 0.08 / 0) o 3164 Steeles Avenue (0.14 / 0.09 /0.01) o 3156 Steeles Avenue (0.14 /0.1 / 0.12) o 3090 Steeles Avenue (0.71 /0.23 / 0.29) - **Total Area (3.17 ha / 1.18 ha / 4.58 ha)** - Realigned Steeles Avenue will bisect the 3090 Steeles Avenue. The new road right-of-way would bisect the property into two parcels – the parcel to the northwest of the road would be 0.29 ha and the parcel to the southeast of the road would be 13.14 ha.	- Total of **seven (7) properties** are impacted, including Halton Region property: - **All measurements in hectares (ha)** (35 m ROW / Grading Easement / Remnant) o 7649 Tremaine Road (2.478 / 0 / 0.030 / 0.359) o Town of Milton Property 1.627 / 0 / 0 / 0) o 3164 Steeles Avenue (0.0094 / 0 / 0 / 0) o 3156 Steeles Avenue (0.112 / 0 / 0 / 0) o 3090 Steeles Avenue (1.675 / 0.512 / 0 / 0) o Property on the NW corner of Peru Road and Steeles Avenue West (0.007 / 0.016 / 0 /0) o 3230 Steeles Avenue (0.0052 / 0.015 / 0 / 0) - **Total Area (5.913 ha / 0.543 ha / 0.030 ha / 0.359 ha)** - The realigned Steeles Avenue and existing Steeles Avenue connection will bisect 3090 Steeles Avenue. The new road right-of-way would separate the property into three parcels. The parcel to the southwest would be 0.72 ha.; the parcel to the east would be 11.72 ha.; and the parcel to the northwest (Sixteen Mile Creek) would be 0.26 ha.	- Total three **(3) properties** are impacted, including Halton Region property - **All measurements in hectares (ha)** (35 m ROW / Grading Easement / Remnant) o 7649 Tremaine Road (1.69 / 0.33 / 4.22) o Town of Milton Property (1.4 / 0.9 / 3.87) o 3090 Steeles Avenue (1.43 /0.36 / 4.03) - **Total Area (4.52 ha / 1.59 ha / 12.12 ha)** - Realigned Steeles Avenue will bisect the 3090 Steeles Avenue. The new road right-of-way would bisect the property into two parcels – the parcel to the west of the road would be 8.55 ha and the parcel to the east of the road would be 4.03 ha.
b	Access	- Impacts to existing local road network and property access. - Qualitative assessment of impact to access related to out-of-way travel	- Existing Steeles Avenue will be maintained for access to local residents and Peru Road. Connection to existing Steeles Avenue may be via a roundabout or conventional intersection.	- Existing Steeles Avenue will be maintained for access to local residents and Peru Road. Connection to existing Steeles Avenue may be via a roundabout or conventional intersection.	- Existing Steeles Avenue will be maintained for access to local residents and Peru Road. Connection to existing Steeles Avenue may be via a roundabout or

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
			- The roundabout is approximately 150 m away (westerly) from the Industrial Drive intersection. - Driveway to 3090 Steeles Avenue will be directly impacted by realigned Steeles Avenue. Length of the driveway will be reduced by approximately 60 m and the access will be via a new intersection from realigned Steeles Avenue.	- The roundabout is approximately 200 m away (westerly) from the Industrial Drive intersection. - Driveway to 3090 Steeles Avenue will be directly impacted by realigned Steeles Avenue. Length of the driveway will be reduced by approximately 125 m and the access will be via a new intersection from realigned Steeles Avenue.	conventional intersection at Industrial Drive. - Commuters that continue on realigned Steeles Avenue will have to make a left turn at the Industrial Drive intersection. There are direct property accesses from realigned Steeles Avenue. - Driveway to 3090 Steeles Avenue continued to be from existing Steeles Avenue.
Community Considerations					
a	Community Fabric / Character	- Potential to create physical barriers or perceived barriers within and between communities - Impacts to aesthetic elements and quantity/quality of natural and man-made aesthetic elements. - Impacts or improvements to community mobility.	- All alternatives avoid the hamlet of Peru, therefore avoiding the creation of physical or perceived barriers within the community. - All alternatives will keep through traffic out of the hamlet, therefore Peru should experience a significant reduction in traffic volumes. This is deemed to be a benefit to the community. Peru Road Character Area attributes are better protected with diversion of through traffic. - All alternatives are expected to enhance community mobility with the planned sidewalks and cycling facilities providing safe multi-modal travel options to residents, with connections to the broader active transportation network.	- Same as Alternative A	- Same as Alternative A
b	Noise and Air Quality	- Qualitative assessment of potential for impacts or improvements to noise levels to sensitive areas.	- Residential properties will back on to the new alignment and will have increased noise levels as a result. Alternative A is located closer to more backyards than the other alternatives therefore a greater number of properties could experience increased noise levels. - A noise analysis was carried out following the selection of the preliminary preferred planning solution. No mitigation is required. - An Air Quality Assessment was carried out following the selection of the preliminary preferred planning solution. The maximum	- Similar to Alternative A, except the roadway is located slightly further away (southerly) from existing residential backyards so potential noise level increases would be expected at fewer properties.	- Similar to Alternatives A and B, although the roadway is set further away (southerly) from existing residential backyards, so potential noise level increases would be relatively lower.

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
			combined concentrations for the future build scenario were all below their respective MECP guidelines or CAAQS, with the exception of the 1-hr NO2CAAQ, annual PM2.5, 24-hr PM10, 24-hr TSP and annual benzene. Mitigation measures are not warranted, due to the small number of days which are expected to exceed the guideline. Total GHG emissions from Steeles Avenue are expected to increase by 37% from the 2020 Existing scenario to the 2031 Future Build Scenario. - All alternatives would be introducing a new road in a rural setting resulting in removal of vegetation and localized air quality impacts.		
c	Parks and Recreation Facilities	- Number of parks/recreation sites/trails displaced, disrupted or adjacent to the corridor	- No existing parks/recreation sites/trails will be displaced. - All alternatives include new multi-use trails and on-road bike lanes that will enhance access to the Town of Milton passive parklands located on the former Jannock lands site, located north of Steeles Avenue on east and west sides of Tremaine Road. - All alternatives encroach into the Town of Milton 'Escarpment View Lands', envisioned as a future active recreational site; however, there is no approved park plan to date. Refer to Factor 1.3 b) for additional details.	- Same as Alternative A	- Same as Alternative A
Land Use					
a	Government Plans and Policies	- Consistency/compatibility with Regional and Town Official Plans, Transportation Master Plans and approved land use plans.	- All alternatives are consistent with the Halton Region Official Plan and Transportation Master Plan that plan for Regional population and employment growth and identify the need for improvements to Steeles Avenue. - All alternatives are consistent with the Town of Milton Official Plan and the Sherwood Survey Secondary Plan which envisioned a future Steeles Avenue road alignment south of the existing roadway.	- Same as Alternative A	- Same as Alternative A

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
			- The Town of Milton Official Plan and Sherwood Secondary Plan identify Steeles Avenue, in the vicinity of Peru Road, as a Character Road. All alternatives serve to protect the Character Road designation by avoiding changes to Steeles Avenue in this area.		
b	Land Use	- Compatibility with existing and planned land uses	- All alternatives occur outside of the Sherwood Survey Secondary Plan area. - Overall, little change to existing and planned land uses in the area. Existing residential and agricultural lands will persist, with some impact to properties and access as documented in Factor 1.1. o Some impact to existing residential properties and business on south side of Steeles Avenue, as discussed in Factor 1.1. o Will encroach onto 3090 Steeles Avenue and will required a new access from Steeles Avenue as discussed in Factor 1.1 o All alternatives encroach into the Town of Milton 'Escarpment View Lands' (formerly known as the Central Milton Holdings Limited lands). Per discussions with the Town of Milton, as documented in the meeting minutes on Appendix A, the Town envisions future active recreational facilities on this parcel. To date, a park plan has not been approved by the Niagara Escarpment Commission. Alternative A has comparatively less encroachment into the Town lands than the other alternatives.	- Similar to Alternative A, with slightly less impact to residential areas and more encroachment into 3090 Steeles Avenue and Town of Milton lands.	- Similar to Alternatives A and B, with no encroachment into residential areas and more encroachment into 3090 Steeles Avenue and Town of Milton lands.
c	Agriculture and Operations	- Impacts to agricultural lands including but not limited to: o Changes to farm field access o Provision for the movement of farm equipment on road network	- All alternatives will have similar impacts to the farm fields located in the west portion of the study area (east of Tremaine Road and south of existing Steeles Avenue).	- Similar to Alternative A	- Similar to Alternative A

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
		○ Changes to farm operations ○ Creation of remnant/inoperable fields	- All alternatives will remove a portion of field area from production. However, farm fields are leased and not owner-operated. - All alternatives will result in a small parcel between Tributary NW-1-E, existing and proposed Steeles Avenue that pose operational challenges agricultural equipment. The new road right-of-way would bisect the property into two parcels – the parcel to the northeast of the road would be about 3.6 ha and the parcel to the southwest of the road would be about 16.1 ha. - Three drop-curb farm field entrances are provided from Tremaine Road that access all of the field areas. There are no existing farm field accesses along Steeles Avenue.		
Socio-Economic and Land Use Summary			**Less Preferred**	**More Preferred**	**Less Preferred**
			Alternative A impacts a greater number of properties than the other alternatives, including encroachment into three residential backyards in Peru, but impacts the least absolute area (ha) of property. This alternative is located the closest to residential areas and therefore is anticipated to have greater potential for increased noise levels to sensitive areas. Alternative B impacts fewer number of properties with less impact to residential backyards than Alternative A and has slightly greater separation distance from residential areas than Alternative A, which is better in terms of anticipated noise impacts. Alternative B has less direct impact on the 3090 Steeles Avenue compared to Alternative C. Alternative C is located further away from the residential area of Peru and impacts the fewest number of properties and is expected to have reduced noise level concerns. However, it has the greatest absolute area (ha) of impact and significantly impacts3090 Steeles Avenue and will likely have impact to their business operation. All alternatives are consistent with Regional and Town planning and policy documents. All alternatives have similar impacts to existing and future land uses, including agricultural lands and operations. All alternatives are deemed to have a benefit to the community of Peru. Therefore, Alternative B is preferred.		

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
Natural Environment					
Plans and Policies					
a	Niagara Escarpment Plan, Greenbelt Plan Areas and Regional Natural Heritage System (NHS)	- Qualitative assessment considering the magnitude (length of corridor in km), nature of potential impacts (fragmentation, encroachment) and significance (considering the various land use designations within Niagara Escarpment (NE) Plan Area) and consistency/compliance with NE Plan policies.	- All alternatives will encroach into Niagara Escarpment Plan (NEP) Area which designates the westerly portion of the study area as 'Escarpment Protection Area' (EPA) and a small part of the easterly portion (south of Steeles Avenue) as 'Escarpment Rural Area' (ERA). - These NEP designations do not preclude transportation infrastructure, providing that policy objectives and reasonable alternatives considered. All alternatives include a grade separated (underpass) at CP rail which will protect escarpment views – a primary objective of the EPA and ERA policies. - Policy objectives related to protection of natural heritage features are captured in the other natural environment factors, below. - Tributary NW-1-E and the narrow woodland/hedgerow crossed by all alternatives are identified in the Region Official Plan as Key Features of the Regional Natural Heritage System. Measures will be identified to mitigate impacts and maintain current natural heritage functions.	- Similar to Alternative A	- Similar to Alternative A
b	Designated Natural Heritage Features (ESA, ANSI, PSW)	- Qualitative and quantitative assessment considering the magnitude (length of crossing) and nature of potential impacts (fragmentation, encroachment, loss) as well as, potential to avoid or mitigate impacts.	- N/A – no ANSI's, ESA'S, or PSW's in the vicinity of the alternatives	- Same as Alternative A	- Same as Alternative A
Aquatic Ecosystem					
a	Fish and Aquatic Habitat	- Qualitative and quantitative assessment that considers the magnitude (number) and	- Sixteen Mile Creek and its wooded riparian corridor is the most prominent natural feature within the study area and is a sensitive, high constraint, coldwater stream. In the vicinity of the Steeles Avenue crossing, the watercourse supports coldwater species including Rainbow		

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
		nature of potential impacts, significance and sensitivity of fisheries and aquatic habitat using, as indicators: - Sensitivity of aquatic habitat features present at crossing location (i.e. spawning habitat etc.) - Crossing site relative to geomorphic features - Fish communities and the presence of aquatic Species at Risk (SAR), including occupied and contributing habitat	Trout (*Oncorhynchus mykiss*), Brown Trout (*Salmo trutta*) and Mottled Sculpin (*Cottus bairdii*), as well as a variety of other sportfish and baitfish species. Bridle Shiner (*Notropis bifrenatus*), a Special Concern species has also been documented. Aquatic habitat in the vicinity Alternative A and B is similar (e.g., riffle dominant morphology). Alternative C has a flat morphology. Conservation Halton has indicated there is confirmed spawning habitat for Rainbow Trout and Brown Trout in the vicinity of the existing bridge crossing and further up and downstream. - Tributary NW-1-E of Sixteen Mile Creek is a small, intermittent warmwater watercourse. This watercourse is recognized in the Milton Heights Neighbourhood Subwatershed Impact Study (SIS) Update (2014) as High Constraint with Rehabilitation Potential, downstream (north) of Steeles Avenue. Rainbow Trout (a coldwater species) and a variety of other baitfish species were captured by WSP at the Steeles Avenue crossing during the 2017 fisheries inventory. - Un-named Tributary of NW-1-E (flows parallel to the north side of Steeles Ave.) is a small, warmwater watercourse (likely permanent). Tributary features are consistent with criteria for Medium to High Constraint per the SIS (2014). A portion of this watercourse (~140 m along Steeles Ave.) has been recently realigned and restored in conjunction with the Tremaine Road works. A variety of cool and warm water baitfish species (e.g., Creek Chub [*Semotilus atromaculatus*], Blacknose Dace [*Rhinichthys atratulus*], Fathead Minnow [*Pimephales Promelas*]) were captured by WSP during the 2017 fisheries inventory. No further realignment is anticipated. - Agricultural Swale (indirect fish habitat). This feature is consistent with the SIS (2014) criteria for Low Constraint – applied to watercourses which are ephemeral or intermittent, have either poorly defined channels with no sorting of substrate or no defined channels, and where no fish were captured. - All the above watercourses are considered 'Contributing Habitat' for Redside Dace (*Clinostomus elongatus*, Endangered under the ESA) by MECP. American Eel (*Anguilla rostrata*, Endangered under the ESA) were also recently (2019) found in Sixteen Mile Creek further upstream near Kelso Dam and MECP considers the reach in the vicinity of the crossing as Occupied Habitat for this species.		
			- Sixteen Mile Creek – new crossing and enclosure of ~ 33 m of channel - Tributary NW-1-E – new crossing and enclosure of ~ 53 m of channel - Agricultural Swale – ~ 20 m section will be removed and requires tie-in to new ditch line. Function will be maintained. - Similar to Alternative B but less impact on Sixteen Mile Creek (shorter span required) - Closer to existing Steeles Avenue, therefore, additional slope stabilization possibly required.	- Sixteen Mile Creek – new crossing and enclosure of ~ 44 m of channel - Tributary NW-1-E – new crossing and enclosure of ~ 53 m of channel - Agricultural Swale – ~ 20 m section will be removed and requires tie-in to new ditch line. Function will be maintained. - Similar to Alternative A but bridge is skewed and would cross over straighter reach which is preferable.	- Sixteen Mile Creek – new crossing and enclosure of channel (~ 49 m if under roundabout) plus the potential need to realign channel. - Tributary NW-1-E – new crossing and enclosure of ~ 53 m of channel - Agricultural Swale – ~ 20 m section will be removed and requires tie-in to new ditch line. Function will be maintained. - Similar to Alternative B but more impact on Sixteen Mile Creek (longer span required).
Terrestrial Ecosystems					
a	Wetlands	- Qualitative and quantitative assessment considering the magnitude (area in ha) and nature of potential impacts (fragmentation, encroachment, loss), significance and sensitivity of wetland units based on density and classification: Provincially	- There are two unevaluated wetlands within the study area, identified as Cattail Mineral Shallow Marsh (MAS2-1) and Forb Mineral Shallow Marsh (MAS2-9). These wetlands are located north of the existing Steeles Avenue and therefore are not likely to be directly impacted by any of the proposed alternatives. Further evaluation of these wetlands was determined to not be necessary based on the vicinity of the Preferred Planning Solution to these wetlands.		

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
		Significant Wetlands; Evaluated Wetlands; Unevaluated Wetlands; and potential to avoid or mitigate impacts.			
b	Woodlands and Other Upland Vegetation	- Qualitative and quantitative assessment considering the magnitude (area in ha) and nature of potential impacts (fragmentation, encroachment, loss), significance and sensitivity of upland vegetation units based on presence and/or density of: o Significant Woodlands o known flora Species at Risk (SAR), o sensitive or rare vegetation communities (based on provincial ELC ranks), as available - Potential to avoid or mitigate impacts.	The following Natural Heritage Features/vegetation communities are found within the immediate area of the proposed alternatives (south of Steeles Avenue) and the removal impacts[3] of each alternative are noted below: - Riparian corridors of Sixteen Mile Creek (1b – FOD 7-3 Willow Lowland Deciduous Forest). This feature has a High Constraint Level4. - Tributary NW-1-E of Sixteen Mile Creek (Unit 9 – FOD 7 – Lowland Deciduous Forest). This feature has a High Constraint Level. - Thicket Feature (Unit 12, CUT1 – Mineral Cultural Thicket). This feature has a High Constraint Level. - Meadow Area (Unit 13 – CUM-1 Dry-Fresh Old Field Meadow). This feature has a High Constraint Level. - Hedgerow (Unit 14 – CUH1 – Cultural Hedgerow). This feature has a Low Constraint Level. - Forest (Unit 11 – FOD9-3 – Fresh-Moist Bur Oak Deciduous Forest). This feature has a High Constraint Level. No Species at Risk (SAR), provincial or regionally rare plant species or vegetation communities (including Butternut) are known to be present within the areas of the alternatives		
			- No direct impact on the forest feature (Unit 11), unlike Alternative C. Similar to Alternative B but alignment is further away from the forest (Unit 11), resulting is less potential indirect impacts. - Potential indirect impacts to the vegetation communities include: o Edge Effects (sunscald, invasive species, localized changes in soil conditions such as flooding or drying) o Construction-related Impacts (damage to vegetation outside of work area, sedimentation, spill of contaminants, damage to limbs, soil compaction) - Least amount of overall vegetation removed when compared to Alternative 2 and 3.	- A very slight (33 m^2) direct impact on the forest feature (Unit 11), but less than Alternative C. Similar to Alternative A but alignment is closer to the forest (Unit 11), resulting is greater potential indirect impacts. - Potential indirect impacts are the same as those listed under Alternative A. - More overall vegetation removed than Alternative 1 and less vegetation removed when compared to Alternative C. <u>Vegetation Removals</u> - Sixteen Mile Creek riparian corridor (Unit 1b – FOD7-3) 3071 m^2 - Tributary NW-1-E riparian corridor (Unit 9 – FOD7) 2675 m^2 - Thicket Feature (Unit 12 – CUT1) – 1912 m^2	- Alternative C would result in some direct impact (i.e., removals) to the forest feature (Unit 11) as well as potential indirect impacts. - Potential indirect impacts are the same as those listed under Alternative A. - Most overall amount of vegetation removed when compared to Alternative A and B. <u>Vegetation Removals</u> - Sixteen Mile Creek riparian corridor (Unit 1b – FOD7-3) 3337 m^2 - Tributary NW-1-E riparian corridor (Unit 9 – FOD7) 3256 m^2 - Thicket Feature (Unit 12 – CUT1) 1866 m^2

[3] *Note that impacts to roadside cultural meadows, roadside thicket, ditches, manicured/mown and agricultural areas have not been included in the impact area calculations.*
[4] *Constraint levels were taken and/or adopted from the Milton Heights Neighborhood Subwatershed Impact Study (SIS; Rand Engineering et al., 2014), which adopted the original constraint levels from the Indian Creek/Sixteen Mile Creek, Sherwood Survey, Subwatershed Management Study (Philips Engineering et al., 2004)*

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
			<u>Vegetation Removals</u> - Sixteen Mile Creek riparian corridor (Unit 1b – FOD 7-3) 1872 m^2 - Tributary NW-1-E riparian corridor (Unit 9 – FOD7) 2411 m^2 - Thicket Feature (Unit 12 – CUT1) 1598 m^2 - Cultural Meadow Area (Unit 13 – CUM1-1) 5790 m^2 - Hedgerow (Unit 14 – CUH1) 1294 m^2 **Total Vegetation Removed = 12, 965 m^2** (~1.29 ha)	- Cultural Meadow Area (Unit 13- CUM1-1) 10,318 m^2 - Hedgerow (Unit 14 – CUH1) 1478 m^2 - Forest (Unit 11 – FOD9-3) 33 m^2 **Total Vegetation Removed = 19, 487 m^2** (~1.95ha)	- Cultural Meadow Area (Unit 13 – CUM1-1) 19,759 m^2 - Hedgerow (Unit 14, unnumbered – CUH1) 2396 m^2 - Forest (Unit 11 – FOD9-3) 1612 m^2 **Total Vegetation Removed = 32, 226 m^2** (~3.22 ha)

c	Wildlife Habitats and Linkages	- Qualitative and quantitative assessment considering the magnitude (area in ha) and nature of potential impacts (fragmentation, encroachment, loss), significance and sensitivity of wildlife habitat and landscape connectivity based on the presence and density of:
		  ○ Significant Wildlife Habitat (SWH) and known or potential habitat for wildlife Species at Risk
		  ○ Known or potential wildlife use (e.g., deer overwintering areas, waterfowl staging, etc.)
		  ○ wildlife movement opportunities, considering local and regional scale (landscape-level) linkages and corridors
		- Potential to avoid or mitigate impacts.
			All alternatives have potential impacts on the following:
			- Crossing wildlife movement corridors associated with the riparian zone of Sixteen Mile Creek (Unit 1a, 1b – FOD 7-3) and Tributary NW-1-E (Unit 9 – FOD 7), the Thicket feature (Unit 12, CUT1) and the Forest feature (Unit 11 – FOD9-3). Movement opportunities can be maintained with appropriate mitigation measures (e.g., appropriately sized structures over the watercourse features, wildlife directional fencing etc.).
			- There is potential for migratory birds to nest in the natural and/or vegetated areas within the study area, including the vegetation communities noted above. Mitigation measures for compliance with the Migratory Birds Convention Act (MBCA) include timing windows for vegetation removals (i.e. no removals within the regional breeding bird period) will be incorporated.
			- Breeding habitat for one anuran species (Spring Peeper) has been confirmed in the vicinity of the riparian forest area of Sixteen Mile Creek on the south side of Steeles Avenue near the intersection of Industrial Drive. Breeding habitat for two additional anuran species (high abundances of Grey Treefrog and Green Frog) was confirmed in the SWM Pond / Marsh area north of Steeles Avenue near the intersection with Industrial Drive. These areas have already been widened under a previous contract, and so impacts to this habitat is not anticipated as part of the current project, however Alternative C could impact the Spring Peeper habitat as noted below.
			- Sixteen Mile Creek and Tributary NW-1-E (downstream/north of Steeles Ave.) have moderately suitable turtle foraging/movement and potential hibernation habitat for Snapping Turtle (Special Concern) and Midland Painted Turtle (Not at Risk), although Sixteen Mile creek hibernation habitat is not ideal due to hard substrates. Impact to this habitat will be low with appropriate mitigation measures (e.g., timing restrictions for works, enclosure of work areas).		

			- Wildlife habitat removals (with regard to migratory birds) are similar to the impacted Vegetation Communities noted above. - The Steeles Avenue structures required for Sixteen Mile Creek and Tributary NW-1-E, can be designed to maintain wildlife movement. Thicket feature would require wildlife fencing to 'funnel' or re-direct wildlife through Tributary NW-1-E structure. - Relative to Alternative B, this alternative has marginally lower potential for indirect impacts on ELC Unit 11 and direct impacts	- Wildlife habitat removals (with regard to migratory birds) are similar to the impacted Vegetation Communities noted above. - The Steeles Avenue structures required for Sixteen Mile Creek and Tributary NW-1-E, can be designed to maintain wildlife movement. Thicket feature would require wildlife fencing to 'funnel' or re-direct wildlife through Tributary NW-1-E structure. - Relative to Alternative A, this alternative has marginally greater potential for minor direct impacts and indirect impacts on ELC Unit 11	- Wildlife habitat removals (with regard to migratory birds) are similar to the impacted Vegetation Communities noted above. - The Steeles Avenue structures required for Sixteen Mile Creek and Tributary NW-1-E, can be designed to maintain wildlife movement. Thicket feature would require wildlife fencing to 'funnel' or re-direct wildlife through Tributary NW-1-E structure.

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
			on Unit 1b, which are higher quality wildlife habitats (deciduous forest areas with potential SAR bat roosting habitat and confirmed Eastern Wood-pewee habitat).	and direct impacts on Unit 1b, which are higher quality wildlife habitats (deciduous forest areas with potential SAR bat roosting habitat and confirmed Eastern Wood-pewee habitat).	- Could impact the breeding habitat for one anuran species (Spring Peeper) around the riparian forest habitat of Sixteen Mile Creek. - Relative to Alternative A and B, this alternative has greater potential for direct impacts on higher quality wildlife habitats in ELC Units 11 (deciduous forest area with potential SAR bat roosting habitat and confirmed Eastern Wood-pewee habitat).

d	Species at Risk (SAR)	- Qualitative and quantitative assessment considering the magnitude and nature of potential impacts on SAR
		  ○ Significant Wildlife Habitat (SWH) and known or potential habitat for wildlife Species at Risk
		  ○ Potential for ESA Permitting requirements
		- Potential to avoid or mitigate impacts on SAR.
			The alternatives have potential impacts on the following:
			- Foraging / dispersal habitat for Monarch (provincially listed as Special Concern), which has been confirmed along the edge of the unevaluated wetland during WSP surveys, however the alignments do not impact this feature which is located north of Steeles Avenue. General foraging / dispersal habitat also present within or along the edges of the other vegetation communities (cultural meadow and forest or hedgerow edges). Impacts would be considered low with appropriate mitigation (e.g., use of seed mix that contains milkweed).
			- Eastern Wood-pewee (provincially listed as Special Concern) was confirmed during the WSP surveys with possible breeding evidence in the Sixteen Mile Creek Riparian Forest (Unit 1a, 1b – FOD 7-3 Willow Lowland Deciduous Forest) as well as in habitat impacted by Alternative C in the Deciduous Forest feature (Unit 11 – FOD9-3 – Fresh-Moist Bur Oak Deciduous Forest).
			- Sixteen Mile Creek and Tributary NW-1-E (downstream/north of Steeles Ave. have moderately suitable turtle foraging/movement and potential hibernation habitat for Snapping Turtle (Special Concern Species) although Sixteen Mile creek hibernation habitat is not ideal due to hard substrates. Impact to this habitat will be low with appropriate mitigation measures (e.g., timing restrictions for works, enclosure of work areas with temporary exclusion fencing).
			- Potential for removal of SAR bat roosting habitat within riparian woodlands area of Sixteen Mile Creek (Unit 1a, 1b – FOD 7-3 Willow Lowland Deciduous Forest), Tributary NW-1-E (Unit 9 – FOD 7 – Lowland Deciduous Forest) and along the Thicket (Unit 12, CUT1), Forest (Unit 11 – FOD9-3), and Hedgerow features (Unit 14 – CUH – Cultural Hedgerow) where WSP has located potential cavity trees, loose bark and/or appropriate species of trees. Further targeted surveys, during the detailed design stages of this project, may be required to confirm presence / absence of SAR bats and evaluate candidate Significant Wildlife Habitat
			- Barn Swallow nests were observed within the CP Rail culvert just north of Steeles Avenue; however, none of the alternatives impact this nesting habitat.
			- No SAR, provincial or regionally rare plant species or vegetation communities are known to be present within the areas of the alternatives.		

			- This alternative would require removals along the edge of the Eastern Wood-pewee breeding habitat along the Sixteen Mile Creek riparian area (Unit 1B – FOD7-3; resulting in lower impacts than Alternatives B and C, and unlikely to result in impacts on this species' local population). - Potential impacts on bat habitat within riparian areas of Sixteen Mile Creek and	- This alternative would require removals within Eastern Wood-pewee breeding habitat along the Sixteen Mile Creek riparian area (Unit 1B FOD7-3), as well as edge direct / indirect impacts on the Forest feature (Unit 11 – FOD9-3); resulting in lower impacts than Alternative C and marginally greater impacts than Alternative	- This alternative would require removals within Eastern Wood-pewee breeding habitat along the Sixteen Mile Creek riparian area (Unit 1b – FOD7-3), as well as direct impacts on the Forest feature Unit 11 (Unit 11 – FOD9-3); resulting in greater impacts than Alternative A and B, but unlikely to result in impacts on this species' local population.

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
			Tributary NW-1-E, as well as the Hedgerow and the Thicket area. WSP found 6 cavity trees and 7 potential Tri-colored bat habitat trees within the Sixteen Mile Creek riparian area, of which **7 would potentially be removed** for this alternative; 12 cavity trees in the Tributary NW-1-E riparian area, of which **2 would potentially be removed** for this alternative; and 3 cavity trees and 10 potential Tri-colored bat habitat trees in the Hedgerow and Thicket areas, of which **6 would potentially be removed** for this alternative; 2 cavity trees and 7 potential Tri-colored bat habitat trees in ELC Unit 11 (FOD9-3), of which **none would potentially be removed for this alternative.**	A, but unlikely to result in impacts on this species local population. - Potential impact on bat habitat within the riparian areas of Sixteen Mile Creek and Tributary NW-1-E, as well as the Hedgerow and the Thicket area. WSP found 6 cavity trees and 7 potential Tri-colored bat habitat trees within the Sixteen Mile Creek riparian area, of which **6 would potentially be removed** for this alternative; 12 cavity trees in the Tributary NW-1-E riparian area, of which **3 would potentially be removed** for this alternative; and 3 cavity trees and 10 potential Tri-colored bat habitat trees in the Hedgerow and Thicket areas, of which **5 would potentially be removed** for this alternative; 2 cavity trees and 7 potential Tri-colored bat habitat trees in ELC Unit 11 (FOD9-3), of which **3 would potentially be removed for this alternative.**	- Potential impact on bat habitat within the riparian areas of Sixteen Mile Creek and Tributary NW-1-E, as well as the Hedgerow and the Thicket area. Field assessment in the Sixteen Mile Creek riparian area did not include coverage in this crossing area; however, based on air photo interpretation, impacts on potential SAR bat habitat in this area would likely be similar to the other alternatives; WSP found 12 cavity trees in the Tributary NW-1-E riparian area, of which **4 would potentially be removed** for this alternative; 3 cavity trees and 10 potential Tri-colored bat habitat trees in the Hedgerow and Thicket areas, of which **1 would potentially be removed** for this alternative; 2 cavity trees and 7 potential Tri-colored bat habitat trees in ELC Unit 11 (FOD9-3), of which **8 would potentially be removed for this alternative.** - *Due the impacts on higher quality forest roosting habitat in Unit 11 (FOD9-3), this alternative has the greatest potential to require an ESA permit for SAR bats.
Natural Environment Summary			**More Preferred**	**Moderately Preferred**	**Less Preferred**
			Alternatives A and B are similar with respect to impacts to Natural Heritage Features and functions with Alternative A impacting less area (m^2) of terrestrial vegetation and associated habitat as well as slightly less Sixteen Mile Creek channel length than Alternative B. In most cases, the differences between Alternatives A and B are minimal and could be managed through mitigation/compensation. Alternative C is the least preferred due to greater impacts to the Sixteen Mile Creek valley/floodplain natural areas and the potential need for channel realignment. Therefore, Alternative A is slightly preferred.		
Surface Water and Groundwater					

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
a	Fluvial Geomorphology	- Qualitative assessment of potential impacts to natural channel processes considering: o Siting of watercourse crossings o Potential need for watercourse realignment	- Crosses Sixteen Mile Creek on a small meander bend, which is not preferred. - The tie-in to existing Steeles Avenue is located at the edge of the valley slope – may require regrading of the valley slope and possible localized channel realignment or slope stabilization.	- Crosses Sixteen Mile Creek on a relatively straight reach or the watercourse. - Crossing is oriented slightly off perpendicular. Geomorphic implications of the bridge design (e.g. location of abutments relative to channel) will be explored in future design phases.	- Would require a substantial realignment of Sixteen Mile Creek and valley (~120 m), eliminating a large meander and likely reducing overall channel length and morphology. The realignment could also potentially shift the location and/or re-orient the CN crossing immediately downstream.
b	Drainage and Stormwater Management	o Assessment of floodplain storage and flood conveyance implications. o Assessment of the ability to manage stormwater.	- Has the smallest footprint within the Regulatory Flood Limit - Steeles Avenue road runoff for all alternatives will be managed with a new storm sewer system. Low Impact Development measures may be employed, where feasible.	- Has slightly larger footprint within the Regulatory Flood Limit than Alternative A - Steeles Avenue road runoff for all alternatives will be managed with a new storm sewer system. Low Impact Development measures may be employed, where feasible.	- Results in substantial fill in the floodplain, reducing flood storage and resulting in an expanded Regulatory Flood Limit. Would require significant earthworks in the valley to compensate for lost flood storage. - Steeles Avenue road runoff for all alternatives will be managed with a new storm sewer system. Low Impact Development measures may be employed, where feasible.
c	Groundwater	- Assessment of groundwater vulnerability based on the number/extent/location of Highly Vulnerable Aquifers (HVA) and other sensitive source protection areas. - Number of private well records within the right-of-way	- All alternatives are located outside of Highly Vulnerable Aquifers and municipal wellhead protections areas (WHPAs). - All alternatives are within an area of limited infiltration due to the presence of till and shale - Sixteen Mile Creek and tributaries are classified as Significant Groundwater Recharge Areas (SGRA) - Groundwater vulnerability is considered 'Medium' - All alternatives will likely involve construction dewatering for any below ground works - Potential presence of unused wells or improperly decommissioned wells within and/or adjacent the construction footprint of all alternatives. Most notably, a well record located at 3090 Steeles Avenue.	- Similar to Alternative A	- Similar to Alternative A except this alternative involves a much greater footprint in the Sixteen Mile Creek valley, with greater impacts to SGRA

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
Surface and Groundwater Summary			**Moderately Preferred**	**More Preferred**	**Less Preferred**
			Alternative B is much more preferred than the other alternatives because it has the most ideal Sixteen Mile Creek crossing and avoids/minimizes the need for substantial creek realignment and valley earthworks/stabilization. Alternatives A and B are similar in terms of groundwater considerations and Alternative C is least preferred due to the impacts to the Sixteen Mile Creek valley and associated SGRA.		
Cultural Environment					
a	Built heritage resources, cultural heritage landscapes and Peru Character Area	- Direct and indirect impacts to designated and listed cultural heritage resources. - Disruption/changes to Peru Character Area and cultural landscape resources.	- No Registered Heritage properties are impacted by any of the alternatives. - All proposed alignments preserve the historic hamlet of Peru and Peru Character Area. The Character Area will benefit from the main traffic flow being diverted away from the hamlet.	- Similar to Alternative A	- Similar to Alternative A
b	Archaeological Resources	- Areas of archaeological potential	- A portion of the study area impacted by the alternative contains archaeological potential and requires further assessment. A Stage 2 Archeological Assessment will be carried out during detailed design. Areas required for easements (e.g. construction) including at key features (including but not limited to structures and watercourse crossings), may be refined during detailed design based on the findings of the technical studies.	- Similar to Alternative A	- Similar to Alternative A except this alternative impacts greater area of archaeological potential since this alternative has much greater impacts on the Sixteen Mile Creek valley
Cultural Environment Summary			**More Preferred**	**More Preferred**	**Moderately Preferred**
			All alternatives are similar in terms of avoiding impacts to Registered Heritage properties and perceived benefits to the Peru Character Area. A Stage 2 Archeological Assessment will be carried out during detailed design for all alternatives. Alternative C is moderately preferred in comparison because it impacts a greater area of high archaeological potential.		
Transportation					

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
a	Transportation Network	- Compatibility with existing and planned broader transportation network including goods movement network considerations. - Impacts on the local road network	- Realigned Steeles Avenue will become the main arterial road connection between Tremaine Road and Regional Road 25 which is consistent with planned Regional Road network. - Access to existing Steeles Avenue and Peru Road will be via a new roundabout or conventional intersection.	- Similar to Alternative A	- Commuters who wish to continue on Steeles Avenue will have to make a turn at the Industrial Drive intersection. Compare to the other alternatives, this create a discontinued connection on Steeles Avenue which is not preferred since it is a Regional Arterial road.
b	Emergency Services	- Potential changes to emergency access/routing.	- Emergency vehicles servicing residents on existing Steeles Avenue and Peru Road will be accessed via a new roundabout or conventional intersection from realigned Steeles Avenue.	- Similar to Alternative A	- Emergency vehicles servicing residents on existing Steeles Avenue and Peru Road will be similar to existing network configuration (i.e. to continue westerly from the Industrial Drive intersection).
c	Multi-modal Transportation	- Compatibility with existing and proposed transit and cycling/walking plans	- On street bike lanes and multi-use trail will be provided to support active transportation uses.	- Similar to Alternative A	- Similar to Alternative A, on street bike lanes and multi-use trail will be provided to support active transportation uses - However, active transportation users who wish to continue on Steeles Avenue will have to make a turn at the Industrial Drive intersection. Compare to the other alternatives, this create a discontinued connection on Steeles Avenue which is not preferred since it is a Regional Arterial road.
d	Geometric Design Standards	- Compatibility with geometric design standards. Assessment of design challenges.	- The horizontal and vertical profile were developed in meeting design criteria of 90 km/h design speed. - The low point of the underpass in the profile is just above the Regional storm water elevation.	- Similar to Alternative A, the horizontal and vertical profile were developed in meeting design criteria of 90 km/h design speed. - The low point of the underpass in the profile is just above the Regional storm water elevation.	- Similar to Alternative A, the horizontal and vertical profile were developed in meeting design criteria of 90 km/h design speed. - The low point of the underpass in the profile is below the Regional storm water elevation. This is not considered to be acceptable from the operation of a regional road perspective.
Transportation Summary			**More Preferred**	**More Preferred**	**Moderately Preferred**

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
			Alternatives A and B are similar in terms of evaluation under the Transportation factors. Both alternatives will provide a continuous connection on the Regional Road network on Steeles Avenue between Tremaine Road and Region Road 25 while supporting active transportation movement. Alternative C is not preferred as commuters and active transportation users will have to make a turn at the Industrial Drive intersection to continue on Steeles Avenue, which is not desirable given Steeles Avenue is a Regional Arterial Road.		
Technical Considerations					
a	Constructability Issues	- Qualitative assessment considering the complexity of construction operations and detour/staging.	- Realigned Steeles Avenue will generally be constructed through greenfield. - Access to construction will be via access road from existing Steeles Avenue and also through agreement with 3090 Steeles Avenue. - An underpass structure is proposed at the CP Rail crossing. The structure is expected to cross at a relatively perpendicular angle. Coordination with CP will be required to facilitate rail track downtime for underpass construction. - A new structure will be constructed over Sixteen Mile Creek through a slightly skewed section of the watercourse.	- Similar to Alternative A, realigned Steeles Avenue will generally be constructed through greenfield. - Access to construction will be via access road from existing Steeles Avenue and also through agreement with 3090 Steeles Avenue. - An underpass structure is proposed at the CP Rail crossing. The structure is expected to cross at a relatively perpendicular angle. Coordination with CP will be required to facilitate rail track downtime for underpass construction. - A new structure will be constructed over Sixteen Mile Creek through a relatively straight section of the watercourse.	- Realigned Steeles Avenue will generally be constructed through greenfield. Compare to Alternatives A and B, Alternative C is longer in length by about 120 m. - Access to construction will be via access road from existing Steeles Avenue and also through agreement with 3090 Steeles Avenue. - An underpass structure is proposed at the CP Rail crossing. The structure is expected to cross at a relatively skewed angle and would result in a slightly longer structure compared to Alternatives A and B. Coordination with CP will be required to facilitate rail track downtime for underpass construction. - A new structure will be constructed over Sixteen Mile Creek just south of Industrial Drive. Given the proximity of the watercourse to the Industrial Drive intersection, a creek realignment will likely be required.
b	Utilities	- Qualitative assessment of potential conflicts with and need for relocation of existing utilities.	- Realigned Steeles Avenue will generally be constructed through greenfield and there are no existing utilities. - Some impact to existing utilities as realigned Steeles Avenue tie into existing Steeles Avenue approximately 240 m west of Industrial Drive.	- Similar to Alternative A, realigned Steeles Avenue will generally be constructed through greenfield and there are no existing utilities. - Some impact to existing utilities as realigned Steeles Avenue tie into existing Steeles Avenue approximately 160 m west of Industrial Drive.	- Similar to Alternative A, realigned Steeles Avenue will generally be constructed through greenfield and there are no existing utilities. - Some impact to existing utilities at the Steeles Avenue / Industrial Drive intersection.

			Steeles Avenue Design Alternatives		
Factor Group/Criteria		**Measures**	**Alternative A**	**Alternative B**	**Alternative C**
Technical Considerations Summary			**More Preferred**	**More Preferred**	**Less Preferred**
			Alternatives A and B are similar in terms of the evaluation under Technical Considerations. Both alternatives will have similar crossing angle at the CP railway underpass, similar construction methodology/access and limited impact to existing utilities. Alternative C is not preferred as it would require the realignment of Sixteen Mile Creek just south of Industrial Drive given the proximity to the Industrial Drive intersection and it has a relatively skewed angle at the CP railway crossing.		
Estimated Capital Cost					
a	Estimated Capital Cost	- Estimated capital costs considering construction of roads, intersection, structures, rail track realignment, cut/fill requirements, utilities, stormwater management etc.	Roadway: $27.0M Structures: $9.5M **Total: $36.5M**	Roadway: $28.5M Structures: $9.5 M **Total: $38M**	Roadway: $30.6M Structures: $11.2M **Total: $41.8M**
Cost Summary			**More Preferred**	**More Preferred**	**Less Preferred**
			The estimated capital cost for Alternatives A and B are generally in the same order of magnitude. Alternative C has a higher estimated capital cost than the other alternatives as it is longer in length and has a higher structure cost (i.e. mostly due to skewed structure at CP railway).		

Alternatives A and B are ranked similarly across Cultural Environment, Transportation, Technical Considerations and Costs.

Alternative B has less impact on residential backyards than Alternative A and is therefore preferred with respect to the socio-economic factor.

Alternative B provides a straighter Sixteen Mile Creek crossing location and angle compared to Alternative A. This minimizes the impact on the creek and valley at the proposed new bridge site.

Alternative B requires slightly more vegetation removal than Alternative A. However, this impact can be mitigated, and the impact is offset by the advantages at the Sixteen Mile Creek crossing.

Alternative C is least preferred because it does not meet flood protection design criteria and involves a much greater impact on the Sixteen Mile Creek valley and other Natural Heritage Features. The higher cost and crossing angle at CP Rail also make this option least preferred.

Alternative B is preferred over the other alternatives and provides the best 'balance' among all factors that were considered. Therefore, Alternative B was selected as the preliminary preferred road alignment alternative.

5.5 Grade Separation Type Design Alternatives

As part of the proposed realignment of Steeles Avenue and future improvements to the corridor, a grade separation is proposed between the new Steeles Avenue alignment and CP railway (south of existing Steeles Avenue corridor). Two basic grade separation design alternatives were evaluated:

- Overpass – road over rail; and
- Underpass – rail over road.

The evaluation of overpass versus underpass is presented in **Table 5-4** below:

Table 5-4: Evaluation of Overpass Versus Underpass for the new Steeles Avenue alignment and CP railway

Factors	Overpass (Road Over Rail)	Underpass (Road Under Rail)	Preference
Socio-Economic Environment	▶ Greater property impacts to adjacent properties associated with larger footprint due to grading. ▶ Would create a visual intrusion to the adjacent community, particularly backyard views of residents along existing Steeles Avenue (including views to the Niagara Escarpment). ▶ Traffic noise from elevated roadway would be higher.	▶ Less property impacts to adjacent properties compared to overpass. ▶ Relatively little visual intrusion to the adjacent community, beyond that for roadway. ▶ Traffic noise from the depressed roadway would be lower.	**Underpass**
Natural Environment	▶ Results in visual intrusion impact to the Niagara Escarpment and not consistent with Niagara Escarpment Plan policies that seek to protect escarpment viewscapes. ▶ Larger footprint may result in greater impacts to adjacent natural areas.	▶ More consistent with Niagara Escarpment Plan policies that protect escarpment viewscapes; underpass is preferred by Niagara Escarpment Commission. ▶ Smaller footprint reduces impacts to adjacent natural areas.	**Underpass**

Factors	Overpass (Road Over Rail)	Underpass (Road Under Rail)	Preference
Surface Water and Groundwater	▶ Drainage will be accommodated via gravity flow.	▶ Underpass will be above the Regional Flood limit for Sixteen Mile Creek (i.e. the underpass will be flooded during a regional storm event), and may require pumping station to remove storm runoff – subject to further review in detailed design.	**Overpass**
Cultural Environment	▶ Visual intrusion would have an adverse impact on Peru Character Area. ▶ No impacts (direct or indirect) to the built heritage resources. ▶ A Stage 2 Archeological Assessment will be required during detailed design	▶ No impacts (direct or indirect) to the built heritage resources ▶ A Stage 2 Archeological Assessment will be required during detailed design	**Underpass**
Technical (including impacts to rail operations)	▶ Overpass would require 10 m of vertical clearance from top of track to top of road to accommodate future electrification of GO Transit and general structure depth. ▶ Would result in maximum grade up to 6% which is beyond the	▶ Underpass would require 5 m of vertical clearance between the underside of the track and top of the road ▶ Maximum grade at ~4%. ▶ Underpass requires a shorter distance to meet road grade of	**Underpass**

Factors	Overpass (Road Over Rail)	Underpass (Road Under Rail)	Preference
	desirable maximum grade of 5% for a grade separation. ▶ Overpass requires a longer distance to meet road grade of existing Steeles Avenue / Industrial Drive intersection. ▶ Significant fill requirements due to profile and grading of the road. ▶ Temporary rail detour (for construction) likely not required. Minimal temporary impacts to CP operations since structure can be built around rail line.	existing Steeles Avenue / Industrial Drive intersection. ▶ Less cut/fill requirements compared to overpass. ▶ Temporary rail detour (for construction) may be required, subject to confirmation with CP Rail. Some rail downtime required to construct new structure. Based on initial input from CP, rail detour arrangement would be confirmed during detailed design.	
Transportation	▶ Longer structure reduces flexibility for tying into local road network and driveway access (e.g. existing Steeles Avenue, 3090 Steeles Avenue driveway, Industrial Drive intersection). ▶ Steeles Avenue is a Regional major arterial road and is intended to support region-wide active transportation infrastructure. Overpass would likely be a deterrent for	▶ Shorter structure length allows greater flexibility for tying into local street network and driveway access (e.g. existing Steeles Avenue, 3090 Steeles Avenue driveway, Industrial Drive intersection) ▶ Steeles Avenue is a Regional major arterial road and is intended to support region-wide active transportation infrastructure. Underpass would be more attractive to pedestrians and	**Underpass**

Factors	Overpass (Road Over Rail)	Underpass (Road Under Rail)	Preference
	pedestrians and cyclists given steep grades.	cyclists since the grade change can be better managed with a raised platform in the underpass.	
Capital and Maintenance Costs	▶ $$$ ▶ Significant fill requirements compared to the underpass option ▶ No pumping station required	▶ $$$ ▶ Minimal cut/fill requirements compared to the overpass option	**Same**

An underpass (rail over road) is preferred because, when compared to the overpass, as this option:

- has less property impact;
- is more consistent with Niagara Escarpment Plan policies that help protect escarpment views;
- has less visual intrusion to the nearby community; and
- is more attractive to pedestrians, cyclists and users of mobility devices since the multi-use trail is raised above the roadway, under the bridge.

5.6 Intersections

The proposed realignment of Steeles Avenue to the south of the existing corridor would provide a connection between the existing Tremaine Road roundabout and the intersection at Industrial Drive (which has been widened to four lanes easterly).

A new intersection will be provided for connection to existing Steeles Avenue and Peru Road. While the connection is being proposed as a roundabout in this study (as shown in **Exhibit 5-6**), both a roundabout intersection and a signalized intersection will be evaluated during the detailed design stage. The roundabout is shown for the purpose of the MCEA Study, since it has a larger potential property impact than the signalized intersection and would be considered a more conservative approach in terms of property protection.

The future intersection or roundabout would also provide driveway access to 3090 Steeles Avenue.

5.7 Confirmation of the Preferred Design Plan

Public and agency feedback during Phase 3 of the MCEA process received during and following PIC #2 was used to confirm the Preferred Design Plan, as described in **Chapter 6** of this ESR.

6 PROJECT DESCRIPTION

The major features of the preferred design and the selection of the technically preferred alternative for Steeles Avenue from Tremaine Road to Industrial Drive are described in **Section 6.1**. Potential impacts, mitigation measures, and commitments to future work along this section of the Steeles Avenue corridor are described in **Section 8**. The preliminary plan is provided in **Appendix J**; the Project Overview is provided in **Exhibit 6-1**.

This information should be reviewed in conjunction with **Section 5** of the ESR which describes the alternative designs. During detailed design, some refinements to the design features recommended in the Environmental Study Report may be necessary. The detailed design phase includes a public consultation process that will provide additional opportunities for public involvement and input. During detailed design, there will also be further consultation with technical agencies and stakeholders, including, but not limited to, Conservation Halton, Ministry of Northern Development, Mines, Natural Resources and Forestry, Ministry of the Environment, Conservation and Parks, Town of Milton, Niagara Escarpment Commission, Indigenous Communities, utilities, and impacted property owners.

The preferred design for Steeles Avenue from Tremaine Road to Industrial Drive in described in more detail in the following sections.

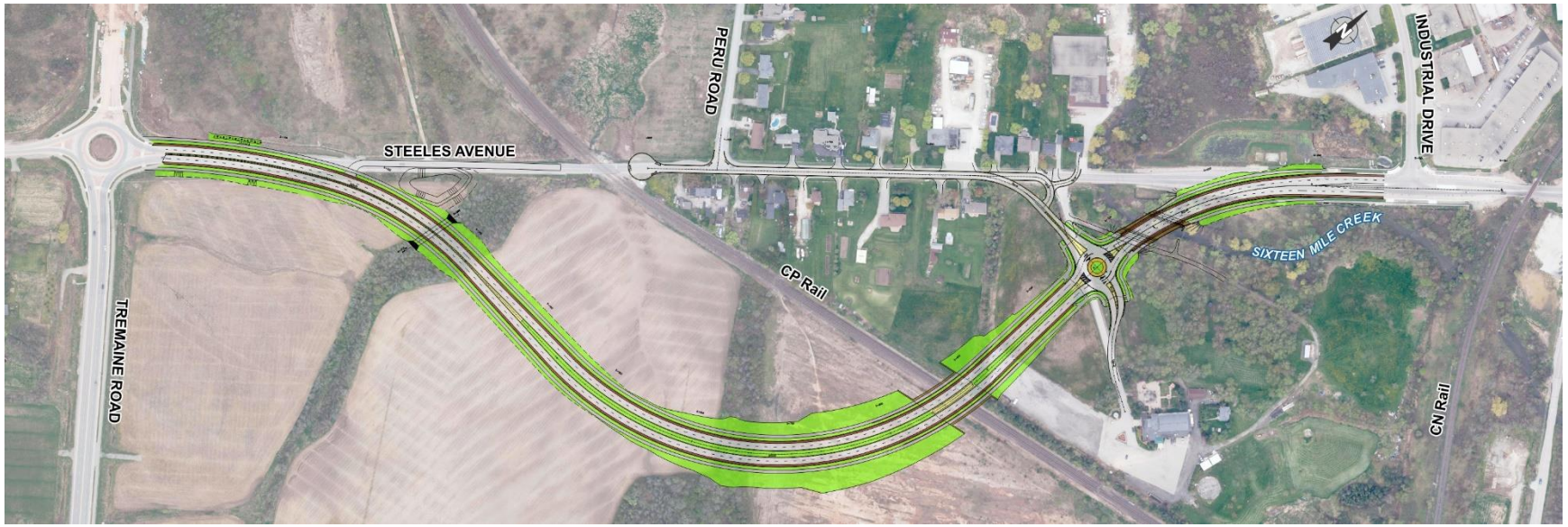
6.1 Major Features

Currently, Steeles Avenue is posted at 60 km/h between Tremaine Road and Industrial Drive. During detailed design, the proposed posted speed limit for Steeles Avenue will be reviewed. It is currently anticipated that the proposed posted speed limit will be 60 to 70 km/h. The major features are as follows:

- 2 lanes in each direction included multi-use trails/sidewalks and bike lanes on each side;
- New underpass structure at CP Rail;
- Roundabout at existing Steeles and entrance to the conference centre; and,
- New bridge over Sixteen Mile Creek.

The geometric details are listed in **Table 6-1** for all new sections of road.

Exhibit 6-1: Project Overview



6.2 Design Criteria

Steeles Avenue is proposed to be realigned to the south of its current location. The design criteria are summarized in **Table 6-1** for the corridor. The design standards shown in the table is based on the TAC (Transportation Association of Canada) Geometric Design Guide for Canadian Roads.

Table 6-1: Design Criteria

Design Criteria	Design Standard	Proposed
Design Speed	80 km/h	80 km/h
Posted Speed	60 km/h	60-70 km/h (subject to review during detailed design)
No. of General Purpose Lanes (GPL) and Width	4 lanes urban @ 3.5 m	4 lanes urban @ 3.5 m
Active Transportation*	1.8 m on-street bike lane 3 m multi-use trails on both sides of the road	1.8 m on-street bike lane 3 m multi-use trails on both sides of the road
Median Width	Varies (2.0m to 6.0m)	Varies (2.0m to 6.0m)
Minimum Grade	0.5%	0.5%
Maximum Grade	6%	3.06%
Minimum Curve Radius	280 m	300 m
Minimum Stopping Sight Distance	130 m	130 m
Minimum Crest Curve	Kcrest = 26	Kcrest = 30
Maximum Crest Curve	Kcrest = 43**	Kcrest = 40
Minimum Sag Curve	Ksag = 30***	Ksag = 15***

Design Criteria	Design Standard	Proposed
Maximum Sag Curve	Ksag = 43*	Ksag = 40
Basic Right-of-Way	Nominal 35 m	Nominal 35 m

** Proposed active transportation facilities will be reviewed during detailed design*
*** Urban drainage requirement*
**** (12-16) comfort control with illumination*

6.3 Horizontal Alignment

The widening and realignment of Steeles Avenue from Tremaine Road to Industrial Drive will generally be shifted to the south of the existing road allowance to cross under the CP railway tracks (at a skew) with a “best fit” approach to allow for localized modification in order to minimize impact to adjacent properties. For example, in the area of the CP grade separation (**Appendix J**, Plate #7, approximately station 5+900), Steeles Avenue will be aligned in a manner that minimizes property impact to the residential property on the north side and business property on the south side (3090 Steeles Avenue).

There is a proposed roundabout along Steeles Avenue at station 6+060 (**Appendix J**, Plate #9). The proposed roundabout intersection would provide a connection to the existing Steeles Avenue and the driveway to the business property on the south side (3090 Steeles Avenue). While the connection is being proposed as a roundabout in this MCEA Study, both a roundabout intersection and a signalized intersection will be considered during the detailed design stage.

The recommended design will be subject to minor refinements during detailed design.

6.4 Profile

The profile of Steeles Avenue will generally follow the existing ground profile to minimize grading and property impacts, match into the existing Steeles Avenue grade at the connection points, and provide adequate vertical clearance at culvert and railway structure crossings.

The proposed grading limits are identified in **Appendix J** and a nominal 5 m construction easement beyond the grading limit and right-of-way has been shown. The

exact limit of the construction and grading easement will be confirmed during detailed design.

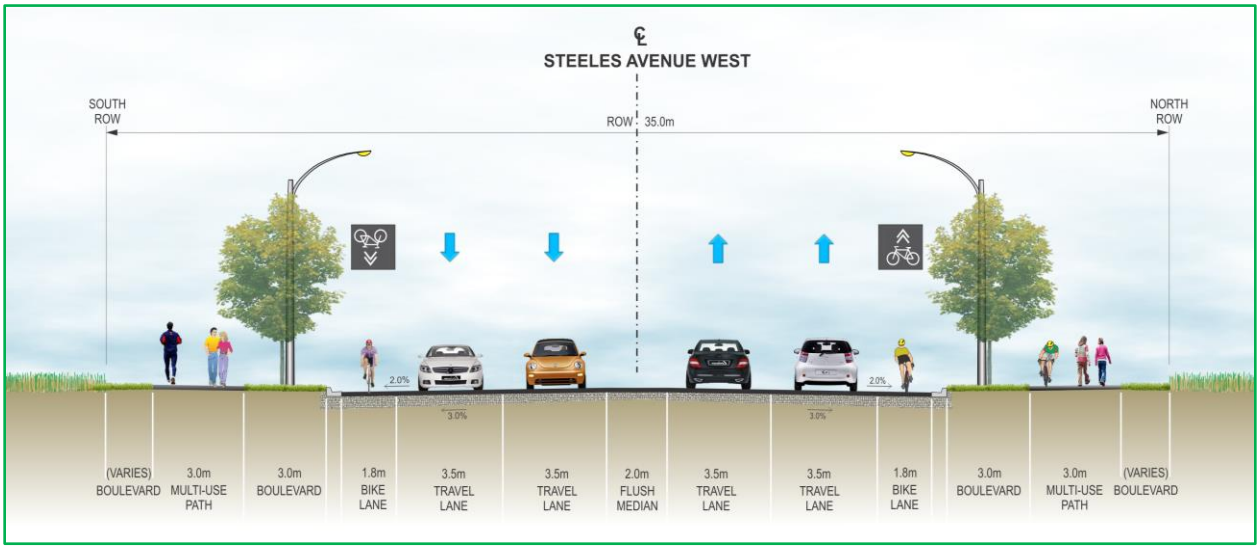
6.5 Typical Road Cross-Section

The typical road cross-section for the proposed 4-lane Steeles Avenue has been developed based on the planned overall right-of-way width of 35 m, which is consistent with the Halton Region Transportation Master Plan – The Road to Change (2011), as well as the Region's Active Transportation Master Plan (2016) and the Official Plan.

The typical road cross-section of the future Steeles Avenue corridor is shown in **Exhibit 6-2**. It is proposed that the typical cross section will consist of two 3.5 m vehicle travel lanes in each direction. On-road bike lanes (1.8 m) and multi-use trails (3.0 m) will be provided on both sides of the road to accommodate cyclists, pedestrians and users of mobility devices.

It should be noted that, during detailed design, there may be refinements to the typical cross section at approaches to intersections to accommodate operational requirements and in constrained areas to reduce localized impacts to adjacent land uses where feasible. Following the confirmation of the Preferred Design, the Ontario Traffic Council (OTC) and the Ministry of Transportation of Ontario (MTO) released an update to Ontario Traffic Manual Book 18: Cycling Facilities (OTM Book 18). The new OTM Book 18 provides updated active transportation guidelines. In terms of Steeles Avenue from Tremaine Road to Industrial Drive, new OTM Book 18 recommends at a minimum a buffered separated bike lanes preferably with separation and desirably cycle tracks above the curb. Based on a preliminary review of the preferred design and the new OTM Book 18 guidelines, the current proposed cross-section, which includes 1.8 m for a bike lane plus the boulevard provides enough room to make any required adjustments to the AT facilities to meet OTM Book 18 guidelines. A further review of the active transportation facilities will be completed in detailed design.

Exhibit 6-2: Typical Road Cross-Section of the Preliminary Preferred Design



6.6 Intersection and Access

6.6.1 Tremaine Road and Industrial Drive

In the preliminary preferred design, the future east-to-west Steeles Avenue corridor will start just east of the existing Tremaine Road roundabout.

A new grade separation will be constructed at the CP Rail and at Sixteen Mile Creek and the new alignment of Steeles Avenue will tie back into the existing road, just west of Industrial Drive.

6.6.2 Tie-In to Existing Steeles Avenue and the Neighbourhood of Peru

A roundabout will provide a connection to existing Steeles Avenue and the neighbourhood of Peru. The type of intersection control will be confirmed during the future detailed design stage.

The original portion of Steeles Avenue will end in a cul-de-sac just west of Peru Road, east of the CP Rail line and the section of Steeles Avenue west of this will be closed, including the existing CP Rail crossing.

6.7 Tributary NW1-E Crossing Culvert

6.7.1 Proposed Roadway

The roadway cross-section at the Tributary NW1-E crossing culvert including lane, shoulder and side clearance widths were established in accordance with the Geometric Design Standards for Ontario Highways (GDSOH) and Road Classifications. The proposed roadway cross-section above the culvert comprises the following from north to south:

- 3.0 m multi-use path
- 3.0 m boulevard
- 1.8 m bike lane*
- 2 x 3.5 m westbound lanes
- 2.0 m median
- 2 x 3.5 m eastbound lanes
- 1.8 m bike lane*
- 3.0 m boulevard
- 3.0 m multi-use path

The proposed Steeles Avenue is on a horizontal curve at the structure's location.

* Following the confirmation of the Preferred Design, the Ontario Traffic Council (OTC) and the Ministry of Transportation of Ontario (MTO) released an update to Ontario Traffic Manual Book 18: Cycling Facilities (OTM Book 18). The new OTM Book 18 provides updated active transportation guidelines. In terms of Steeles Avenue from Tremaine Road to Industrial Drive, new OTM Book 18 recommends at a minimum a buffered separated bike lanes preferably with separation and desirably cycle tracks above the curb. Based on a preliminary review of the preferred design and the new OTM Book 18 guidelines, the current proposed cross-section, which includes 1.8 m for a bike lane plus the boulevard provides enough room to make any required adjustments to the AT facilities to meet OTM Book 18 guidelines. A further review of the active transportation facilities will be completed in detailed design.

Geotechnical Investigation and Foundations Requirements

A Geotechnical Assessment was completed to investigate the subsurface soil and groundwater conditions in the study area. The following section summarizes the Geotechnical Investigation for the Tributary NW1-E crossing culvert. The Geotechnical Investigation Report is available in **Appendix M**.

The subsurface stratigraphy encountered at the Tributary NW1-E crossing culvert comprised a pavement structure over stiff to hard silty clay till underlain by hard clayey silt till.

Factored geotechnical resistances at Ultimate Limit States (ULS) and Serviceability Limit States (SLS) of 225 kPa and 150 kPa will be used for the preliminary design of an open footing culvert with spread footings founded on the stiff to hard, native silty clay/clayey silt till.

Bedding and backfill to the culvert should be in accordance with OPSD 803.010. A minimum 300 mm thickness of Granular A bedding material is recommended below the culvert. The bedding thickness may need to be increased where sub-excavation is required to remove deleterious materials below the design excavation level or a less competent subgrade is encountered.

Backfill to the proposed culvert shall consist of free-draining, non-frost susceptible granular material conforming to OPS Granular A or B Type II requirements.

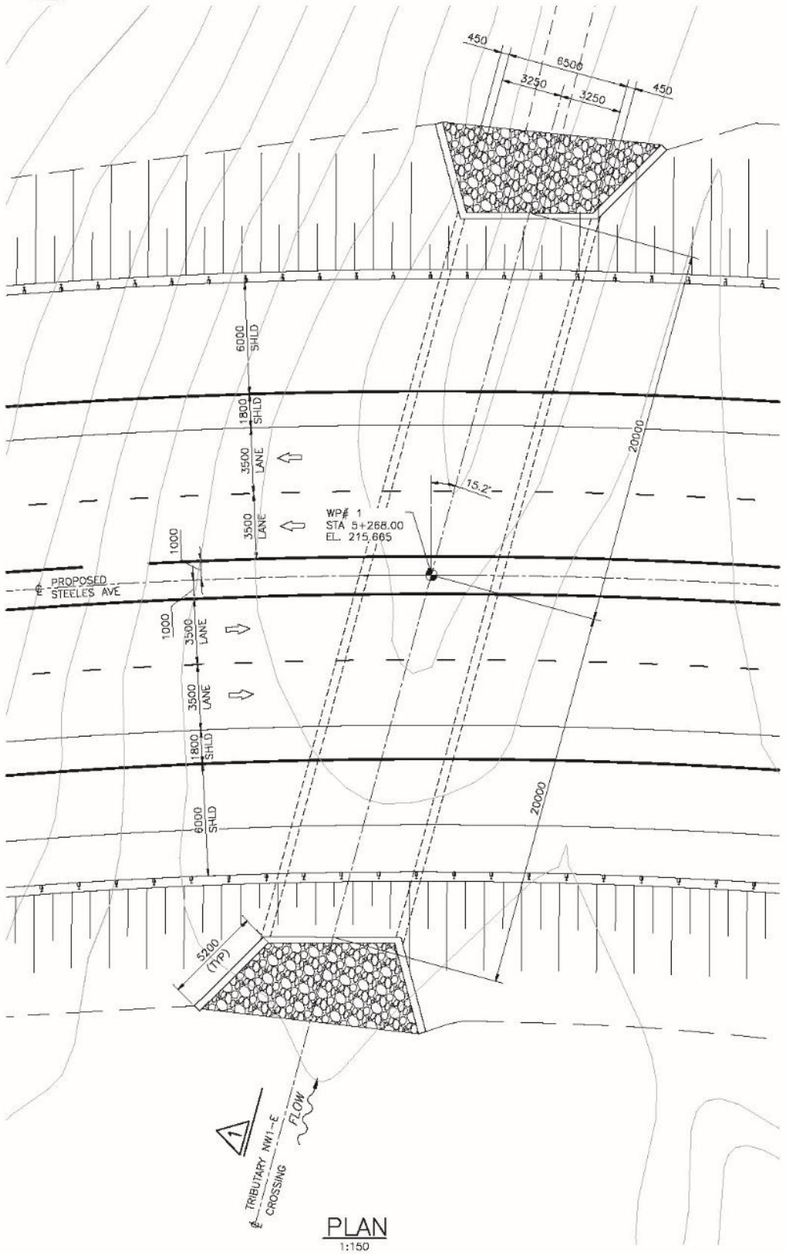
Hydraulic Assessment

The design storm at this location is the 100-year event, with a high-water level elevation of 212.88 m. Based on the Hydraulic analysis, the recommended culvert opening is a 6.5 m clear span by 2.6 m opening height. Due to the existing terrain and grades at the inlet and outlet, a minimum slope shall be provided. The proposed invert elevations are at EL. 211.70 m at the inlet and EL. 211.50 m at the outlet. D_{50} = 150 mm rock protection, 350 mm thick shall be placed on the streambed to form a low flow channel.

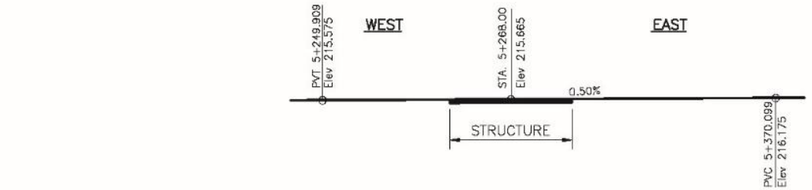
Proposed Structure

The General Arrangement drawing for the Tributary NW1-E crossing culvert is shown in **Exhibit 6-3**. The proposed structure is a single cell cast-in-place reinforced concrete rigid frame open footing box culvert. The culvert has a clear span of 6.5 m, an opening height of 2.6 m, and a length of 40.0 m. There are four conventional cantilever cast-in-place reinforced concrete retaining walls located at each corner of the structure. The

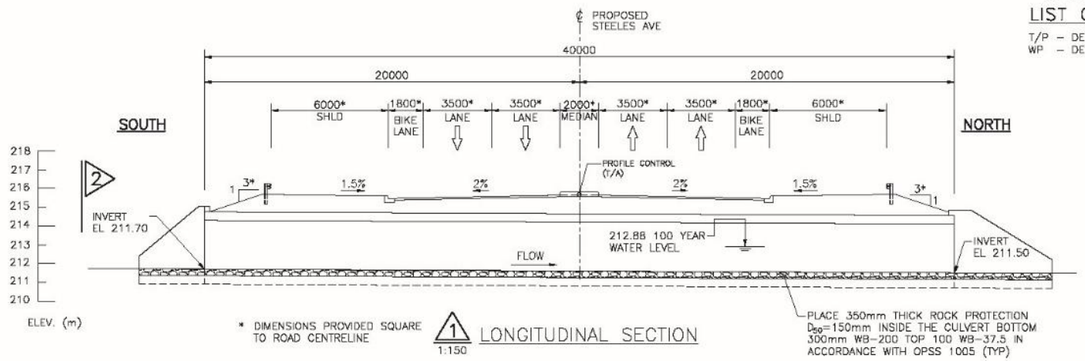
northwest and southeast wingwalls are approximately 5.2 m long. These wingwalls and retaining walls are skewed approximately 30° away from the centreline of the culvert. The northeast and southwest wingwalls are approximately 5.2 m long and are skewed approximately 30° away from the centerline of the culvert. At the ends of the culvert are 0.3 m tall concrete headwalls above the top slab. The culvert is on a 15.2° skew to the roadway and buried under approximately 1 m of fill.



PLAN
1:150

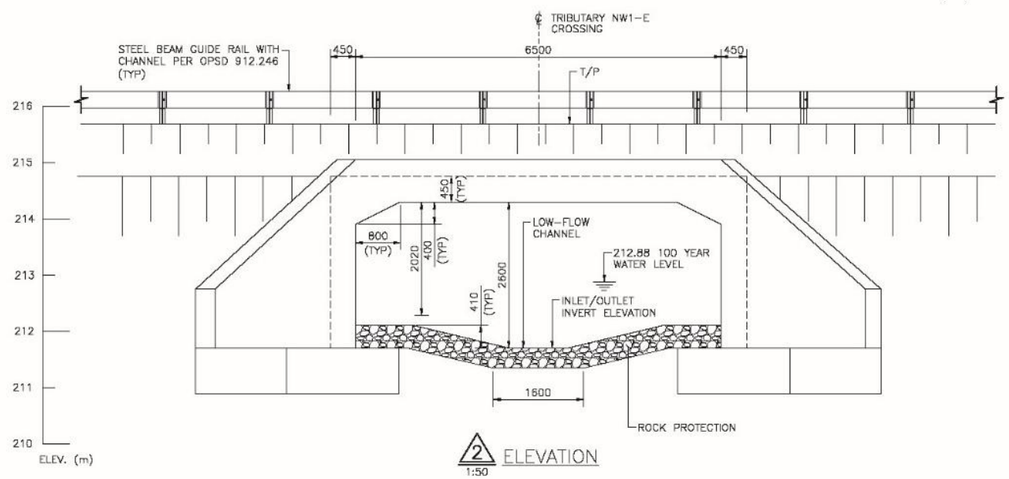


PROPOSED STEELES AVE PROFILE
N.T.S.



* DIMENSIONS PROVIDED SQUARE TO ROAD CENTRELINE

1 LONGITUDINAL SECTION
1:150



2 ELEVATION
1:50

GENERAL NOTES:

CLASS OF CONCRETE:

CAST-IN-PLACE CONCRETE	30MPa

CLEAR COVER TO REINFORCING:

SOFFIT OF TOP SLAB	60±10
REMAINDER	70±20

REINFORCING STEEL:

1. REINFORCING STEEL SHALL BE GRADE 400W.
2. UNLESS SHOWN OTHERWISE, TENSION LAP SPLICES FOR REINFORCING STEEL BARS SHALL BE CLASS 'B'.
3. BAR HOOKS SHALL HAVE STANDARD HOOK DIMENSIONS USING MINIMUM BEND DIAMETERS, WHILE STIRRUPS AND TIES SHALL HAVE MINIMUM HOOK DIMENSIONS. ALL HOOKS SHALL BE IN ACCORDANCE WITH THE STRUCTURAL STANDARD DRAWING SS12-1, UNLESS INDICATED OTHERWISE.

CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, DETAILS, AND ELEVATIONS OF THE EXISTING STRUCTURE THAT ARE RELEVANT TO THE WORK SHOWN ON THE DRAWINGS PRIOR TO COMMENCEMENT OF THE WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE CONTRACT ADMINISTRATOR.
2. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ADEQUATE PROTECTION OF UTILITIES, SERVICES, ROADWAYS, ETC. DURING CONSTRUCTION OPERATIONS.
3. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN, INSTALLATION, RELOCATION, AND CONTINUOUS MONITORING OF TEMPORARY FLOW PASSAGE AND DEWATERING OPERATIONS TO PERMIT THE FLOW OF WATER THROUGH OR AROUND THE WORK ZONE SUCH THAT THE WORK IS EXECUTED IN THE DRY. THE LIMITS OF COFFERDAMS SHALL BE DETERMINED BY THE CONTRACTOR.
4. EXISTING FILL AND SURFICIAL ORGANIC MATERIALS SHALL BE EXCAVATED TO NATIVE SOIL AND REPLACED WITH GRANULAR 'B' TYPE II AS DIRECTED BY THE CONTRACT ADMINISTRATOR.
5. BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH SIDES OF THE CULVERT KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL BE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.

LIST OF ABBREVIATIONS:

T/P – DENOTES TOP OF PAVEMENT
WP – DENOTES WORKING POINT

PR-XXXXX XX OF XX

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MODIFIED: 11/10/2021 7:20:21 PM BY: PARZ
DATE PLOTTED: 11/11/2021 2:23:24 PM BY: PARZ

NO.	DATE	BY	REVISIONS	MANU	CAD

DESIGN	ZP	CH'KD		DATE Nov. 10, 21
DRAWN	ZP	CH'KD		
SCALE				REFERENCES

FIELD NOTES
REGION BOOK

STAMP

REGIONAL

SEE COVER SHEET FOR REGIONAL APPROVAL

wsp
Halton REGION

TITLE
TRIBUTARY NW1-E CROSSING
PRELIMINARY GENERAL ARRANGMENT
PROPOSED STEELES AVE

CONSULTANT FILE NO.	REGIONAL DRAWING NO.
XXM-XXXXX	XXXXXXXX
CONTRACT NO.	DRAWING NO.
PR-	SHEET XX OF XX

6.8 CP Rail Grade Separation

6.8.1 Proposed Railway Horizontal and Vertical Alignment

The horizontal alignment of the railway tracks at the structure location are on a tangent. The existing north and south track are spaced at 4.27 m.

The existing vertical profile of the railway tracks is a vertical sag curve. The profile will be reviewed in consultation with CP Rail during the detailed design phase.

The minimum vertical clearance above the roadway is 5.6 m, exceeding the minimum requirement of 5.0 m per TAC standards.

6.8.2 Proposed Roadway

The roadway cross section at the CP Rail grade separation (rail-over-road) including lane, shoulder and side clearance widths were established in accordance with the Geometric Design Standards for Ontario Highways (GDSOH) and Road Classifications. The proposed roadway cross section below the structure comprises the following from east to west (see **Appendix J**, Plate #7):

- 3.0 m raised sidewalk / multi-use path
- Retaining Wall
- 2.5 m buffer
- 2.3 m bike lane including shoulder*
- 2 x 3.5 m northbound lanes
- 0.5 m shoulder
- 6.0 m median
- 0.5 m shoulder
- 2 x 3.5 m southbound lanes
- 2.3 m bike lane including shoulder*
- 2.5 m buffer
- Retaining Wall
- 3.0 m raised sidewalk / multi-use path

The proposed Steeles Avenue is on a horizontal curve at the structure's location.

* Following the confirmation of the Preferred Design, the Ontario Traffic Council (OTC) and the Ministry of Transportation of Ontario (MTO) released an update to Ontario Traffic Manual Book 18: Cycling Facilities (OTM Book 18). The new OTM Book 18 provides updated active transportation guidelines. In terms of Steeles Avenue from Tremaine Road to Industrial Drive, new OTM Book 18 recommends at a minimum a buffered separated bike lanes preferably with separation and desirably cycle tracks above the curb. Based on a preliminary review of the preferred design and the new OTM Book 18 guidelines, the current proposed cross-section, which includes 1.8 m for a bike lane plus the boulevard provides enough room to make any required adjustments to the AT facilities to meet OTM Book 18 guidelines. A further review of the active transportation facilities will be completed in detailed design.

6.8.3 Geotechnical Investigation and Foundations Requirements

The following section summarizes the Geotechnical Investigation for the CP Rail grade separation. The Geotechnical Investigation Report is available in **Appendix M**.

The stratigraphy encountered near the CP Rail crossing consisted of very stiff to hard silty clay fill to a depth of 2.1 m (Elev. 209.3), underlain by hard clay till/shale complex grading to shale bedrock at 4.0 m (Elev. 207.4). A groundwater level was measured at a depth of 1.7 m (Elev. 209.6) in the monitoring well.

The rail bridge structure will be supported on spread footings founded on shale bedrock. Factored geotechnical resistances of 1,000 kPa at ULS will be employed for preliminary design of spread footings on the sound shale bedrock below Elev. 203.0.

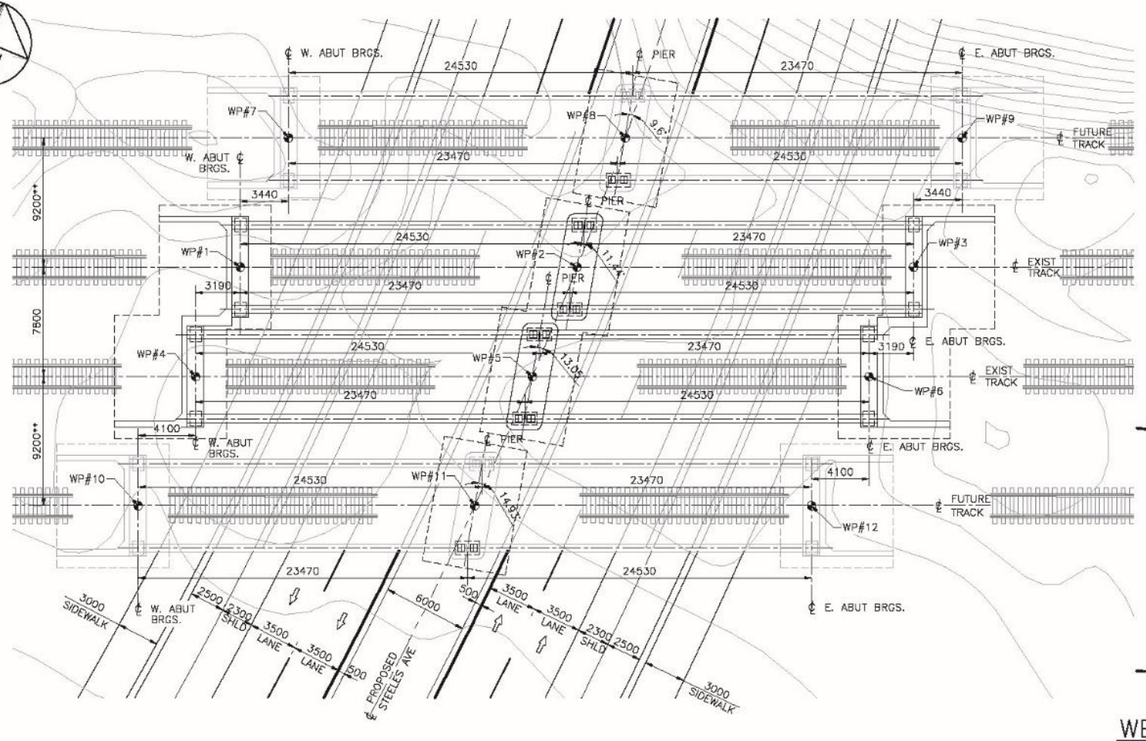
Considering the presence of shale bedrock at the base of the road cut, the preferred foundation system for the structure consists of spread footings bearing on rock. Caissons socketed into the rock could also be considered if higher foundation capacities are required.

The geotechnical resistance at SLS is not expected to govern design of spread footings on shale bedrock. For working stress design (AREMA code), an allowable bearing capacity of 1,000 kPa is recommended. The provided capacities will be confirmed with additional rock coring and analysis during detailed design.

Proposed Structure

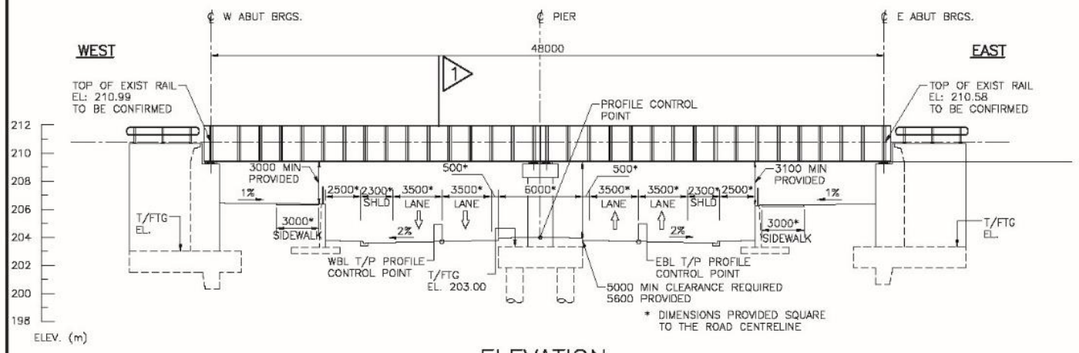
The General Arrangement drawing for the CP Rail grade separation is shown in **Exhibit 6-4**. The proposed structure comprises two single-track, two-span through plate girder (TPG) subways, each with a total length of 48.0 m. The individual span lengths of the through plate girders will vary between 23.47 m and 24.53 m. The new structure crossing would require a median pier.

The decks will comprise ballast on a steel deck plate supported by transverse steel floor beams, longitudinal steel stringers, and longitudinal steel plate girders. The substructure comprises two common reinforced concrete abutments and one reinforced concrete pier for each structure in the median. The abutments would be constructed square to the centerline of the existing tracks, per CP Rail requirements; however, the piers would be constructed along varying skews (11.44° for the north structure and 13.05° for the south structure), required to accommodate the horizontal curve of the proposed Steeles Avenue. Approximate 30.0 m long retaining walls would be provided at all four corners of the structure to retain the embankments. A trainman's walkway would be provided along the south side of the south structure. Two future tracks, one to the north and one to the south, have been incorporated into the design. These future tracks would be located at 9.2 m centres from the existing north and south tracks.



PLAN
1:200

** DIMENSIONS OF FUTURE TRACK TO BE CONFIRMED BY CPR



ELEVATION
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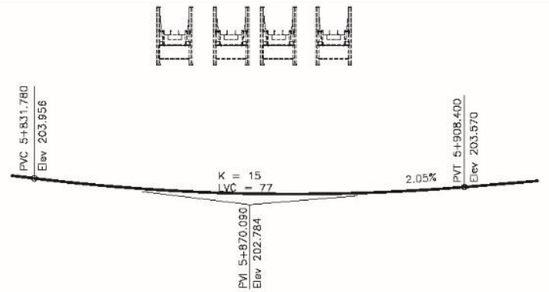
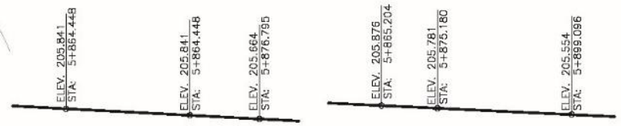


℄ PROPOSED STEELES AVE PROFILE
N.T.S.

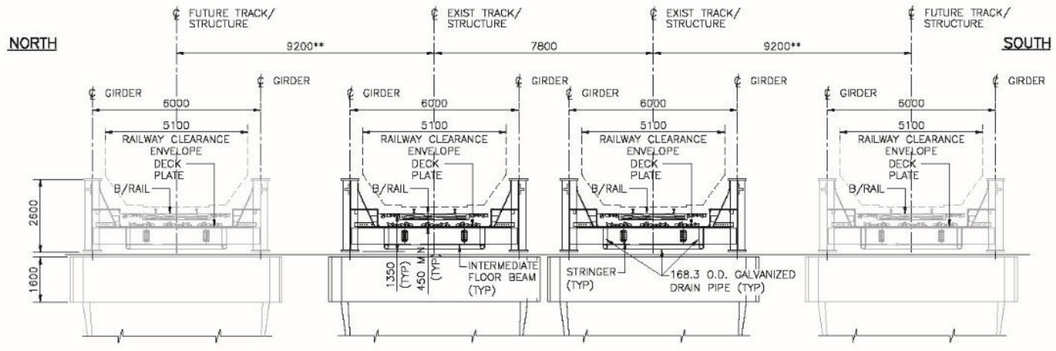
WBL PROFILE
N.T.S.

EBL PROFILE
N.T.S.



WBL SIDEWALK PROFILE
N.T.S.

EBL SIDEWALK PROFILE
N.T.S.



1 SECTION
1:100

** DIMENSIONS OF FUTURE TRACK TO BE CONFIRMED BY CPR

GENERAL NOTES:

ALL ELEVATIONS ARE TO GEODETIC DATUM.

BRIDGE DESCRIPTION

FOUR (4) NEW BRIDGES CONSISTING OF A SINGLE SPAN BALLASTED DECK THROUGH PLATE GIRDER (T.P.G.) SUPPORTED ON A CONCRETE ABUTMENTS IS TO BE CONSTRUCTED TO CARRY TWO (2) EXISTING AND TWO (2) DIVERSION CANADIAN PACIFIC RAILWAY TRACK.

MATERIAL SPECIFICATIONS

DESIGN AND WORKMANSHIP:
– A.R.E.M.A. MANUAL 2020 FOR RAILWAY ENGINEERING TO CARRY RAILWAY TRAFFIC IN CANADA (2016).

REINFORCING STEEL:	C.S.A./CAN–G30.18–LATEST EDITION
CONCRETE:	C.S.A./CAN–A23.1 & A23.2–LATEST EDITION
STRUCTURAL STEEL:	C.S.A./CAN–G40.21–LATEST EDITION
WELDING:	C.S.A./CAN W59–LATEST EDITION

DESIGN LOADS

1. LIVE LOAD – COOPER E90 OR ALTERNATE LIVE LOAD, WITH IMPACT FOR ROLLING EQUIPMENT WITHOUT HAMMER BLOW FOR SUPER STRUCTURE.
2. COOPER E90, NO IMPACT, FOR SUBSTRUCTURE.
3. DESIGN BALLAST DEPTH – 600mm (MAX)

FOUNDATIONS

GEOTECHNICAL INFORMATION TAKEN FROM GEOTECHNICAL INVESTIGATION AND DESIGN REPORT.

CLASS OF CONCRETE

ABUTMENTS AND RETAINING WALLS	35 MPa
MASS CONCRETE	20 MPa
FOOTINGS	35 MPa
REMAINDER	35 MPa

CLEAR COVER TO REINFORCING STEEL

FOOTING	100 ± 25 mm
ABUTMENTS, WINGWALLS & RETAINING WALLS	
FRONT FACE	85 + 10 – 20 mm
BACK FACE	70 ± 20 mm
REMAINDER	70 ± 20 mm

(UNLESS NOTED OTHERWISE)

REINFORCING STEEL

1. REINFORCING STEEL SHALL BE IN ACCORDANCE WITH CSA STANDARD G30.18 LATEST EDITION, GRADE 400W.
2. STAINLESS STEEL SHALL BE TYPE 316 LN OR DUPLEX 2205 AND HAVE A MINIMUM YIELD STRENGTH OF 500 MPa, UNLESS OTHERWISE SPECIFIED.
3. BAR MARKS WITH PREFIX 'S' DENOTES STAINLESS STEEL BARS.
4. TENSION LAP SPLICES FOR REINFORCING STEEL SHALL BE CLASS B, UNLESS SHOWN OTHERWISE.
5. BAR HOOKS SHALL HAVE STANDARD HOOK DIMENSIONS USING MINIMUM BEND DIAMETERS. STIRRUPS AND TIES SHALL HAVE MINIMUM HOOK DIMENSIONS.

CONSTRUCTION NOTES

1. THE CONTRACTOR SHALL ESTABLISH THE BEARING SEAT ELEVATION BY DEDUCTING THE ACTUAL BEARING THICKNESS FROM THE TOP OF BEARING ELEVATIONS. IF THE ACTUAL BEARING THICKNESSES ARE DIFFERENT FROM THOSE GIVEN WITH THE BEARING DESIGN DATA, THE CONTRACTOR SHALL ADJUST THE REINFORCING STEEL TO SUIT.

APPLICABLE STANDARD DRAWINGS:

OPSD 3120.100	WALLS RETAINING, CONCRETE, TOE WALL
OPSD 3121.150	WALLS RETAINING, BACKFILL MINIMUM GRANULAR REQUIREMENT
OPSD 3190.100	WALLS, RETAINING AND ABUTMENT WALL DRAIN
OPSD 3950.100	JOINTS CONCRETE EXPANSION AND CONSTRUCTION ON STRUCTURE

NO.	DATE	BY	REVISIONS	MANU	CAD
DESIGN	ZP	CH'KD		DATE	Sep. 7, 21
DRAWN	ZP	CH'KD			
SCALE				REFERENCES	

FIELD NOTES
REGION BOOK

STAMP

REGIONAL

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wsp
Halton REGION

TITLE
CPR BRIDGE
PRELIMINARY GENERAL ARRANGMENT
PROPOSED STEELES AVE

CONSULTANT FILE NO.	REGIONAL DRAWING NO.
XXM–XXXXX	XXXXXXXX
CONTRACT NO.	DRAWING NO.
PR–	SHEET XX OF XX

PR–XXXXX XX OF XX

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6.9 Sixteen Mile Creek Bridge

6.9.1 Proposed Roadway

The roadway cross section over Sixteen Mile Creek including lane, shoulder and side clearance widths were established in accordance with the Geometric Design Standards for Ontario Highways (GDSOH) and Road Classifications. The proposed structure cross section comprises the following from east to west (see **Appendix J**, Plate #9):

- 0.375 m bicycle railing
- Variable width (3 m minimum) sidewalk / multi-use path
- 0.35 m parapet wall with railing
- 3.3 m bike lane including shoulder*
- 2 x 3.5 m northbound lanes
- 2 x 3.5 m southbound lanes
- 3.3 m bike lane including shoulder*
- 0.35 m parapet wall with railing
- Variable width (3 m minimum) sidewalk / multi-use path
- 0.375 m bicycle railing

The proposed Steeles Avenue is on a horizontal curve at the structure's location.

* Following the confirmation of the Preferred Design, the Ontario Traffic Council (OTC) and the Ministry of Transportation of Ontario (MTO) released an update to Ontario Traffic Manual Book 18: Cycling Facilities (OTM Book 18). The new OTM Book 18 provides updated active transportation guidelines. In terms of Steeles Avenue from Tremaine Road to Industrial Drive, new OTM Book 18 recommends at a minimum a buffered separated bike lanes preferably with separation and desirably cycle tracks above the curb. Based on a preliminary review of the preferred design and the new OTM Book 18 guidelines, the current proposed cross-section, which includes 1.8 m for a bike lane plus the boulevard provides enough room to make any required adjustments to the AT facilities to meet OTM Book 18 guidelines. A further review of the active transportation facilities will be completed in detailed design.

6.9.2 Geotechnical Investigation and Foundations Requirements

The following section summarizes the Geotechnical Investigation for the Sixteen Mile Creek bridge. The Geotechnical Investigation Report is available in **Appendix M**.

The subsurface stratigraphy encountered to the south of Sixteen Mile Creek, consisted of 0.2 m of topsoil, overlying a 1.2 m thick very stiff clay layer, underlain by a 5.6 m thick deposit of hard silty clay to clayey silt till, mantling shale bedrock at a depth of 7.0 m. A groundwater level was measured in the monitoring well at a depth of 1.3 m (Elev. 201.1). It is noted that occasional to numerous cobbles and boulders were encountered.

Factored geotechnical resistances at Ultimate Limit States (ULS) and Serviceability Limit States (SLS) of 500 kPa and 350 kPa will be used for the preliminary design of spread footings founded on the hard native till founded at or below Elev. 201.0 plus any scour depth required.

Hydraulic Assessment

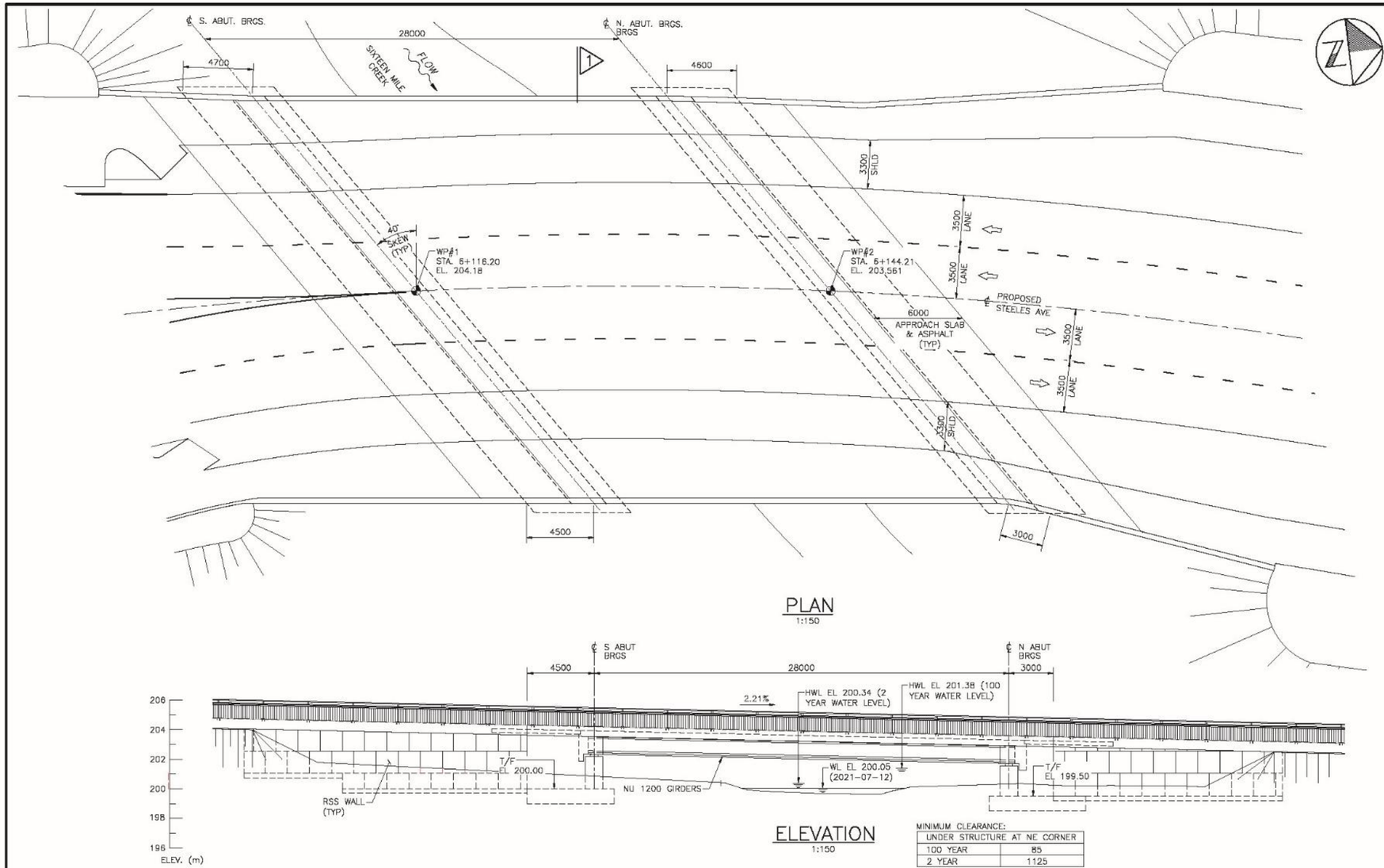
The design storm at this location is the 100-year event, with a high-water level EL. 201.38 m, providing a minimum clearance of 85 mm.

Proposed Structure

The General Arrangement drawing for the Sixteen Mile Creek bridge is shown in **Exhibit 6-5**. The proposed structure is a single span bridge (28 m span) with semi-integral abutments founded on spread footings, constructed on a 40° skew to the roadway.

The superstructure will comprise a 225 mm thick cast-in-place concrete deck supported by 12 lines of precast concrete NU 1200 girders. A 90 mm asphalt wearing surface and waterproofing system will be provided on top of the concrete deck. Two concrete parapet walls with railings will be provided on both sides of the roadway providing separation from the sidewalk, in addition to two bicycle railings provided on either side of the bridge. The overall width of the bridge will be approximately 27.5 m.

Retained Soil Structure (RSS) retaining walls will be provided on both sides of each approach.



GENERAL NOTES:

CLASS OF CONCRETE:

ALL CONCRETE UNLESS OTHERWISE NOTED 30 MPa

CLASS OF CONCRETE FOR PRECAST GIRDERS IS GIVEN ON PRESTRESSED GIRDER DRAWINGS.

CLEAR COVER:

BOTTOM OF ABUTMENTS AND PILE CAPS	100±25
DECK	
TOP	70±20
BOTTOM	40±10
REMAINDER UNLESS OTHERWISE NOTED	70±20

REINFORCING:

1. REINFORCING STEEL SHALL BE GRADE 400W.
2. UNLESS SHOWN OTHERWISE, TENSION LAP SPLICES SHALL BE CLASS B.
3. BAR MARKS WITH PREFIX 'S' DENOTE STAINLESS STEEL BARS.
4. STAINLESS REINFORCING STEEL SHALL BE TYPE 316 LN OR DUPLEX 2205 AND HAVE A MINIMUM YIELD STRENGTH OF 500 MPa, UNLESS OTHERWISE SPECIFIED.
5. BAR HOOKS SHALL HAVE STANDARD HOOK DIMENSIONS USING MINIMUM BEND DIAMETERS, WHILE STIRRUPS AND TIES SHALL HAVE MINIMUM HOOK DIMENSIONS. ALL HOOKS SHALL BE IN ACCORDANCE WITH THE STRUCTURAL STANDARD DRAWING SS12-1 UNLESS INDICATED OTHERWISE.

RETAINED SOIL SYSTEM

RETAINED SOIL SYSTEM WALL SHALL HAVE THE FOLLOWING ATTRIBUTES:

APPLICATION: FALSE ABUTMENT AND WALL / SLOPE
PERFORMANCE: HIGH
APPEARANCE: HIGH

CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL ESTABLISH THE BEARING SEAT ELEVATIONS BY DEDUCTING THE ACTUAL BEARING THICKNESSES FROM THE TOP OF BEARING ELEVATIONS. IF THE ACTUAL BEARING THICKNESSES ARE DIFFERENT FROM THOSE GIVEN WITH THE BEARING DESIGN DATA, THE CONTRACTOR SHALL ADJUST THE REINFORCING STEEL TO SUIT.
2. CONSTRUCT ABUTMENTS TO THE BEARING SEAT ELEVATIONS. THE CONTRACTOR SHALL SUPPLY TEMPORARY LATERAL BRACINGS FOR ABUTMENTS. FORMWORK AND LATERAL BRACINGS SHALL NOT BE REMOVED UNTIL THE CONCRETE IN DECK HAS REACHED 70% OF ITS SPECIFIED 28-DAY STRENGTH.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR STABILITY OF STRUCTURE DURING CONSTRUCTION.
4. THE FOLLOWING REQUIREMENTS MUST BE SATISFIED WHEN PLACING BACKFILL AGAINST THE SUPER-STRUCTURE:
   (I) BACKFILL SHOULD NOT BE PLACED AGAINST END DIAPHRAGMS UNTIL THE DECK HAS REACHED 75% OF ITS SPECIFIED CONCRETE COMPRESSIVE STRENGTH.
   (II) BACKFILL SHOULD BE PLACED AGAINST END DIAPHRAGMS SIMULTANEOUSLY AT BOTH ENDS OF THE STRUCTURE. AT NO TIME SHALL THE DIFFERENCE IN HEIGHT OF BACKFILL BE GREATER THAN 500MM.
5. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF ALL TEMPORARY STRUCTURES, PROTECTION SYSTEM, CONSTRUCTION PLATFORMS AND DEBRIS CONTAINMENT SYSTEM.
6. ALL ELEVATIONS ARE TO GEODETIC DATUM.

PR-XXXXX XX OF XX

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DESIGN	ZP	CH'KD		DATE Sep. 8, 21
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SCALE				REFERENCES

FIELD NOTES REGION BOOK

STAMP

REGIONAL

SEE COVER SHEET FOR REGIONAL APPROVAL

wsp

Halton REGION

TITLE
SIXTEEN MILE CREEK BRIDGE
PRELIMINARY GENERAL ARRANGMENT
PROPOSED STEELES AVE

CONSULTANT FILE NO.	REGIONAL DRAWING NO.
XXM-XXXXX	XXXXXXXX
CONTRACT NO.	DRAWING NO.
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6.10 Provisions for Active Transportation

The preliminary preferred design will include a multi-use trail and on-road bike lanes on both sides of the road. The multi-use trail will be a concrete sidewalk on the proposed structure over the Sixteen Mile Creek and the bike lanes will remain on both sides of the proposed structure as on-road bike lanes with guardrails.

Halton Region Council has approved the Active Transportation Master Plan (ATMP) which recommends Regional Walking and Cycling Networks to facilitate and promote active transportation within Halton (as discussed in **Section 2.1.7**).

Halton Region ATMP was developed in consultation with the four local municipalities, including the Town of Milton within the subject area. Consistent with the Active Transportation Master Plan, active transportation facilities on Steeles Avenue from Tremaine Road to Industrial Drive are proposed as follows:

- Bike lanes; and,
- Boulevard multi-use trails:

For details regarding the Halton Region ATMP, please go to the website at: https://www.halton.ca/For-Residents/Roads-Construction/Infrastructure-Master-Plans..

6.11 Drainage and Stormwater Management

A Drainage and Stormwater Management Report was prepared in support of the Steeles Avenue MCEA Study (see **Appendix F**). The following provides a summary of the Drainage and Stormwater Management Report.

6.11.1 Stomwater Design Criteria

The following stormwater management criteria were considered in the design:

- **SWM Quality Control Criteria**: An Enhanced Level of stormwater treatment was identified for the study area. This is the highest level of treatment (80% removal of total suspended solids) identified in the MOECC (now MECP) SWM Planning and Design Manual (2003).
- **SWM Quantity Control Criteria**: CH SWM criteria state that the post-development flows shall be controlled to pre-development levels for the 2-year, 5-year, 10-year, 25-year, 50-year and 100-year storm events.

- **Extended Detention / Erosion Control Criteria**: SWM facilities shall include an additional storage volume for extended detention to reduce / mitigate the potential erosion impact on the receiving watercourse. Where appropriate, extended detention shall be included in the SWM facilities.
- **Grassed Swales**: For grassed swales to be most effective for stormwater treatment, flow depth should be minimized, bottom width maximized, and channel slope minimized. The grassed swale design should convey the peak flow with a velocity less than 0.5 m/s and flow depth less than 0.25 m. The bottom width should be a minimum of 0.75 m and the channel slope should be a maximum of 1%.

The following design objectives were established to minimize the potential impacts of the proposed road widening on the surrounding environment, based on the prevailing policy framework:

- Provide an effective / efficient drainage system
- Minimize risk to public safety
- Maintain flow paths for upstream lands
- Maintain or enhance the quality of storm runoff
- Maintain or reduce flood risk for lands within and surrounding the transportation corridor
- Minimize future maintenance requirements
- Situate SWM measures on lands available in the transportation corridor

6.11.2 Hydrologic Modelling

Due to the realignment of Steeles Avenue, and consequently partial relocation to the south in proposed conditions, runoff of the existing areas where the realignment is proposed were calculated. The flows generated in existing conditions new alignment are the quantity control targets for the post-development proposed conditions.

The proposed widening of Steeles Avenue will result in an increase of impervious area from the existing conditions. Increase pavement areas as a result of Steeles Avenue are proposed to be addressed by stormwater quality treatment and quantity control measures. Storm sewers, a dry pond, an underground pipe storage facility, and OGS units are proposed within the new urbanized roadway to replace the existing drainage systems. The proposed conditions post-development drainage mosaics are included in Exhibits 5 and 6 in **Appendix F**.

To appropriately size the SWM facilities discussed above, post-development flows with and without controls were calculated. The SWM facilities are proposed at strategic locations along the study corridor to provide quality and quantity control.

Table 6-2 provides a summary of the hydrological modelling results of the proposed conditions uncontrolled flows.

Table 6-2: Summary of the Proposed Conditions Uncontrolled Flows Hydrological Modelling Results

Catchment / HYD ID	Flow (m^3/s)					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
200	0.21	0.29	0.35	0.41	0.46	0.52
205	0.10	0.14	0.16	0.19	0.22	0.24
1021	0.19	0.34	0.45	0.59	0.70	0.81
500	0.20	0.35	0.46	0.61	0.72	0.83
510	0.34	0.50	0.61	0.76	0.87	0.98
210	0.30	0.43	0.52	0.65	0.74	0.84
215	0.10	0.14	0.16	0.19	0.21	0.23
520	0.39	0.55	0.66	0.82	0.93	1.04
220	0.07	0.09	0.11	0.13	0.14	0.15
530	0.46	0.64	0.76	0.94	1.06	1.20
225	0.09	0.12	0.14	0.17	0.19	0.21
230	0.03	0.05	0.07	0.09	0.11	0.13
235	0.13	0.23	0.30	0.40	0.48	0.55
540	0.16	0.28	0.37	0.49	0.59	0.68
240	0.04	0.05	0.07	0.08	0.10	0.11
550	0.16	0.29	0.38	0.51	0.61	0.71
245	0.02	0.03	0.03	0.04	0.05	0.05
560	0.17	0.29	0.39	0.51	0.61	0.71

Table 6-3 provides a summary of the hydrological modelling results of the proposed conditions controlled flows.

Table 6-3: Summary of the Proposed Conditions Controlled Flows Hydrological Modelling Results

Catchment ID / HYD ID	Flow (m^3/s)					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
200	0.21	0.29	0.35	0.42	0.47	0.52
205	0.10	0.14	0.16	0.19	0.22	0.24
1021	0.19	0.34	0.44	0.59	0.70	0.81
500	0.20	0.35	0.46	0.61	0.72	0.83
510	0.22	0.39	0.51	0.67	0.79	0.91
210	0.33	0.48	0.57	0.71	0.80	0.91
215	0.10	0.14	0.16	0.19	0.21	0.23
520	0.43	0.61	0.73	0.90	1.01	1.14
220	0.07	0.09	0.10	0.12	0.14	0.15
530	0.10	0.17	0.22	0.28	0.33	0.37
225	0.09	0.12	0.14	0.17	0.19	0.21
230	0.03	0.05	0.07	0.09	0.11	0.13
235	0.13	0.23	0.30	0.40	0.48	0.55
540	0.16	0.28	0.37	0.49	0.59	0.68
240	0.04	0.06	0.07	0.09	0.10	0.11
550	0.16	0.29	0.38	0.51	0.61	0.70
245	0.02	0.03	0.03	0.04	0.05	0.05
560	0.17	0.29	0.39	0.51	0.61	0.71
700	0.03	0.04	0.05	0.06	0.07	0.08
710	0.09	0.16	0.20	0.25	0.28	0.32

The results in **Table 6-3** show that Catchments 230, 235, 240, and 245 in post-development conditions have not significantly changed compared to the pre-development flows at the outlet points since there is no significant increase in impervious areas due to the proposed improvements along Steeles Avenue.

Due to the proposed improvements, the flows draining towards Tributary NW1-E via Catchment 205 and flows generated from Catchment 225 have increased in post-development conditions. Due to property constraints within the vicinity of both catchments, the implementation of SWM controls to treat runoff of both catchments is not possible. However, as an improvement to the drainage conditions, runoff from

Catchments 200, 210, and 215 are proposed to be overcontrolled via the SWM facilities in order to compensate for the increase of flows along Catchments 205 and 225.

Overall, the results provided in **Table 6-2** and **Table 6-3** show that post-development flows are less than existing conditions at the outlet points due to the controls provided by using the proposed dry pond and the underground pipe storage facility.

The summary output files of the post-development hydrological modelling are provided in Appendix B of **Appendix F**.

6.11.3 Hydraulic Assessment

Hydraulic Performance Standards

The MTO Highway Drainage Design Standards (2008) provide the framework for the assessment of the drainage system, freeboard, and clearance requirements for the structures within the project area.

The MTO's Highway Drainage Design Standards (HDDS) prescribe standards for watercourse crossings. The standards that are relevant to this study are as follows:

- **Design Flow**: In accordance with the requirements of the MTO HDDS WC-1, a structure with a span greater than 6.0 m on an urban arterial roadway should be designed to convey a minimum of the 100-year design storm.
- **Freeboard**: The culvert or bridge structures require a minimum of 1.0 m freeboard measured vertically from the headwater elevation (HWL) for the design storm peak flow to the edge of the travelled lane at the lowest point on the road profile adjacent to the spill point.
- **Soffit Clearance**: The soffit clearance criterion relates to the distance between the water surface elevation generated by the peak flow of the design storm and the structure soffit elevation. The MTO HDDS specifies that the clearance for freeways, arterials and collectors shall be equal to or greater than 1.0 m.
- According to the MTO HDDS WC-13 "design of water crossing shall incorporate passage of the Relief Flow over the Roadway in cases where the Regulatory Flow exceeds the Design Flow of the bridge". The standard recommends that if the Regulatory Storm overtops the road, two parameters shall not be exceeded:

- The maximum depth of flow on the roadway should not exceed 0.3 metres
- The product of the velocity and depth on the roadway should not exceed 0.8 m2/s

A summary of the MTO Drainage Design Standards for water crossings can be found in **Table 6-4**.

Table 6-4: MTO Drainage Standards for Water Crossings

Item	Design Standard	Description	Standard	Section
1	Design Flow Storm	100-Year	WC-1	1.1.1
2	Top of Road Freeboard (Min.)	>1.0 m (Design Flow Water Surface Elevation – top of road low point)	WC-7	3.1.2
3	Top of Road Freeboard (Desired)	>1.0 m (Design Flow Energy Grade Line Elevation – top of road low point)	WC-7	3.1.1
4	Relief Flow (Max. Depth over roadway)	Max. depth over roadway should not exceed 0.3 m for Regulatory Storm	WC-13	3.2.1
5	Relief Flow (Velocity x Depth)	Velocity x Depth should not exceed 0.8 m2/s for Regulatory Storm	WC-13	3.2.2
6	Soffit Clearance	Design Flow Water Surface Elevation – Soffit Elevation ≥1.0 m	WC-2	3.2.1
7	Flood Depth	Culvert with diameter or rise <3.0 m HW/D <= 1.5 Culvert with diameter or rise 3.0 to 4.5 m HW <= 4.5 m Culvert with diameter or rise > 4.5 m HW/D <= 1	WC-7	3.5

In addition to the MTO Highway Drainage Design Standards (2008), where practical and feasible, it is desirable for Regional roads to achieve a flood-free condition in the Regional Storm.

Culvert #1 Tributary NW1-E

Under the proposed conditions, since the existing road alignment will shift south, the existing culvert (Culvert C1) running beneath the existing Steeles Avenue alignment is

proposed to be removed. A channel is proposed to connect CP Rail Culvert C2 to the upstream.

The proposed Steeles Avenue crossing top of road freeboard, flood depth and other hydraulic parameters as they pertain to the MTO HDDS are identified in **Table 6-4** and **Table 6-5** illustrates whether the new Steeles Avenue crossing is meeting the MTO HDDS Criteria.

Table 6-5: New C1 Crossing (Tributary NW1-E) Top of Road and Flood Depth Summary – Proposed Conditions

Description	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
Water Surface Elevation	212.28	212.43	212.52	212.69	212.70	212.88	214.24
Energy Grade Line Elevation	212.29	212.45	212.56	212.73	212.75	212.93	214.27
Top of Road (Low Point)	215.22	215.22	215.22	215.22	215.22	215.22	215.22
(2+4) Top of Road Freeboard (Min.)	2.94	2.79	2.70	2.53	2.52	2.34	0.98
(3) Top of Road Freeboard (Desired)	2.93	2.77	2.66	2.49	2.47	2.29	0.95
Top of Road Velocity	n/a	n/a	n/a	n/a	n/a	n/a	n/a
(5) Top of Road Velocity x Depth	n/a	n/a	n/a	n/a	n/a	n/a	n/a
(7) Flood depth	0.23	0.29	0.33	0.40	0.40	0.47	1.02

Table 6-6: New C1 Crossing (Tributary NW1-E) Steeles Avenue Crossing Hydraulic Performance Summary – Proposed Conditions

Criteria Description	Criteria Storm Events	Meets Criteria (Yes or No)
(2) Top of Road Freeboard (Min.)	100-Year	Yes
(3) Top of Road Freeboard (Desired)	100-Year	Yes
(4) Relief Flow (Max. Depth over roadway)	Regional	Yes
(5) Relief Flow (Velocity x Depth)	Regional	Yes
(7) Flood depth	100-Year	Yes

As seen above, under the proposed conditions, the new Steeles Avenue culvert will meet all MTO HDDS Criteria.

Due to removal of the existing Steeles Avenue culvert, the proposed water surface elevations at Section 70.2, located just upstream of the existing Steeles Avenue alignment will vastly improve.

Sixteen Mile Creek Bridge Crossing

A hydraulic analysis was undertaken for the proposed new Steeles Avenue bridge and have developed two potential scenarios:

- Scenario 1: With Existing Steeles Avenue Bridge
- Scenario 2: Without Existing Steeles Avenue Bridge

Running the two Scenarios, the following can be concluded:

- Under Scenario 1:
  - Water level at both cross-sections (Section 2166 and Section 2246) between the new and existing Steeles Avenue Bridge will rise.
  - The increase in WSL north of the existing Steeles Avenue Bridge is insignificant (0.07 m for the regional storm event).
  - There will be no impact into private property, as the Region owns the land.
  - Upstream of the existing CNR culverts, there will be only a slight increase in Water Surface Elevation for the regional storm (0.06 m).
- Under Scenario 2:
  - There will be a significant hydraulic improvement north of the existing Steeles Avenue bridge (Section 2246), due to water level decreasing
  - There will be no changes in water elevations at the two cross-sections, between the new and old bridge, when compared with Scenario 1.

The new Steeles Avenue Bridge at Sixteen Mile Creek top of road freeboard, soffit clearance and other hydraulic parameters, for both scenarios, as they pertain to the MTO HDDS are identified in **Table 6-6** and **Table 6-7**. **Table 6-8** and **Table 6-9** illustrates whether the proposed New Steeles Avenue Bridge is meeting the MTO HDDS Criteria.

Table 6-7: New Sixteen Mile Creek Bridge – Scenario 1 Top of Road and Soffit Clearance

Description	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
Water Surface Elevation	200.34	200.61	200.78	200.96	201.17	201.37	206.00
Energy Grade Line Elevation	200.37	200.66	200.85	201.05	201.27	201.42	206.00
Top of Road (Low Point)	201.59	201.59	201.59	201.59	201.59	201.59	201.59
(2+4) Top of Road Freeboard (Min.)	1.25	0.98	0.81	0.63	0.42	0.22	-4.41
(3) Top of Road Freeboard (Desired)	1.22	0.93	0.74	0.54	0.32	0.17	-4.41
Top of Road Velocity	n/a	n/a	n/a	n/a	n/a	n/a	n/a
(5) Top of Road Velocity x Depth	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Soffit Elevation	201.47	201.47	201.47	201.47	201.47	201.47	201.47
(6) Soffit Clearance	1.13	0.86	0.69	0.51	0.30	0.10	-4.53

Table 6-8: New Sixteen Mile Creek Bridge – Scenario 2 Top of Road and Soffit Clearance

Description	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
Water Surface Elevation	200.34	200.61	200.78	200.96	201.17	201.37	206.00
Energy Grade Line Elevation	200.37	200.66	200.85	201.05	201.27	201.42	206.00
Top of Road (Low Point)	201.59	201.59	201.59	201.59	201.59	201.59	201.59
(2+4) Top of Road Freeboard (Min.)	1.25	0.98	0.81	0.63	0.42	0.22	-4.41
(3) Top of Road Freeboard (Desired)	1.22	0.93	0.74	0.54	0.32	0.17	-4.41
Top of Road Velocity	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Description	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
(5) Top of Road Velocity x Depth	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Soffit Elevation	201.47	201.47	201.47	201.47	201.47	201.47	201.47
(6) Soffit Clearance	1.13	0.86	0.69	0.51	0.30	0.10	-4.53

Table 6-9: New Sixteen Mile Creek Bridge – Scenario 1 Hydraulic Performance Summary

Criteria Description	Criteria Storm Events	Meets Criteria (Yes or No)
(2) Top of Road Freeboard (Min.)	100-Year	No
(3) Top of Road Freeboard (Desired)	100-Year	No
(4) Relief Flow (Max. Depth over roadway)	Regional	No
(5) Relief Flow (Velocity x Depth)	Regional	No
(6) Soffit Clearance	100-Year	No

Table 6-10: New Sixteen Mile Creek Bridge – Scenario 2 Hydraulic Performance Summary

Criteria Description	Criteria Storm Events	Meets Criteria (Yes or No)
(2) Top of Road Freeboard (Min.)	100-Year	No
(3) Top of Road Freeboard (Desired)	100-Year	No
(4) Relief Flow (Max. Depth over roadway)	Regional	No
(5) Relief Flow (Velocity x Depth)	Regional	No
(6) Soffit Clearance	100-Year	No

As noted above, there are no major differences in how the proposed structure performs hydraulically, since the water levels at the two cross-sections located between the new and the old bridge will roughly be the same in both scenarios.

Even with a 0.43 m raise of the Steeles Avenue Road profile, at Station 6+154, the proposed structure will not meet any of the MTO HDDS criteria, however hydraulic improvements are warranted at this location up to the 100-year storm event, when compared to the existing structure. It is not feasible to meet freeboard and clearance criterion due to site conditions. However, the road profile has been raised at the north

end, which results in the bridge having a 1.13 m clearance under the 2-year storm event, which is useful for maintenance purposes.

The existing CNR twin culverts are controlling the flows; therefore, the Regional Storm will overtop Steeles Avenue. **Table 6-10** illustrates the flooding depth over Steeles Avenue under proposed conditions. The road low point has an elevation of 201.59 m and as presented below; the Regional Storm will overtop Steeles Avenue by 4.41 m. The full results are included in Appendix D of **Appendix F**. However, the analyses show that all structures / crossings accommodate the 100-year storm event.

Table 6-11: Regional Storm Overtopping Depth over Steeles Avenue

Storm Event	Water Surface Elevation (m)	Overtopping Depth above Road Low Point Elevation (m)
2-yr	200.34	-1.25
5-yr	200.61	-0.98
10-yr	200.78	-0.81
25-yr	200.96	-0.63
50-yr	201.17	-0.42
100-yr	201.37	-0.22
Regional	206.00	4.41

Proposed Conditions – Opportunity for Future CNR Culverts Improvements

Through the consultation process, a future potential opportunity was identified to improve the water surface elevations within the study area, and specifically at the new Sixteen Mile Creek crossing along Steeles Avenue, by potentially improving the CNR culverts. **These culverts are owned by a third party and fall outside the scope of the current EA**. However, modelling analysis has been undertaken for this scenario to highlight the potential improvements that could be achieved in the surrounding area through other capital works.

A preliminary drainage analysis was completed to understand the feasibility of the opportunity of replacing the CN culverts. It has been observed that by replacing the CNR culverts with a bridge the flow depths would improve. For the potential new CNR bridge, two options have been considered: one that features a single 26.5 m span and

one that features a 1.8 m pier in the middle and two 12.5 m spans. Upon performing a hydraulic analysis of the two options, it has been observed that there would be no major differences in Water Surface Elevations between the two bridges.

The hydraulic analysis of the proposed Steeles Avenue Bridge along with the potential CNR culvert improvements considers two scenarios:

- Scenario 1: With Existing Steeles Avenue Bridge
- Scenario 2: Without Existing Steeles Avenue Bridge

Based on analysis, the new Steeles Avenue Bridge at Sixteen Mile Creek top of road freeboard, soffit clearance and other hydraulic parameters, for both scenarios, as they pertain to the MTO HDDS are identified in **Table 6-11** and **Table 6-12**. **Table 6-13** and **Table 6-14** illustrates whether the proposed New Sixteen Mile Creek Bridge is meeting the MTO HDDS Criteria.

Table 6-12: New Sixteen Mile Creek Bridge – Scenario 1 Top of Road and Soffit Clearance

Description	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
Water Surface Elevation	200.34	200.61	200.79	200.96	201.18	201.38	202.69
Energy Grade Line Elevation	200.37	200.66	200.85	201.05	201.27	201.43	202.74
Top of Road (Low Point)	201.59	201.59	201.59	201.59	201.59	201.59	201.59
(2+4) Top of Road Freeboard (Min.)	1.25	0.98	0.80	0.63	0.41	0.21	-1.10
(3) Top of Road Freeboard (Desired)	1.22	0.93	0.74	0.54	0.32	0.16	-1.15
Top of Road Velocity	n/a	n/a	n/a	n/a	n/a	n/a	2.34
(5) Top of Road Velocity x Depth	n/a	n/a	n/a	n/a	n/a	n/a	2.57
Soffit Elevation	201.47	201.47	201.47	201.47	201.47	201.47	201.47
(6) Soffit Clearance	1.13	0.86	0.68	0.51	0.29	0.09	-1.22

Table 6-13: New Sixteen Mile Creek Bridge – Scenario 2 Top of Road and Soffit Clearance

Description	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
Water Surface Elevation	200.34	200.61	200.79	200.96	201.18	201.38	202.69
Energy Grade Line Elevation	200.37	200.66	200.85	201.05	201.27	201.43	202.74
Top of Road (Low Point)	201.59	201.59	201.59	201.59	201.59	201.59	201.59
(2+4) Top of Road Freeboard (Min.)	1.25	0.98	0.80	0.63	0.41	0.21	-1.10
(3) Top of Road Freeboard (Desired)	1.22	0.93	0.74	0.54	0.32	0.16	-1.15
Top of Road Velocity	n/a	n/a	n/a	n/a	n/a	n/a	2.33
(5) Top of Road Velocity x Depth	n/a	n/a	n/a	n/a	n/a	n/a	2.56
Soffit Elevation	201.47	201.47	201.47	201.47	201.47	201.47	201.47
(6) Soffit Clearance	1.13	0.86	0.68	0.51	0.29	0.09	-1.22

Table 6-14: New Sixteen Mile Creek Bridge – Scenario 1 Hydraulic Performance Summary

Criteria Description	Criteria Storm Events	Meets Criteria (Yes or No)
(2) Top of Road Freeboard (Min.)	100-Year	No
(3) Top of Road Freeboard (Desired)	100-Year	No
(4) Relief Flow (Max. Depth over roadway)	Regional	No
(5) Relief Flow (Velocity x Depth)	Regional	Yes
(6) Soffit Clearance	100-Year	No

Table 6-15: New Sixteen Mile Creek Bridge – Scenario 2 Hydraulic Performance Summary

Criteria Description	Criteria Storm Events	Meets Criteria (Yes or No)
(2) Top of Road Freeboard (Min.)	100-Year	No
(3) Top of Road Freeboard (Desired)	100-Year	No
(4) Relief Flow (Max. Depth over roadway)	Regional	No
(5) Relief Flow (Velocity x Depth)	Regional	Yes
(6) Soffit Clearance	100-Year	No

Running the two scenarios, there would be no changes in water elevations between the new and old bridge. However, an improvement is found north of the existing bridge due to decreasing water levels with the removal of the existing structure.

By replacing the CNR culverts with a bridge, the flooding point would shift to the CP Rail crossings, located downstream of the new CNR bridge. It is to be noted that the shift in flooding point will not create a worse situation than existing conditions. The downstream CP Rail would be controlling the flows; therefore, the Regional Storm would still overtop Steeles Avenue, however with a significant improvement as compared to maintaining the existing CNR culverts.

In terms of the flooding depth over Steeles Avenue with the potential CNR improvements, the road low point has an elevation of 201.59 m and as presented below; the 100-year storm event can be accommodated, and the Regional Storm is modelled to overtop Steeles Avenue by 1.1 m compared to 4.41 m without the improvements, as illustrated in **Table 6-15**.

Table 6-16: Regional Storm Overtopping Depth over Steeles Avenue

Storm Event	Water Surface Elevation (m)	Overtopping Depth above Road Low Point Elevation (m)
2-yr	200.34	-1.25
5-yr	200.61	-0.98
10-yr	200.79	-0.80
25-yr	200.96	-0.63
50-yr	201.18	-0.41
100-yr	201.38	-0.21

Storm Event	Water Surface Elevation (m)	Overtopping Depth above Road Low Point Elevation (m)
Regional	202.69	1.10

Prior to any implementation of improvements at the CNR culverts, further analysis is required, including a review of constructability, and would be further investigated as part of other capital projects in the surrounding area. The full results are included in Appendix D of **Appendix F**.

Hydraulic Analysis Results of Proposed Culverts

Hydraulic design was completed for the three new culverts under proposed road conditions using the CulvertMaster hydraulic model. The culvert analysis was undertaken for the 25- and 100-year design storm events. A summary can be found in **Appendix F**.

In the detailed design stage of this project, culvert lengths and inverts will need to be adjusted accordingly to match the proposed conditions floor elevations within the vicinity of the culverts. Once accurate elevations are determined, the hydraulic performances of the proposed culverts can be enhanced to further meet the design criteria.

6.12 Utilities and Municipal Services

There are a number of existing buried and aerial utilities located on either side along the Steeles Avenue corridor (varies), including watermain, sanitary sewer, gas main, hydro, and telecom. Existing hydro poles along the corridor will have to be relocated as a result of the proposed realignment of Steeles Avenue. This will be pursued during detailed design in consultation with Milton Hydro, and Hydro One Networks Inc. Other utilities such as Bell, Cogeco, and Enbridge Gas may also be impacted as a result of the realignment of Steeles Avenue from Tremaine Road to Industrial Drive. These utilities will be contacted during detailed design to confirm the conflicts and the extent of relocation required.

6.13 Construction Phasing

With the realignment of the proposed Steeles Avenue to the south of the existing road allowance, it is anticipated that the proposed structures and majority of the roadwork

can be constructed while maintaining traffic on the existing roadway. Once completed, the Steeles Avenue traffic can be moved to the new roadway and the existing CP at-grade crossing will be removed and the closed section of the existing Steeles Avenue will remain open for Milton Hydro for access.

6.14 Streetscape

Photo renderings were prepared and presented at PIC #2 to illustrate the preliminary preferred design:

- **Exhibit 6-6** depicts a potential roundabout intersection at Steeles Avenue, rendered from a photo. This image provides a bird's eye view, looking northwest. The image includes the CP Rail underpass located in the left part of the image, the neighbourhood of Peru in the top centre of the image and a roundabout connecting the new Steeles Avenue to the existing Steeles Avenue, prominently in the centre of the image. The Sixteen Mile Creek valley crossing can also be seen to the right of the roundabout. For illustrative purposes, a roundabout was shown as it would have a larger property impact. The intersection type will be confirmed in the future detailed design stage.
- **Exhibit 6-7** depicts the approach to the CP Rail underpass from the west on Steeles Avenue, rendered from a photo.
- **Exhibit 6-8** depicts the approach to the roundabout from the southeast on Steeles Avenue, rendered from a photo.
- **Exhibit 6-9** depicts the crossing of the Sixteen Mile Creek bridge, looking west from Steeles Avenue, rendered from a photo.

Exhibit 6-6: Photo Rendering of a Potential Roundabout at Steeles Avenue

Exhibit 6-7: Photo Rendering of the approach to the CP Rail underpass from the west on Steeles Avenue

Exhibit 6-8: Photo Rendering of the approach to the roundabout from the southeast on Steeles Avenue

Exhibit 6-9: Photo Rendering of the crossing of the Sixteen Mile Creek bridge, looking west from Steeles Avenue

6.15 Property Requirements

The approximate property requirements for privately owned or publicly owned (municipal) properties are summarized in **Table 6-16**. A total of seven (7) properties are impacted, including a Town of Milton property. Property requirements are preliminary only and subject to further review and refinement during detailed design. All adjacent and potentially impacted property owners were notified of the MCEA Study and invited to attend the Public Information Centres.

The proposed right-of-way width for Steeles Avenue between Tremaine Road and Industrial Drive is in accordance with the approved Halton Region Transportation Master Plan, Active Transportation Master Plan and Official Plan.

Table 6-17: Preliminary Property Requirements

Location	Preliminary Property Requirements (ha) (35 m ROW / Grading Easement / Permanent Easement / Non-ROW Regionally Owned)
7649 Tremaine Road	2.478 / 0 / 0.030 / 0.359
Town of Milton Property	1.627 / 0 / 0 / 0
3164 Steeles Avenue	0.0094 / 0 / 0 / 0
3156 Steeles Avenue	0.116 / 0 / 0 / 0
3090 Steeles Avenue	1.675 / 0.512 / 0 / 0
Property on the NW corner of Peru Road and Steeles Avenue West	0.139 / 0 / 0 /0
3230 Steeles Avenue	0.0064 / 0 / 0 / 0
Total Area	**6.051 / 0.512 / 0.030 / 0.359**

6.16 Preliminary Cost Estimate

Based on the best available information at the time of the MCEA Study, the total cost for the realignment of Steels Avenue between Tremaine Road Industrial Drive, including structure costs, is estimated to be $49,518,697.10, excluding HST. A summary of the Item costs in provided in the **Table 6-17** below.

Table 6-18: Preliminary Cost Estimate

Item Description	Quantity	Unit	Estimated Unit Cost	Total
Earth Excavation	150,000	m^3	$21.00	$ 3,150,000.00
Hot Mix HL1 (40mm depth)	3,700	t	$115.00	$ 425,500.00
Hot Mix HDBC (120mm depth)	10,600	t	$115.00	$ 1,219,000.00
19mm Crusher Run Limestone (150mm)	14,000	t	$10.00	$ 140,000.00
50mm Crusher Run Limestone (550mm)	51,000	t	$20.00	$ 1,020,000.00
Concrete Curb and Gutter	6,200	m	$73.00	$ 452,600.00
Concrete Sidewalk / Median / Platform	4,000	m^2	$90.00	$ 360,000.00
Concrete Strip	1,300	m^2	$85.00	$ 110,500.00
Asphalt Pathway	8,100	m^2	$33.00	$ 267,300.00
Storm Sewer		L.S.		$ 1,300,000.00
SWM Facilities/Oil Grit Separator		L.S.		$ 300,000.00
Driveway Culverts	200	m	$488.00	$ 97,600.00
Steel Beam Guide Rail	400	m	$844.00	$ 337,600.00
Topsoil and Sod	30,000	m^2	$12.00	$ 360,000.00
Cold Plane existing Pavement	2,000	m^2	$5.00	$ 10,000.00
Removal of Curb and Gutter	160	m	$20.00	$ 3,200.00

Item Description	Quantity	Unit	Estimated Unit Cost	Total
Clearing and Grubbing		L.S.		$ 150,000.00
Landscaping		L.S.		$ 500,000.00
Illumination:				
Permanent		L.S.		$ 400,000.00
Temporary		L.S.		$ 30,000.00
Structures:				
Concrete Culvert at Sta. 5+267		L.S.		$ 1,300,000.00
CP Underpass (includes 2 TPG, 2 Piers and abutment for 4 TPG)		L.S.		$ 8,400,000.00
Sixteen Mile Creek Bridge		L.S.		$ 3,800,000.00
Removal of Existing Sixteen Mile Creek Bridge		L.S.		$ 300,000.00
Retaining Walls		L.S.		$ 1,000,000.00
Temporary Shoring		L.S.		$ 1,500,000.00
Rail Diversion Grading and Sub-ballast		L.S.		$ 500,000.00
Maintenance of Traffic:				
Traffic Control		L.S.		$ 50,000.00
Temporary Widening/Staging		L.S.		$ 100,000.00
Miscellaneous (~20%)		L.S.		$ 5,516,660.00
CP Rail Costs:				
Trackwork		L.S.		$ 3,500,000.00
Flagging		L.S.		$ 300,000.00
CP Design / Review		L.S.		$ 100,000.00
Utility Relocation (est. by Consultant)				$ 500,000.00
Contingency (~15%)				$ 5,624,994.00

Item Description	Quantity	Unit	Estimated Unit Cost	Total
Engineering (Detailed Design & CA ~15%)				$ 6,393,743.10
TOTAL (excluding HST)				$ 49,518,697.10

7 CONSULTATION

Public, stakeholder, technical agency and Indigenous community consultation is a key part of the MCEA Study process. Halton Region has provided opportunities for such input at key points in the MCEA Study process. The intent of the consultation process was to ensure that all stakeholders and Indigenous communities were given the opportunity to provide input on the transportation needs and existing environment along the Steeles Avenue corridor as well as the preliminary preferred design.

The following section documents the key consultation events with technical agencies, stakeholders, Indigenous communities and the public that are associated with the Steeles Avenue MCEA Study.

7.1 Public Consultation

The following sections describe the public consultation efforts completed, the key comment themes received from the public throughout the study and how they were addressed by the Project Team, and meetings with individual property owners. All public notifications, materials, comments received and responses, excluding personal information, are provided in **Appendix A**.

7.1.1 Notice of Study Commencement

The Notice of Study Commencement for the Steeles Avenue MCEA Study between Tremaine Road and Industrial Drive was published on the Region's website and in the *Milton Champion* on June 1 and June 8, 2017.

The Notice was mailed to property owners within the study area, technical agencies (federal, provincial, and municipal agencies), Indigenous Communities, and utility companies identified on the project mailing list on June 1, 2017. The project mailing list and Notice of Study Commencement can be found in **Appendix A**.

7.1.2 Public Information Centres

Public Information Centres (PICs) were a key part of the overall consultation process of this project, allowing the public to provide their feedback throughout the study process and assist in the development of a preferred planning solution alternative. As outlined in

Section 1.2.1, two PICs were held during the MCEA Study and a summary of each PIC is provided below:

- PIC #1 was held in-person on November 21, 2019, and
- PIC #2 was held virtually from April 15, 2021 to May 17, 2021.

Public Information Centre #1 (November 21, 2019)

The purpose of PIC #1 was to provide an opportunity to meet the Project Team to discuss any issues related to the project, and review the study scope, existing conditions, proposed typical cross sections, road corridor concept alternatives, evaluation criteria and next steps in the study process.

The Notice of PIC #1 was published in the *Milton Champion* on November 7, 2019 and November 14, 2019. A copy of the PIC Notice is provided in **Appendix A**.

Stakeholders, property owners, members of the public, technical agencies, and utility companies were notified of the PIC via email or mail on November 6 and November 7, 2019, respectively. The Notice of PIC #1 was sent to relevant Indigenous communities via courier mail on November 11, 2019.

The PIC was held as follows:

Date:	Thursday, November 21, 2019
Time:	Drop-in between 6:30 and 8:30 p.m.
Location:	Milton Town Hall, Milton Room 150 Mary Street, Milton, ON L9T 6Z5

A total of individuals signed in at the PIC.

A total of five (5) comments were received, including one (1) via comment sheet submission at PIC #1, and four (4) via email. Key feedback themes identified from the comments received included:

- Support for the overall project
- Concern regarding future traffic congestion as it relates to the new developments within the study area

- Concerns regarding impacts to properties, noise impacts and potential implementation of noise mitigation measures, and impacts to local businesses and land.
- Concern related to traffic speed following the implementation of the proposed Steeles Avenue widening
- Inquiry regarding the need for the proposed Steeles Avenue widening subsequent to construction of the Tremaine Road connection to Highway 401

A copy of the PIC #1 notification memo and a copy of the display boards is provided in **Appendix A**.

Public Information Centre #2 (April 15, 2021 – May 17, 2021)

The purpose of PIC #2 was to provide an overview of the existing conditions, identify public feedback received at PIC #1, present and obtain public input on the design components and evaluation process as well as the preliminary preferred design, and identify next steps in the study.

The Notice of PIC #2 was published in the *Milton Champion* on April 8, 2021 and April 15, 2021. A copy of the PIC notice is provided in **Appendix A**.

Property owners, members of the public, technical agencies, and utility companies were notified of the PIC via mail and email on April 12 and April 13, 2021, respectively. The Notice of PIC #2 was sent to relevant Indigenous communities via registered mail on April 12, 2021.

Due to the COVID-19 pandemic, PIC #2 was held exclusively online to adhere to Ontario Public Health recommendations. The PIC presentation materials were published in two digital formats:

1. A PDF of the PIC presentation slides; and,

2. Four (4) video presentation of the presentation slides with narration.

Each video presented a section of the PIC presentation, which included (1) Introduction, (2) Background, (3) Road Alignment Alternatives, and (4) Preliminary Preferred Design and Next Steps. Transcripts of the narrated videos were also provided.

The digital materials for PIC #2 was published as noted below:

Date Posted: Thursday, April 15, 2021

Project Webpage:	https://www.halton.ca/For-Residents/Opportunities-to-Participate/Online-consultation-Steeles-Avenue-Municipal-Clas
PDF of Presentation Slides Publication:	https://www.halton.ca/getmedia/16e7ddc9-1ba1-4142-80af-582fbbc29549/PW-Steeles-Ave-PIC-2-AODA-FINAL.aspx

Halton Region indicated that physical copies of the PIC #2 materials would be available upon request should an individual or group require it; no requests were received.

An online questionnaire was prepared and published by Halton Region on the project website. The survey was made available to the public during the comment period, from April 15 to May 17, 2021. The purpose of the survey was to gather feedback from the public regarding the preliminary preferred design. A copy of the survey questions is provided in **Appendix A**.

Over 80 comments were received from the online survey, via mail, and via email. Key feedback themes identified from the comments received included:

Support

- General support for the improvements and Alternative B
- Support of a potential roundabout
- Support for Active Transportation facilities

Concerns and Inquiries

- Concerns regarding general and specific property impacts
- Inquiries regarding widening the existing Steeles Avenue alignment
- Concerns regarding construction
- Inquiries regarding the Tremaine Road connection to Highway 401
- Concerns regarding safety and traffic congestion
- Inquiries regarding the timing of construction
- Concerns regarding a potential roundabout
- General opposition to the study

A Frequently Asked Questions (FAQ) document was created and posted on the Study webpage to address the concerns and inquiries that were received during and following PIC #2.

A summary report of PIC #2, including a copy of the display boards and comments received, is provided in **Appendix A**.

7.1.3 Individual Property Owner Meetings

Engagement of stakeholders / interested members of the public occurred throughout the study, and was not limited to the formal PIC meetings. Interested property and business owners could request to meet with the Project Team at any time throughout the study. Correspondence with property owners and meeting minutes are provided in **Appendix A**.

7.2 Technical Agencies

Technical agencies were notified of the commencement of the Steeles Avenue MCEA Study through mail or email in June 2017. Comments received from technical agencies are provided in **Appendix A**. A number of meetings with agencies were held, along with two Technical Agency Committee (TAC) meetings, which are documented in this section.

As noted in **Section 7.1.2.1** and **Section 7.1.2.2**, technical agencies were also invited to attend the two PICs that were held. A list of government agencies, utilities and Indigenous Communities that were invited to participate in the TAC is provided in **Section 1.5.4** of this ESR.

7.2.1 Technical Agency Committee Meetings

As noted above, two TAC meetings were held were held on:

- TAC Meeting #1 – October 21, 2019
- TAC Meeting #2 – September 30, 2020

A brief summary of each of these meetings is provided in the sub-sections below. Meeting minutes are included in **Appendix A**. Comments received at the TAC meetings were taken into consideration as the study progressed.

Technical Agency Committee Meeting #1 (October 21, 2019)

The purpose of TAC Meeting #1 was to provide an overview and status update on the Steeles Avenue MCEA Study, present the existing conditions, alternative solutions,

preliminary analysis of road corridor concepts and next steps, and obtain input from the TAC.

Representatives from the following technical agencies attended TAC Meeting #1:

- Conservation Halton
- Niagara Escarpment Commission

Meeting minutes from TAC Meeting #1 are available in **Appendix A**.

Technical Agency Committee Meeting #2 (September 30, 2020)

The purpose of TAC Meeting #2 was to provide a status update, outline the design alternatives and evaluation, present the preliminary preferred design alternative and next steps, and obtain input from the TAC.

Representatives from the following technical agencies and stakeholder groups attended TAC Meeting #2:

- Town of Milton
- Milton Hydro
- Conservation Halton
- Ministry of the Environment, Conservation and Parks
- Ministry of Northern Development, Mines, Natural Resources and Forestry (*formerly the Ministry of Natural Resources and Forestry*)
- CN Rail

Meeting minutes from TAC Meeting #2 are available in **Appendix A**.

7.2.2 Town of Milton

Given that the study area is located within the Town of Milton, two meetings with the Town of Milton were held:

- Town of Milton Meeting #1 – July 31, 2019
- Town of Milton Meeting #2 – August 13, 2020

A brief summary of each of these meetings is provided in the sub-sections below. Meeting minutes are included in **Appendix A**. Comments received at the Town of Milton meetings were taken into consideration as the study progressed.

Town of Milton Meeting #1 (July 31, 2019)

The purpose of the Town of Milton Meeting #1 was to provide an overview and status update on the Steeles Avenue MCEA Study, present the existing conditions, alternative solutions, preliminary analysis of road corridor concepts and next steps, and obtain input from the Town of Milton.

Meeting minutes from the Town of Milton Meeting #1 are available in **Appendix A**.

Town of Milton Meeting #2 (August 13, 2020)

The purpose of the Town of Milton Meeting #2 was to provide a status update following TAC meeting #1, outline the design alternatives and evaluation, present the preliminary preferred design alternative and next steps, and obtain input from the Town of Milton.

Meeting minutes from the Town of Milton Meeting #2 are available in **Appendix A**.

7.2.3 Conservation Halton, Niagara Escarpment Commission and the Ministry of the Environment, Conservation and Parks

A number of meetings with Conservation Halton (CH), the Niagara Escarpment Commission (NEC), and the Ministry of the Environment, Conservation and Parks (MECP) were arranged throughout the study:

- CH and NEC Meeting – September 8, 2017
- CH, NEC and MECP Meeting – July 5, 2019
- CH, NEC and MECP Meeting – August 23, 2019
- CH Meeting – November 30, 2021
- CH Meeting – January 17, 2022
- CH Meeting - May 30, 2022

A brief summary of each of these meetings is provided in the sub-sections below. Meeting minutes are included in **Appendix A**. Comments received at the CH, NEC and MECP meetings were taken into consideration as the study progressed.

CH and NEC Meeting (September 8, 2017)

The purpose of this CH and NEC Meeting was to provide an overview and status update on the Steeles Avenue MCEA Study, present the existing conditions, the study

status, the natural environment review, next steps, and obtain input from CH and NEC. Note that the MECP was also invited but was unable to attend this meeting.

Meeting minutes from this CH and NEC Meeting are available in **Appendix A**.

CH, NEC and MECP Meeting (July 5, 2019)

The purpose of this CH, NEC and MECP Meeting was to provide an overview and status update on the Steeles Avenue MCEA Study, present the existing conditions, alternative solutions and next steps, and obtain input from these agencies. Representatives from all three agencies were in attendance.

Meeting minutes from this CH, NEC and MECP Meeting are available in **Appendix A**.

CH, NEC and MECP Meeting (August 23, 2019)

The purpose of this CH, NEC and MECP Meeting was to provide a status update, outline the design alternatives and evaluation, present the preliminary preferred design alternative and next steps, and obtain input from the TAC. Representatives from all three agencies were in attendance.

Meeting minutes from this CH, NEC and MECP Meeting are available in **Appendix A**.

CH Meeting (November 30, 2021)

The purpose of this CH Meeting was to update Conservation Halton on the preliminary hydraulic analysis completed since the last meeting and discuss the results. The meeting was facilitated with a presentation.

Meeting minutes from this CH Meeting are available in **Appendix A**.

CH Meeting (January 17, 2022)

The purpose of this CH Meeting was to continue the discussion with Conservation Halton on the preliminary hydraulic analysis completed and to discuss Conservation Halton's comments on the materials presented on January 17, 2022.

Meeting minutes from this CH Meeting are available in **Appendix A**.

CH Meeting (May 30, 2022)

The purpose of this CH Meeting was to discuss the draft ESR and associated draft appendices that was distributed to CH on May 4, 2022.

7.2.4 Canadian Pacific Railway

The Canadian Pacific Railway (CP Rail) is the governing / approval body for any changes to their infrastructure. Discussion has occurred with CP Rail throughout the study and meeting minutes are provided in **Appendix A**.

The Project Team has specifically consulted with CP Rail through the development and assessment of bridge design alternatives (**Section 5** of this ESR) and the Preliminary Preferred Design Alternative was sent to CP Rail for review before presenting it to the public at PIC #2.

Two meetings were held with CP Rail:

- CP Rail Meeting #1 – November 26, 2019
- CP Rail Meeting #2 – August 14, 2020

A brief summary of each of these meetings is provided below. Meeting minutes are included in **Appendix A**. Comments received at the CP Rail meetings were taken into consideration as the study progressed.

CP Rail Meeting #1 (November 26, 2019)

The purpose of the CP Rail Meeting #1 was to provide an overview and status update on the MCEA Study, present the existing conditions, road corridor alternative design concepts, and road and grade separation design alternatives, discuss CP Rail operational constraints and other considerations and next steps, and obtain input from CP Rail.

CP Rail Meeting #2 (August 14, 2020)

The purpose of the CP Rail Meeting #2 was to provide a status update on the study, outline the design alternatives and evaluation, present the preliminary preferred design alternative and next steps, and obtain input from the CP Rail.

7.3 Indigenous Community Engagement

Indigenous Communities were notified of this study at study commencement and were notified and invited to attend all PICs, including the Mississaugas of the Credit First Nation, Six Nations of the Grand River and Haudenosaunee Confederacy Chiefs Council (consultation is typically deferred through the Haudenosaunee Development Institute (HDI). Additionally, the Credit River Métis Council was also invited to attend PIC #2 as they were identified as a potentially interested Indigenous Community at that time. **Table 7-2** provides a summary of the Project Team's efforts to engage with the Indigenous Communities listed above. Letters provided to Indigenous Communities can be found in **Appendix A**. No responses were received by Indigenous Communities. As noted in **Section 3.3.1**, prior to undertaking the Stage 2 Archaeological Assessment work, Indigenous communities will be advised and afforded the opportunity to have field liaison representative participation.

Table 7-1: Summary of Indigenous Community Engagement

Indigenous Community	Date	Notification Details
Six Nations of the Grand River	February 1, 2018	Sent study commencement letter and notice via mail.
Haudenosaunee Confederacy Chiefs Council	February 1, 2018	Sent study commencement letter and notice via mail.
Mississaugas of the Credit First Nation	February 1, 2018	Sent study commencement letter and notice via mail.
Six Nations of the Grand River	November 11, 2019	Sent Notice of PIC #1 via courier mail.
Haudenosaunee Confederacy Chiefs Council	November 19, 2019	Sent Notice of PIC #1 via courier mail.
Mississaugas of the Credit First Nation	November 19, 2019	Sent Notice of PIC #1 via courier mail.
Six Nations of the Grand River	April 12, 2021	Sent Notice of PIC #2 and letter via registered mail.
Haudenosaunee Confederacy Chiefs Council	April 12, 2021	Sent Notice of PIC #2 and letter via registered mail.

Indigenous Community	Date	Notification Details
Mississaugas of the Credit First Nation	April 12, 2021	Sent Notice of PIC #2 and letter via registered mail.
Credit River Métis Council	April 12, 2021	Sent Notice of PIC #2 and letter via registered mail.
Six Nations of the Grand River	December 15, 2022	Sent Notice of Study Completion and letter via email.
Haudenosaunee Confederacy Chiefs Council	December 15, 2022	Sent Notice of Study Completion and letter via email.
Mississaugas of the Credit First Nation	December 15, 2022	Sent Notice of Study Completion and letter via email.
Credit River Métis Council	December 15, 2022	Sent Notice of Study Completion and letter via email.

8 POTENTIAL ENVIRONMENTAL IMPACTS, MITIGATION MEASURES AND COMMITMENTS TO FUTURE WORK

This section outlines the potential environmental impacts, including the natural environment, socio-economic environment, cultural environment, and transportation. Potential direct and indirect impacts are described, including mitigation measures and commitments to future work during the detailed design and construction phases.

8.1 Natural Environment

The expansion and improvements for Steeles Avenue involve constructing the new preferred alignment as a four-lane arterial roadway, with flush and raised medians or center turn lanes as well as bike lanes, and multi-use trailway / sidewalks. The general location of the preferred alignment of Steeles Avenue from Tremaine Road to Industrial Drive is shown on Exhibit 1, **Appendix E** and the preliminary design Drawings of the alignment are shown on Plates 1 to 18 of **Appendix J**.

As outlined, the new preferred alignment of Steeles Avenue extends to the south of the existing road. In addition to the direct footprint impacts associated with the new road alignment, the CP Rail crossing involves construction of an underpass for the road (rather than an overpass) to minimize both visual and footprint impacts.

The preferred alignment crosses or impacts nine Natural Heritage Features that were identified within the study area (see Exhibit 3-2 and Exhibit 1, **Appendix E**) including:

- Feature 1 – Unnamed Tributary of NW-1-E
- Feature 2 – Swale Feature
- Feature 3 – Tributary of NW-1-E of Sixteen Mile Creek and Riparian Forest
- Feature 5 – Cultural Thicket
- Feature 5a – Deciduous Forest
- Feature 6 – Old Field Meadow
- Feature 7 – Cultural Hedgerow
- Feature 8 – Sixteen Mile Creek and Riparian Forest (and associated swale)

- Feature 9 – Storm Water Management Pond (SWMP) and associated Marsh

With the exception of the Natural Heritage Features 6 and 7 noted above, the remaining Natural Heritage Features are identified as 'Key Features' of the Regional Natural Heritage System (see Exhibit 3-2). The preferred alignment also crosses two agricultural fields and two residential / mown areas.

The impacts of the preferred design and the recommended mitigation measures to address those impacts are outlined in this section. This preliminary impact assessment and recommended mitigation measures will be refined during the detailed design stage, at which point the mitigation measures will be incorporated into the contract documents.

8.1.1 Designated Areas

As outlined in Section 3.4.1, the study area is located within the Niagara Escarpment Plan Area (Escarpment Rural Area and Escarpment Protection Area), Greenbelt Plan Areas (Urban River Valley System), Regional Natural Heritage System and CH Regulation Limits. Each of these designated areas are crossed by the preferred alignment and will be impacted to varying degrees. Impacts to the features within these designated areas are discussed in the following sections.

8.1.2 Vegetation Communities and Vascular Plants

The preferred alignment crosses primarily through agricultural fields and mown / manicured open space areas. Crossings of natural / semi-natural habitat are listed above in **Section 8.4**. No vegetation SAR are found within the preferred alignment. One Butternut sapling occurs approximately 50 m to the south of the preliminary grading limits, at the east end of the study area.

Potential Direct Impacts

A total of ~3.039 ha of natural / semi-natural vegetation will be removed for the construction of the proposed works for the preferred alignment on the south side of Steeles Avenue. This preliminary assessment of vegetation removals as based on the footprint (i.e., preliminary grading limits) of the new section of Steeles Avenue from Tremaine Road to Industrial Drive, as well as the footprints on the existing roadway (e.g., cul-de-sac). These limits were then over-laid on the vegetation community boundaries (see Exhibit 1, **Appendix E**). Some of the vegetation community boundaries, specifically the wetland communities, and significant woodlands will be

refined at detailed design to confirm the impacted areas and inform the associated restoration and/or compensation measures, in consultation with relevant agencies.

As noted above, most of the vegetation removals are comprised of agricultural fields and mown / manicured open space areas. Natural / semi-natural terrestrial habitat removals will be required in at two riparian forest crossings (Units 1b and 9), a small edge of Deciduous Forest (Unit 11), two Cultural Thickets (Units 7 and 12), a Cultural Hedgerow (Unit 14), and a Cultural Meadow (Unit 2). Units 1b, 9, 11 and 12 have all been assessed as Significant Woodlands (according to the ROP criteria) and are mapped within the Regional Natural Heritage System.

A small amount of culturally impacted wetland (i.e., Unit 4b and 6) will also be removed, along with a small area of roadside Forb Mineral Shallow Marsh (Unit 17) wetland associated the existing SWMP in the northeast corner of the study area. Units 4b and Unit 17 have been assessed as Regionally Significant Wetlands (according to the ROP criteria). These features are also wholly (Unit 17) or partially (Unit 4b) mapped within the Regional Natural Heritage System.

The manicured open space area (Unit 15) to be removed contains mature planted Silver Maple trees. Please note that at detailed design, Unit 15 will be further assessed in the field to re-evaluate if the criterion for a Woodland and Significant Woodland is met.

A breakdown of the preliminary vegetation removal assessment by community type is provided in **Table 8-1** below, and the removal areas are shown on Exhibit 1 (**Appendix E**).

Table 8-1: Anticipated Direct Impacts to Vegetation Communities

Unit	Community Classification	Community Type / Designation(s)	Anticipated Direct Impacts	Recommended Mitigation Measures
Natural / Semi-natural communities				
1b	Willow Lowland Deciduous Forest (FOD7-3)	Upland / Significant Woodland / RNHS / Urban River Valley System (Greenbelt)	**~0.215 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)

Unit	Community Classification	Community Type / Designation(s)	Anticipated Direct Impacts	Recommended Mitigation Measures
2	Dry- Moist Old Field Meadow (CUM1-1)	Upland / Urban River Valley System (Greenbelt)	**~0.233 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
3a	Dry- Moist Old Field Meadow (CUM1-1)	Upland / partially within the RNHS	**~0.013 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
4b	Cattail Mineral Shallow Marsh (MAS2-1)	Wetland / Regionally Significant Wetland / partially within the RNHS	**~0.026 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
4c	Cattail Mineral Shallow Marsh (MAS2-1)	Wetland	**~0.011 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
5	Dry- Moist Old Field Meadow (CUM1-1)	Upland	**~0.038 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
6	Cattail Mineral Shallow Marsh (MAS2-1)	Wetland / Niagara Escarpment Protection Area	**~0.068 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**) Located within CH Regulation Limits
7	Mineral Cultural Thicket (CUT1)	Upland / Niagara Escarpment Protection Area	**~0.170 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)

Unit	Community Classification	Community Type / Designation(s)	Anticipated Direct Impacts	Recommended Mitigation Measures
8	Dry-Moist Old Field Meadow (CUM1-1)	Upland / Niagara Escarpment Protection Area	**~0.080 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
9	Lowland Deciduous Forest (FOD7)	Upland / Significant Woodland / RNHS / Niagara Escarpment Protection Area	**~0.329 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
11	Fresh-Moist Bur Oak Deciduous Forest (FOD9-3)	Upland / Significant Woodland / RNHS / Niagara Escarpment Protection and Rural Area	**~0.007 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
12	Mineral Cultural Thicket (CUT1)	Upland / Significant Woodland / RNHS / Niagara Escarpment Rural Area	**~0.246 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
13	Dry-Moist Old Field Meadow (CUM1-1)	Upland / Niagara Escarpment Rural Area	**~1.386 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
14	Cultural Hedgerow	Upland / partially within the RNHS	**~0.127 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)

Unit	Community Classification	Community Type / Designation(s)	Anticipated Direct Impacts	Recommended Mitigation Measures
17	Forb Mineral Shallow Marsh (MAS2-9)	Wetland / Regionally Significant Wetland / RNHS / Urban River Valley System (Greenbelt)	**~0.042 ha** of this community will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
Other impacted Areas (i.e., not natural / semi-natural vegetation communities)				
15	Manicured Open Space (MOS)	Upland / RNHS / partially within the Urban River Valley (Greenbelt) / Candidate Significant Woodlot	**~0.349 ha** of the manicured open space will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
Agriculture		Upland / Niagara Escarpment Protection Area	**~1.789 ha** of the agricultural areas will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
Mown Areas		Upland / RNHS	**~0.561 ha** of the mown areas will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
Residential		Upland	**~0.083 ha** of the residential areas will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)
SWMP		Constructed wetland / RNHS	**~0.042 ha** of the SWMP will be removed by the preferred road alignment.	Standard mitigation measures (**Section 8.1.5.4**)

Unit	Community Classification	Community Type / Designation(s)	Anticipated Direct Impacts	Recommended Mitigation Measures
Parking Lot		n/a	**~0.207 ha** of the parking lot will be removed by the preferred road alignment.	n/a

The vegetation to be removed for the road construction is comprised of community types that are all common in Ontario and well represented in the area generally, all of which have been culturally influenced to varying degrees. Vegetation impacts (e.g., final grading limits, refined vegetation community boundaries) will be confirmed at detailed design. Mitigation measures to protect retained vegetation features are outlined in **Section 8.1.5.4**.

Potential Indirect Impacts

As with any construction activities, there is always potential for indirect impacts to adjacent retained vegetation features during and following construction including, but not limited to the following:

- Release of construction-generated sediment to adjacent habitats.
- Vegetation clearing / damage beyond the working area.
- Spills of contaminants, fuels and other materials that may reach natural areas.
- Damage from excessive or improper application of herbicides and pesticides for ROW maintenance requirements.
- Damage to adjacent natural vegetation from roadway maintenance activities such as salting and sanding, structure / culvert repairs, ditch cleanout.
- Salt runoff and salt spray into vegetated areas may cause loss of vegetation vigour and in extreme cases, vegetation dieback, and spread of salt tolerant flora (halophytes).
- Changes in drainage patterns (groundwater and/or surface runoff flow) that can impact dependent vegetation / wetland areas located either upgradient or downgradient of the ROW. Blocking of existing surface / subsurface drainage patterns can result in upstream and downstream vegetation dieback / condition changes. An increase in downstream runoff can result in erosion impacts on receiving vegetation.

- Spread of invasive species from within or off-site due to un-clean construction equipment.
- Edge impacts resulting from the exposure of a new forest edge (e.g., for Units 1b, 9 and 11). Potential impacts include changes in microclimate resulting from increased wind and sun exposure and increased transmission of wind-dispersed seeds of non-native or invasive species.

These potential indirect impacts to vegetation and habitat features can be managed through implementation of standard mitigation measures, as outlined in **Section 8.1.5.4**.

Tree Inventory and Removals within the Study Area are shown in **Appendix K**. A Landscape Concept Plan, as well as renderings, has also been completed and is shown in **Appendix K**.

8.1.3 Wildlife and Habitat

Potential impacts on wildlife habitat are generally similar to those discussed for the vegetation communities, consisting of direct / indirect impacts to lower quality wildlife habitats associated with culturally influenced vegetation communities, and temporary construction-related disturbance effects. Some additional operation-related effects are specific to wildlife (e.g., potential for increased wildlife road mortalities or restriction of wildlife movement).

The vegetation communities that occur within the footprint of the preferred alternative alignment provide habitat for common, disturbance-tolerant wildlife species; however, potential impacts for more sensitive wildlife habitats and / or SAR species and habitats have been identified within and adjacent to the proposed alignment footprint, which will require mitigation measures, as detailed in **Section 8.1.5.4**.

Potential Direct Impacts

The removal of culturally influenced vegetation communities, including ELC Unit 7 (CUT1) and Units 2 and 5 (CUM1-1) along the existing Steeles Avenue ROW, hedgerows and residential lawn areas, is expected to have minimal impacts on disturbance-tolerant bird and wildlife species (e.g., minor loss of potential nesting habitat for Song Sparrow, American Robin, Mourning Dove, Northern Cardinal).

Removals in more sensitive habitats include:

- Relatively small removal areas and fragmentation of deciduous riparian forest communities in ELC Units 1b and 9, which provide breeding habitat for forest specialized birds (e.g., American Redstart, Eastern Wood-pewee, Hairy Woodpecker) and potential bat roosting habitat.
- Minor removals from other shrub thicket and treed areas (ELC Unit 12 and 15) that provide potential bat roosting habitat and higher quality bird habitat (e.g., Brown Thrasher and Northern Mockingbird).
- Minor edge removals from mature deciduous forest in ELC Unit 11, which provides habitat for forest specialized birds (e.g., Eastern Wood-pewee and Indigo Bunting) and potential bat roosting habitat.
- Minor edge removal of the wetland in ELC Unit 17, which provides habitat for Green Frog, Gray Treefrog and Spring Peeper, and potential habitat (including overwintering habitat) for turtles (Snapping Turtle and Midland Painted Turtle).

The proposed alignment alternative avoids other more sensitive or specialized wildlife habitat identified in the study area, including habitat associated larger woodland interiors and wetlands (e.g., potential and confirmed herpetofauna habitat in ELC Unit 4a (MAS2-1).

Significant Wildlife Habitat

The proposed vegetation removals and construction works are expected to result in minimal impacts to candidate / confirmed Significant Wildlife Habitat (SWH) identified in the study area. The candidate and confirmed SWH features are primarily associated with the riparian corridors, larger deciduous forest units and wetlands, which will be avoided or will have minimal direct impacts:

- Confirmed SWH – Amphibian Breeding (Wetland) in ELC Unit 17: Minor edge impacts along the west side of the existing Steeles Avenue ROW where there is already traffic-related disturbance and previous road widening works.
- Confirmed SWH – Special Concern species:
    - Eastern Wood-pewee breeding habitat: Minor removals in ELC Unit 1b and 15, and minor edge removals for Unit 11, which avoids the central portions of the woodland where nesting habitat is more likely to occur. This species is known to occur in relatively small forest blocks and the proposed removals are unlikely to displace individuals using this habitat.

  - Midland Painted Turtle: the precise location of nesting or overwintering habitat in the study area is unknown; however, likely habitat in ELC Unit 4a (MAS2-1) will be avoided, and mitigation measures will be recommended for works associated with the watercourse crossings and impacts to Unit 17.
  - Monarch: no reproductive habitat was confirmed for this species, and no removals are proposed from marsh edge foraging habitat where the individual was observed (ELC Unit 4a).
- Candidate SWH: no impacts on candidate SWH features are expected with implementation of recommended mitigation measures.

Wildlife Movement Corridors

The preferred alternative road alignment will further fragment the local habitat mosaic resulting in potential direct impacts to wildlife (i.e., increased road mortality) and indirectly through restriction of wildlife movement and habitat use. As the project design progresses, it will be important to ensure that key connections between wildlife habitats and regional / landscape-level movement corridors are maintained.

As described previously in **Section 3.4.7.5**, local wildlife movement in the study area is likely focused along the riparian corridors (Sixteen Mile Creek, Tributary NW-1-E), the rail corridor and the linear cultural thicket community connecting the rail corridor to Unit 11. Where the proposed road alignment crosses these movement corridors there is potential for increased wildlife mortality and barriers to movement; however, these impacts can be effectively mitigated through appropriate design / sizing of the crossing structures and use of wildlife funnel fencing in key areas (Sixteen Mile Creek, Tributary NW-1-E) as described in **Section 8.1.5.4**.

8.1.4 Fish and Fish Habitat

The preferred alignment crosses and / or impacts four of the watercourses found within the study area including:

- Sixteen Mile Creek (and associated swale, Natural Heritage Feature #8)
- Tributary NW-1-E of Sixteen Mile Creek (Natural Heritage Feature 3)
- Unnamed Tributary of NW-1-E (Natural Heritage Feature #1)
- Agricultural Swale (Natural Heritage Feature #2)

The existing fisheries and aquatic habitat conditions of these watercourses are found in **Section 3.4.7** and summarized on Table 1, **Appendix E**, and the locations are shown on Exhibit 1 (**Appendix E**).

The following sections present the proposed works and impacts for each watercourse which are discussed generally with regard to the preliminary design. A summary of the proposed Stormwater Management Practices with the study area in relation to the receiving watercourses has also been included in this section. These impacts will be further detailed and refined during the detailed design phase.

Potential Direct and Indirect Impacts

Sixteen Mile Creek and Associated Swale (Natural Heritage Feature #8)

Proposed Works at the Proposed Crossing Site of the Preferred Design

The preliminary design of the proposed crossing structure is a single span bridge (28 m span) with semi-integral abutments founded on spread footings, constructed on a 40° skew to the roadway. The overall width of the bridge will be approximately 27.5 m. See **Exhibit 6-5** for the General Arrangement drawing, and the aquatic habitat mapping in **Appendix E**.

Proposed Works at the Existing Crossing of Steeles Avenue

The existing bridge structure that runs beneath the existing Steeles Avenue alignment is proposed to be removed. Restoration of the watercourse channel post bridge removal will be further investigated at the detailed design stage as indicated below.

Potential Direct Impacts at the Proposed Crossing Site of the Preferred Design

The new structure fully spans the bankfull channel width of Sixteen Mile Creek at this location (approximately 8.5 m) and one direct impact of the new bridge crossing on the creek is localized removal of the riparian vegetation at the crossing site.

In the geomorphological report by Geomorphix (2022), there is a recommendation that “bioengineering (e.g., vegetated rock buttresses / offset protection) may be incorporated into the existing channel banks to combat erosive forces and help direct flows through the crossing” (**Appendix L**). This recommendation would result in the temporary alteration of the channel banks and potential interference with migration of salmonids during the spawning season. Further geomorphological assessment should be

completed at detailed design to confirm if this type of treatment is required and if so, to provide appropriate designs.

Loss of sunlight from the new bridge will also reduce solar and allochthonous inputs and may reduce the vigour of the riparian vegetation along the along banks in the immediate vicinity of the new structure. Since the abutments are located well back from the bankfull channel, the impacts of the new bridge on Sixteen Mile Creek can be addressed with the implementation of stringent mitigation measures (e.g., the use of appropriate timing windows etc., see **Section 8.1.5**).

There is also a small swale feature located on the north side of Sixteen Mile Creek at the crossing location. As noted in **Section 3.4.7**, the swale is grass lined, ranges in width from 2 - 3 m (no defined channel) and is found entirely within the flood plain and in the area of the new structure (see aquatic habitat mapping in **Appendix E** and Plate #9 in **Appendix J**).

The new bridge will remove most the swale feature. Although direct fish use of the swale is considered unlikely (lack of defined channel and lack of a connection to the bankfull channel of Sixteen Mile Creek), it was dry at the time of survey. Therefore, it is recommended that the swale be further assessed at the detailed design stage during early spring (after snow melt and / or a rainfall event) and if standing water is present, it should be sampled with an electrofisher to confirm fish absence or presence. Subsequent constraint levels (e.g., low or medium) can then be properly attributed and used to determine if further review is required by DFO for the removal of this habitat.

Potential Direct Impacts at the Existing Crossing of Steeles Avenue

Direct impacts of the existing bridge removal include localized removal of riparian vegetation and temporary alteration of the channel banks and bed. However, the benefits of ‘opening up’ and restoring the channel at the crossing site far outweighs the potential impacts, which can be addressed with the implementation of the mitigation measures outlined in **Section 8.1.5.**

Improvements associated with ‘opening up’ the channel includes increased solar and allochthonous inputs and naturalization of the channel banks. Further geomorphological assessment should be completed at detailed design to assess the best type of treatment / restoration to improve the channel conditions with the removal of the existing bridge, and to provide appropriate designs.

Sixteen Mile Creek is a sensitive coldwater stream that is designated High Constraint in the Milton Heights Neighborhood SIS (Rand Engineering et al., 2014). The watercourse is considered 'Contributing Habitat' for Redside Dace and 'Occupied Habitat' for American Eel by MECP, both are protected species. Furthermore, CH has indicated that there is confirmed spawning habitat for Brown Trout and Rainbow trout is the vicinity of the new crossing.

MNRF also indicated that there are records of Bridle Shiner (SC under the ESA and SARA) in the vicinity of the study area and MECP indicated that there are historical records of Northern Sunfish (SC) in the Sixteen Mile Creek watershed (see correspondence in **Appendix A**). DFO SAR mapping (April 2022) also indicates that Northern Sunfish SARA) is "found (or potentially found)" in this tributary.

Potential Indirect Impacts at Both Crossing Sites

Potential construction related indirect impacts of the proposed bridge works, both along the preferred design alternative and associated with the existing bridge removal and restoration at Steeles Avenue, include local disruption during the works and potential for erosion and downstream sediment transport during periods of higher flow. These can be addressed with the use of the mitigation measures outlined in **Section 8.1.5**.

Further review of the impacts on Sixteen Mile Creek at both crossing sites will occur at detailed design, along with submission of these works to DFO as a Request for Review (RfR). An Information Gathering Form or IGF (requested by MECP during the detailed design stage, see November 9, 2020 email in **Appendix A**) will also be sent to MECP, outlining the detail of these works in relation to potential impacts on American Eel.

Tributary NW-1-E of Sixteen Mile Creek (Natural Heritage Feature 3)

Proposed Works at the Proposed Crossing Site of the Preferred Design

The preliminary design of the proposed crossing structure is a single cell cast-in-place reinforced concrete rigid frame open footing box culvert. The culvert has a clear span of 6.5 m, an opening height of 2.6 m, and a length of 40.0 m. There are four conventional cantilever cast-in-place reinforced concrete retaining walls located at each corner of the structure. The northwest and southeast wingwalls are approximately 5.2 m long. A preliminary design for a low channel for fish passage and overbank 'bench' areas for wildlife movement have been incorporated into the design.

See **Exhibit 6-3** for the General Arrangement drawing, and the aquatic habitat mapping in **Appendix E**.

Proposed Works at the Existing Crossing of Steeles Avenue

As noted in the hydraulic assessment in Section 6.11.2.1, the existing culvert (Culvert C1 – a 0.75 m HDPE pipe) of Tributary NW-1-E that runs beneath the existing Steeles Avenue alignment is proposed to be removed, which will greatly improve the flow retention at this crossing. Restoration of the watercourse channel post culvert removal will be further investigated at the detailed design stage as indicated below.

Potential Direct Impacts at the Proposed Crossing Site of the Preferred Design

The open footing culvert will more than span the bankfull channel width (3.5 to 4 m, 0.4 m depth) found in the area of the crossing. Downstream of Steeles Avenue the bankfull channel ranges from 2.5 to 3 m.

Direct impacts of the new culvert enclosure include localized removal of riparian vegetation and temporary alteration of the channel banks and bed. Enclosure of approximately 40 m of the watercourse will also result in reduced solar and allochthonous inputs. The habitat conditions through the affected reach are not particularly sensitive since the channel has been modified in the past and resembles a small, straightened drain feature at the crossing location. The impacts of the new culvert can be addressed with the implementation of the mitigation measures outlined in **Section 8.1.5**.

Opportunities to improve on the preliminary design of the low flow channel through the structure are documented in the geomorphological report by Geomorphix (2022) (**Appendix L**). It is recommended that “provision of a morphologically diverse channel such as riffle-pool or cascade is appropriate as it would essentially replicate a natural fluvial system while also promoting stability within the crossing”. Further geomorphological assessment should be completed at detailed design to confirm if this type of treatment is required / needed and if so to provide appropriate designs.

Potential Direct Impacts at the Existing Crossing of Steeles Avenue

Direct impacts of the existing culvert removal include localized removal of riparian vegetation and temporary alteration of the channel banks and bed. However, the benefits of ‘opening up’ and restoring the channel at the crossing site far outweighs the

potential impacts, which can be addressed with the implementation of the mitigation measures outlined in **Section 8.1.5.**

Opportunities to improve on existing conditions are documented in the geomorphological report by Geomorphix (2022) (**Appendix L**). They note that "the roadwork provides an opportunity to redefine the existing altered condition of NW-1-E near Steeles Avenue. Realignment of the watercourse in the vicinity of the existing roadway applying natural channel design standards can improve connectivity with downstream reaches, enhance hydrologic function, and promote aquatic habitat and passage conditions." Other improvements associated with 'opening up' the channel includes increased solar and allochthonous inputs. Further geomorphological assessment should be completed at detailed design to confirm if this type of treatment / restoration is the best way to improve the channel conditions with the removal of the existing culvert, and if so to provide appropriate designs.

The habitat conditions through the affected reach are not particularly sensitive since the channel has been modified in the past and resembles a small, straightened drain feature up and downstream of the crossing location. The culvert (0.75 m diameter HDPE pipe) currently outlets downstream through an old stone retaining wall in poor condition.

Tributary NW-1-E Sixteen Mile Creek is classified as a warmwater system with direct fish use. It is identified as 'Intermittent – seasonal habitat' and designated as 'High Constraint with Rehabilitation Potential' in the Milton Heights Neighborhood SIS (Rand Engineering et al., 2014). It is considered 'Contributing Habitat' for Redside Dace and American Eel, and both are protected species.

MNRF also indicated that there are records of Bridle Shiner (SC under the ESA and SARA) in the vicinity of the study area and MECP indicated that there are historical records of Northern Sunfish (SC) in the Sixteen Mile Creek watershed (see correspondence in **Appendix A**). DFO SAR mapping (April 2022) also indicates that Northern Sunfish SARA) is "found (or potentially found)" in this tributary.

Potential Indirect Impacts

Potential construction related indirect impacts of the proposed culvert works, along both the preferred design alternative and associated with the existing culvert removal and restoration works, includes local disruption during the works and potential for erosion

and downstream sediment transport during periods of higher flow, which can be addressed with the use of the mitigation measures outlined in **Section 8.1.5**.

Further review of the impacts on Tributary NW-1-E will occur at detailed design, along with submission of these works to DFO as a Request for Review (RfR).

Unnamed Tributary of NW-1-E (Natural Heritage Feature #1)

Proposed Works

The preliminary design of the preferred alignment encroaches on approximately 52 m of the Unnamed Tributary of NW-1-E at the west end. This encroachment could require realignment of this section of the watercourse (channel shifted slightly the north), however the use of a retaining wall should be considered to avoid the impacts of a realignment. Both scenarios should be reviewed at detailed design, with the preference of using a retaining wall, if possible.

See Plate #3 in **Appendix J** and the aquatic habitat mapping in **Appendix E**.

Potential Direct and Indirect Impacts

If a realignment is required, direct impacts would include localized removal of riparian vegetation and alteration of the channel banks and bed. The channel section through the affected reach was previously realigned as part of the Tremaine Road improvements to the west. The impacts of a realignment can be addressed with the implementation of the mitigation measures outlined in **Section 8.1.5**. If a realignment is required, a geomorphological assessment should be completed at detailed design to further document existing conditions and provide appropriate designs.

The Unnamed Tributary of NW-1-E is a small warmwater watercourse (likely permanent) with direct fish use that is designated as Medium to High constraint in the *Detail Design of Improvements to Tremaine Road, from 300 m South of 14th Sideroad (former Main Street) to 150 m North of Steeles Avenue, Town of Milton, Natural Environment Impact Assessment*, Ecoplans Limited/WSP, 2013. It is considered 'Contributing Habitat' for Redside Dace and American Eel, both are protected species.

MNRF also indicated that there are records of Bridle Shiner (SC under the ESA and SARA) in the vicinity of the study area and MECP indicated that there are historical records of Northern Sunfish (SC) in the Sixteen Mile Creek watershed (see

correspondence in **Appendix A**). DFO SAR mapping (April 2022) also indicates that Northern Sunfish SARA) is “found (or potentially found)” in this tributary.

Potential construction related indirect impacts of the potential realignment works include local disruption during the works and potential for erosion and downstream sediment transport during periods of higher flow, which can be addressed with the use of the mitigation measures outlined in **Section 8.1.5**.

If a realignment is required, further review of the impacts on the Unnamed Tributary NW-1-E will occur at detailed design, along with submission of these works to DFO as a Request for Review (RfR).

Agricultural Swale (Natural Heritage Feature #2)

Proposed Works

The preferred alignment will remove approximately 36 m of this swale where it connects to the existing roadside ditch along the south side of Steeles Avenue. See Plate #1 in **Appendix J**.

Potential Direct and Indirect Impacts

Although 36 m of this swale will be removed, the function of the swale will be retained.

This feature is a small, agricultural field swale that conveys the ephemeral ditch drainage from Steeles Ave. and local surface drainage to Tributary NW-1-E. This swale would be considered ‘Low Constraint’ under the Aquatic Constraints definition found in the Milton Heights Neighborhood SIS (Rand Engineering et al., 2014). There is no direct fish habitat, however since the swale drains to Tributary NW-1-E, it would be considered ‘Contributing Habitat for Redside Dace’, both are protected species.

MNRF also indicated that there are records of Bridle Shiner (SC under the ESA and SARA) in the vicinity of the study area and MECP indicated that there are historical records of Northern Sunfish (SC) in the Sixteen Mile Creek watershed (see correspondence in **Appendix A**). DFO SAR mapping (April 2022) also indicates that Northern Sunfish SARA) is “found (or potentially found)” in this tributary.

Potential construction related indirect impacts (e.g., erosion and downstream sediment transport during period of flow) can be addressed with the use of the mitigation measures outlined in **Section 8.1.5**.

Stormwater Management and Fisheries

The preliminary design of the preferred Steeles Avenue alignment will result in an increase in impervious areas and resulting road runoff compared to the existing conditions. Therefore, stormwater mitigation measures are important to alleviate potential impacts (e.g., potential increases in erosion and resulting sediment, runoff related contaminants, stream temperature) resulting from increased quantity and the quality of stormwater runoff on receiving watercourses. Water temperature is one of the most important factors since it determines what lives in a watercourse (e.g., fish species and invertebrates), and so particular attention to the mitigation of thermally enriched stormwater runoff (from the paved and hardened surfaces of the new preferred alignment) is particularly important.

The Drainage and Stormwater Management Report (**Appendix F**) notes the following preliminary mitigating measures that will offset the impacts relating to water quality and quantity in the receiving watercourses:

- Under proposed conditions, improvements to quality and quantity controls will be achieved by directing some of the roadway areas to a proposed dry pond (outlets to Tributary NW-1-E of Sixteen Mile Creek), and an underground pipe storage facility (ultimately drains to Sixteen Mile Creek) to provide peak control.
- The new urbanized roadway will be drained by a new storm sewer to be located within the right-of-way. Storm sewer designs are going to be provided during the detailed design phase.
- Enhanced level of quality treatment of the roadway will be provided by using oil grit separators (OGSs), enhanced grassed swales, and Low Impact Development (LID) practices to function as a treatment train. LID practices will be reviewed at detailed design.

The mitigation measures noted above are preliminary and as noted they will be further analyzed and finalized at the detailed design stage, with particular emphasis on the mitigating the thermal impacts of stormwater runoff. For example, the Drainage and Stormwater Management Report (**Appendix F**) notes that the proposed dry pond that will outlet to Tributary NW-1-E of Sixteen Mile Creek, could also be replaced with an underground storage facility / tank. From a thermal impact perspective, an underground storage facility / tank could provide more thermal mitigation / regulation to Tributary NW-1-E than a dry pond. As noted in a report entitled Data Synthesis and Design Considerations for Stormwater Thermal Mitigation Measures, Toronto and Region

Conservation Authority (TRCA) and Credit Valley Conservation (CVC), 2019, the following reference was made in relation to underground tanks and chambers:

> "From a thermal mitigation perspective, these systems function much like an infiltration trench, but typically for much larger flows. In a study of an underground detention chamber in Markham conducted by STEP in collaboration with the University of Toronto, the temperature outflows were found to be consistently below inflow temperatures throughout the warm season (Drake et al., 2016). Temperatures did not show diurnal fluctuations or significant changes in response to rainfall events."

If at detailed design a dry pond is found to be required, other potential mitigation measures associated with a dry pond could include cooling trenches, usually installed downstream of the pond if the land area permits. These are further described in the above report as:

> "Cooling trenches typically consist of one or more geotextile wrapped perforated pipes in a clear stone filled trench that is buried underground. Contact of warm pond flow with cooler stone media and side walls promoted transfer of heat from the water to the stone and surrounding soils, thereby reducing the temperature of outflows discharged to the stream"

An underground pipe storage facility in combination with oil grit separators are also proposed for drainage to Sixteen Mile Creek. This facility will be further investigated at detailed design to determine if underground pipes or a storage tank should be used. From a thermal mitigation perspective, both pipes and tanks are located underground and should provide increased thermal mitigation / regulation, however the increased storage and retention of a tank should increase the amount of time for cooling the flow which should be considered.

Also noted in the Drainage and Stormwater Management Report (**Appendix F**) "Quality treatment of runoff from the roadway catchments will be provided through oil grit separators (OGS) and vegetative grassed swales in maintaining a treatment train approach. There is a possibility of providing bio-swales in proposed ditches as a LID measure which will be further reviewed in the detailed design phase." As noted in TRCA and CVC report (2019) "Low Impact Development Practices (LID) can be implemented within the upstream drainage area or pond block to provide cooling. They increase the

capacity of streams to assimilate thermal impacts primarily by reducing stormwater volumes through infiltration, evapotranspiration and / or reuse, although several practices also reduce temperatures."

As noted above, the stormwater quantity and quality treatment plan will be further reviewed and finalized at detailed design in coordination with CH. Further review of the impacts of increased stormwater runoff on the receiving watercourses with the study area, and the proposed mitigation measures (with particular attention on mitigating thermal impacts), will also be completed at that time to ensure that any direct and indirect impacts are minimized as much as possible. This has been added as a commitment in **Section 8.9**.

8.1.5 Species of Conservation Concern

This section reviews potential impacts of the proposed works on aquatic, botanical and wildlife SCC (including SAR). The assessment will address species that were confirmed to be present or have a reasonable potential of occurring in the study area (as previously assessed in **Section 3.4.8**). Potential impacts for SAR are also summarized in Table 4 in **Appendix E**.

Aquatic SCC Potential Impacts

As outlined, MECP has noted that Sixteen Mile Creek is considered 'Contributing Habitat for Redside Dace' [END under the ESA and SARA] and 'Occupied Habitat' for American Eel [END under the ESA] in the vicinity of the Steeles Avenue. The remaining watercourses (Tributary NW-1-E of Sixteen Mile Creek, Unnamed Tributary of NW-1-E, and the Swale) within the study area are considered 'Contributing Habitat' for Redside Dace and American Eel.

MECP also noted that there are historical records of Northern Sunfish (SC under the ESA and SARA) within the watershed. Northern Sunfish is also indicated on DFO SAR mapping as "found (or potentially found)" within Sixteen Mile Creek and the other watercourses within the study area (i.e., Tributary NW-1-E of Sixteen Mile Creek, Unnamed Tributary of NW-1-E and the Agricultural Swale). Furthermore, MNRF also indicated that there are records of Bridle Shiner (SC under the ESA and SARA) in the vicinity of the study area.

As noted, for both these SC species the only potential habitat found within the study area is in the Tributary of NW-1-E, downstream (north) of Steeles Avenue and the CP

Rail Culvert. However, given the preference of warmwater habitat for both species, this tributary (classified as warmwater) may not provide their preferred habitat since it appears to provide more coldwater habitat given the findings of the field surveys in July 2017 (Rainbow Trout fingerling was captured downstream of Steeles Ave.).

At the Sixteen Mile Creek crossing, the new bridge structure fully spans the bankfull channel width, which will result in local removal of riparian vegetation and possible temporary alteration of the channel banks if bio-engineering techniques are incorporated into the design (at detailed design). There will also be some local removal of riparian vegetation and alteration of the channel banks and bed associated with the culvert works and potential realignment works associated with Tributary NW-1-E of Sixteen Mile Creek and the Unnamed Tributary of NW-1-E respectively. The culvert works on Tributary NW-1-E of Sixteen Mile Creek are located well upstream of Steeles Avenue (approximately 200 m) and will not directly impact the potential habitat for Northern Sunfish and Bridle Shiner found downstream of Steeles Avenue and the CP Rail Culvert.

The overall habitat conditions and contributing functions of these watercourses should be maintained, or in the case of the potential watercourse realignment, re-instated. Stringent mitigation measures with particular attention to the design and implementation of effective erosion and sediment control, and the use of an appropriate timing window to protect sensitive spawning periods for these noted species, are recommended to minimize potential impacts to these species as outlined in **Section 8.1.5**.

Vegetation SCC Potential Impacts

Species at Risk

As previously noted, a Butternut sapling (END) was found in Unit 1b, approximately 50 m south of the preliminary grading limits (see location on Exhibit 1, **Appendix E**). If it is determined at the detailed design phase that impacts are anticipated to occur within 50 m of the tree, a Butternut Health Assessment (BHA) shall be completed to inform permitting or registration requirements.

Although not observed, the following three (3) additional SAR flora have reasonable potential to occur within the study area:

- American Columbo (END);
- Eastern Flowering Dogwood (END); and

- Red Mulberry (END)
    - The preferred alignment should be reviewed at detailed design to confirm that these species are not present.
- Provincially Rare Species
    - In addition to the SAR discussed above, one (1) provincially rare species, Northern Hawthorn (S3) has potential to be present in the cultural thicket and hedgerows within the study area. The preferred alignment should be reviewed again at detailed design to confirm that this species is not present.
- Regionally Significant Species
    - As discussed in **Section 3.4.8**, there were 13 regionally significant species documented in the study area during the 2017 and 2018 surveys, including:
        - Short-scale Sedge
        - Knotted Rush
        - Virginia Creeper
        - Pendulous Bulrush
        - Shagbark Hickory
        - Canada Horseweed
        - Rough Bedstraw
        - Eastern Red Cedar
        - White Spruce
        - Purple-leaved Willow-herb
        - Woodland Strawberry
        - Yellow Avens
        - Panicled Aster
    - These species have been documented according to the vegetation unit in which they were observed (See Table 2, **Appendix E**); exact locations were not recorded. The vegetation communities supporting these species should be reviewed at detailed design to determine impacts to these individuals / populations, if any. Consultation with CH should then occur to determine appropriate mitigation measures, on a species-specific basis.

Wildlife SCC Potential Impacts

Species at Risk – Confirmed

Through background data review and the 2017-2018 field surveys, five (5) SAR[5] wildlife were confirmed using habitat within or adjacent to the preferred alignment footprint – Barn Swallow (Threatened, ESA and SARA), Eastern Wood-Pewee (Special Concern, ESA and SARA), Snapping Turtle (Special Concern, ESA and SARA), Midland Painted Turtle (not listed, ESA; Special Concern, SARA) and Monarch (Special Concern, ESA and SARA). Potential impacts on these species are outlined below:

- **Barn Swallow:** Potential impacts resulting from the proposed roadway / bridge construction are limited to minor removal or temporary disturbance of foraging habitat (e.g., cultural meadow and riparian corridors). The proposed works will not impact the confirmed nesting habitat (CP Rail culvert at Tributary NW-1-E of Sixteen Mile Creek crossing). Post-construction, there is potential for the new bridge to provide nesting habitat.
- **Eastern Wood-pewee:** Breeding habitat for Eastern Wood-pewee will be directly impacted by the proposed works, as the preferred alignment will result in removals in woodland units where possible breeding evidence was recorded (ELC Unit 1b, and edge of Unit 11). However, this species is not highly area-sensitive and sufficient areas for Eastern Wood-pewee breeding habitat will remain available adjacent to the alignment. No significant impacts on local populations are anticipated.
- **Monarch:** This species was recorded along the wetland edge in ELC Unit 4a and no direct impacts are proposed for this location. Although the preferred alignment footprint will result in removal of potential foraging / dispersal habitat in cultural meadow / fields, overall impacts are expected to be minimal as no caterpillars or eggs were recorded and no areas with high concentrations of Milkweed vegetation will be impacted by the proposed works. In addition, areas with temporary disturbance for grading along the right-of-way are expected to regenerate or be restored, providing suitable meadow foraging / dispersal habitat post-construction.
- **Snapping Turtle** and **Midland Painted Turtle:** Precise locations of nesting and/or overwintering habitat in the study area for these species are unknown; however, it is likely that habitat is limited to wetland in ELC Unit 4a with occasional dispersal along the Tributary of NW-1-E of Sixteen Mile Creek and the Sixteen Mile Creek corridors. There is also potential turtle habitat in ELC Unit 17 and the adjacent SWM pond. Except for some minor edge removals in ELC Unit 17, the potential turtle habitat in the wetlands will not be directly impacted by the

[5]Of the five (5) SAR confirmed, only one (1) species (Barn Swallow, THR) is currently afforded protection under the ESA. The other confirmed species are listed as Special Concern.

proposed works; however, mitigation measures to prevent turtles from entering or nesting in the work areas are recommended in **Section 8.1.5**.

- There is also potential for reduced road mortality risks since the existing Steeles Avenue vehicle traffic will be eliminated adjacent to ELC Unit 4a, and permanent wildlife fencing could direct herpetofauna to safely cross below the new structure at Tributary of NW-1-E of Sixteen Mile Creek.

Species at Risk – Potential

As discussed in **Section 3.4.8**, the SAR screening assessment identified eight (8) other species that have a reasonable potential of occurring within the study area. The impacts of the proposed works for these potential SAR are reviewed below:

- **SAR Bats (moderate potential for Little Brown Myotis and Northern Myotis)**: There is a minimal potential for impacts on SAR bat habitat within the riparian areas of Sixteen Mile Creek and Tributary NW-1-E, as well as the hedgerow and the thicket area. In the 2017-2018 field surveys, WSP identified:
  - six (6) cavity trees and seven (7) potential Tri-coloured bat habitat trees in the Sixteen Mile Creek riparian area, of which six (6) would potentially be removed for the preferred alternative
  - 12 cavity trees in the Tributary NW-1-E riparian area, of which three (3) would potentially be removed for the preferred alternative
  - three (3) cavity trees and 10 potential Tri-coloured bat habitat trees in the hedgerow and thicket areas, of which five (5) would potentially be removed for this alternative
  - two (2) cavity trees and seven (7) potential Tri-coloured bat habitat trees in ELC Unit 11 (FOD9-3), of which three (3) would potentially be removed for this alternative (see Exhibit 1, **Appendix E** for location of impacted trees).

MECP review comments (email October 23, 2020, **Appendix A**) indicate that the proposed tree removals for the Steeles Avenue preferred alignment would not be considered damage or destruction of habitat under the ESA, provided that mitigation measures are implemented (timing window for tree removal outside of the April 1 – September 30 timing window as described in **Section 8.1.5.4**). MECP also noted that further acoustic monitoring surveys of bats will not be required and efforts to mitigate impacts to displaced bats by installing bat boxes will be encouraged.

- **Bank Swallow** and **Chimney Swift:** There is a moderate potential for these aerial insectivore species to occur as foraging visitants over cultural meadow,

riparian, or wetland vegetation in the study area; however, no confirmed or potential nesting habitat for these species was identified and impacts from the proposed works will be limited to minor removals and/or temporary disturbances during construction for foraging habitats.

- **Common Nighthawk:** Potential nesting habitat was identified in the sparsely vegetated cultural meadow (ELC Unit 13). Targeted surveys for this species were not completed; however, they are unlikely to be warranted given that: general mitigation measures for protecting migratory bird nests will be implemented (as described in **Section 8.4.5**), Common Nighthawk is listed a Special Concern under the ESA (not afforded general habitat protection), and sufficient areas with similar quality habitat well remain available in ELC Unit 13 beyond the alignment footprint.
- **Wood Thrush:** Potential nesting habitat is present in ELC Unit 11; however, with implementation of recommended mitigation measures (i.e., MBCA timing windows for tree removals) no impacts on this species are anticipated, and because removals are limited to the edge of this wooded area, no impacts on the function of the breeding habitat are anticipated.
- **Eastern Milksnake:** This species is a habitat generalist and could occur in variety of natural or rural areas. With implementation of recommended mitigation measures (e.g., temporary and permanent wildlife exclusion fencing) no impacts from the proposed works are anticipated.
- **Yellow Banded Bumblebee:** This species is a habitat generalist with abundant suitable habitat in the regional landscape; therefore, proposed removals are unlikely to impact habitat availability.

8.1.6 Mitigation Measures

The following sections outline a series of mitigation measures that are recommended to address the potential impacts of the road construction works within the study area. These measures will be further refined during detailed design. Construction-related measures and measures related to design are outlined to avoid or minimize the potential impacts to local vegetation and associated wildlife and wildlife habitat (including SAR), and to fish and fish habitat.

Design-related Mitigation Measures

The following mitigation measures have been incorporated into the design of the new Sixteen Mile Creek bridge and the Tributary NW-1-E culvert to minimize impacts to fish and fish habitat:

- the new bridge will completely span the bankfull channel of Sixteen Mile Creek.
- the bridge structure will be drained such that deck drains that outfall directly to the river are not required.
- An enhanced level of stormwater quality treatment is proposed to replace the existing drainage system and mitigate / treat the increased quantity and the quality of stormwater runoff from the preferred Steeles Avenue alignment, prior to entering the study area watercourses. The preliminary stormwater treatment plan may include the use of a dry pond that outlets to Tributary NW-1-E of Sixteen Mile Creek and an underground pipe storage facility for flows that ultimately drain to Sixteen Mile Creek. An enhanced level of quality treatment of the roadway will be provided by using oil grit separators (OGSs) enhanced grassed swales, and Low Impact Development (LID) practices to function as a treatment train.
- Further analysis and consideration to further mitigate the thermal impacts of the stormwater runoff will be completed at detailed design. For example, an underground storage facility / tank could be used for treating stormwater runoff to Tributary NW-1-E of Sixteen Mile Creek instead of a dry pond. Similarly, an underground storage tank could be used for treating stormwater runoff to Sixteen Mile Creek, instead of an underground pipe storage facility. Also, the use of potential cooling trenches in combination with the proposed dry pond and LID practices such as 'bio swales' could be used within the upstream drainage area or pond block to provide additional cooling measures and should be considered. (see the Drainage and Stormwater Management Report in **Appendix F**).
- The Tributary NW-1-E culvert will be an open bottom culvert that will include a low flow channel designed for fish passage. Wildlife passage / movement opportunities through culvert will include the use of overbank bench areas. The culvert will be designed and installed to transition smoothly with the up and downstream channel sections.
- Both the bridge at Sixteen Mile Creek and the open-bottom culvert at Tributary NW-1-E should be reviewed at detailed design to ensure the dimensions are suitable to ensure wildlife passage for a range of wildlife including White-tailed Deer, small to mid-sized mammals (e.g., voles, fox, skunk, raccoon) and herpetofauna (e.g., turtles, snakes and frogs). Conservation Halton's Road Ecology Best Management Practices: Quick Reference Guide (2018) should be consulted to ensure relevant measures are incorporated. At a minimum the following design guidelines should be targeted, in consultation with the Region and CH:
    - An openness ratio (OR) of **0.6 to 1.0** to ensure suitable passage for deer. This OR is also suitable for small and mid-sized mammals and

herpetofauna. If this OR can't be achieved for the culvert, the minimum OR should be **0.1** (i.e., the minimum OR for turtles)

- Minimum height of 2 m
- Use of suitable substrates. Avoid use of rip-rap and fill voids between larger material with materials appropriate for wildlife footing (e.g., native substrates or granular B)
- Install habitat features to provide cover for small wildlife (e.g., boulder piles, anchored logs), where appropriate

- Wildlife fencing to funnel wildlife to the two watercourse crossings (Tributary NW-1-E to Sixteen Mile Creek) should also be further explored at detailed design, in consultation with the Region and CH.

Construction-related Mitigation Measures – Erosion and Sediment Control

- A comprehensive erosion and sediment control plan will be developed and implemented by the Contractor to prevent migration of sediment laden runoff (or other contaminants) from the construction zone to the watercourses, including inspection and maintenance, until final cover is established. These measures include but are not limited to the following elements:
  - Temporary erosion and sediment control measures will be installed prior to construction and maintained throughout to prevent / control erosion and prevent migration of sediment to watercourses or terrestrial features.
  - The erosion and sediment control measures will be routinely inspected, including after storms, and repaired as required.
- Isolation of the near-water construction zones using standard perimeter silt fencing of the general construction zone up and downstream. Additional protection (e.g., two rows of standard silt fencing) will be used where needed for disturbed areas that drain to the watercourses.
- At the crossing locations along the preferred design alternative (Sixteen Mile Creek and Tributary NW-1-E), isolation of the bridge bank areas (if bioengineering works are required) and culvert construction zones, should utilize cofferdams (e.g., gravel bags free of fines) where instream works are required. Cofferdams should also be used for the proposed bridge and culvert (C1) removal works (Sixteen Mile Creek and Tributary NW-1-E) along the existing Steeles Avenue alignment. Temporary flow management measures will be used to maintain clean flow downstream, if needed. Flow withdrawal hoses (if required) will be sited so as to avoid entrainment of fine sediment off the bed, and discharge hoses sited to prevent bed erosion and downstream sediment

transport. Any hoses required to withdraw water from the watercourses (e.g., during temporary flow management) will be screened to prevent fish entrapment. The design opening of the screen material (or screen size) cannot exceed 2.54 mm and the contractor must refer to the Fisheries and Oceans Canada Interim Code of Practice https://www.dfo-mpo.gc.ca/pnw-ppe/codes/screen-ecran-eng.html to further identify the requirements relating to the shape, installation and maintenance for end-of-pipe fish protection screens. If outflow from dewatering is directed on to the land, the discharge station shall be located a minimum of 30 m from the channel edge into a vegetated area and supplemented with a filtration device (e.g., filter sock).

- All exposed surfaces will be stabilized and re-vegetated following construction.

General Site Containment

- The extent of the disturbed areas along the project limits will be kept to a minimum and monitored to minimize the extent of construction-related disturbance. Defined construction access areas will be delineated to prevent unnecessary disturbance.
- The Contractor will develop and implement appropriate spills prevention measures and a spills management plan, including spill control and absorbent materials, instructions regarding their use and notification procedures. The plan will be maintained on-site at all times, and all personnel will be familiar with its implementation. No storage, maintenance or refueling of equipment will be permitted near the watercourses. These measures will encompass:
    - Vehicle maintenance and fueling will be carried out at the maintenance areas in the works yards or at commercial garages whenever possible.
    - Refueling will only be carried out by trained personnel. Care will be taken to prevent the release of fuels to the environment when refueling small equipment in the field.
    - Refueling will not be permitted within 30 m of any woodland, wetland or watercourse, or the top of bank areas.
    - Vehicles will be maintained to minimize leaks. When detected, leaks will be repaired immediately.
    - The Contractor will have a Fuel and Hazardous Material Spill Contingency Plan in place and emergency spill equipment will be maintained on site. Any spilled product shall be contained and cleaned-up in accordance with the Spills Response Contingency Plan.

- All spills will be immediately controlled and reported to the authorities having jurisdiction and the Owner's Representative.
- Any potentially hazardous materials will be stored and handled according to applicable Regulations and all products shall be properly labeled.
- Equipment will be generally free of fluid leaks and externally cleaned/degreased to prevent any deleterious substance from entering the area.
- In dust-sensitive areas, dust will be controlled through the use of water.
- All temporary storage of debris / excess materials generated from construction will be properly sited and contained to prevent migration offsite and specifically entry to the watercourse.
- Storage sites will be inspected periodically for compliance with these requirements.

General Vegetation, Wildlife and Fish Protection

Vegetation

- Vegetation that does not require removal for purposes of the construction will be protected through the installation and maintenance of temporary vegetation and tree protection measures (e.g., temporary fencing).
- Appropriate vegetation clearing techniques will be used (e.g., felling trees away from retained natural areas).
- Unnecessary traffic, dumping and storage of materials over tree roots will be avoided.
- Edge management measures (e.g., planting to 'seal' the new forest edge) for Vegetation Units 1b, 9, 11 and 12 will be considered at detailed design and implemented where appropriate.
- The Butternut tree in Unit 1b will be reviewed at detailed design. If it is determined that impacts are anticipated to occur within 50 m of the tree, a Butternut Health Assessment (BHA) (between May 15 and August 30) shall be completed to inform permitting or registration requirements.
- The preferred alignment should be reviewed at detailed design to confirm that the SAR and provincially rare vascular plant species identified to have reasonable potential to occur, are not present.
- The vegetation communities supporting regionally significant vascular plant species should be reviewed at detailed design to determine impacts to these

individuals / populations, if any. Consultation with CH should then occur to determine appropriate mitigation measures, on a species-specific basis.

- All exposed surfaces will be stabilized and re-vegetated following construction. Disturbed areas will be re-seeded with a native seed-mix. Native plantings suitable to the site conditions will also be used in the development of Landscape Plan (**Appendix K**) at the detailed design stage.
- Tree Inventory and Removals within the Study Area are shown in **Appendix K** and will be refined at the detailed design stage. The Region's Tree Canopy Replacement Policy will be adhered to at detailed design, where applicable and through coordination with the Regional Foresters.
- Vehicles, machinery and heavy equipment will arrive on-site in clean condition, including free of mud / soil / dirt from other locations and including clean wheel / tire / tracks, and will be maintained free of fluid leaks. In order to reduce the spread of invasive species, equipment will be thoroughly cleaned before being brought onsite and before leaving the site in accordance with the Clean Equipment Protocol (Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf (ontarioinvasiveplants.ca)).

Wildlife and Wildlife Habitat (including SCC)

The mitigation measures outlined above to minimize effects to vegetation and protect adjacent retained natural areas will also serve to protect the associated wildlife habitat. However, it is also necessary to ensure the protection of nesting migratory birds as well as all wildlife that may utilize the areas where construction is proposed.

The contractor is responsible to protect migratory birds and to be in compliance with the *Migratory Birds Convention Act* (1994) and Regulations. The "Regional Nesting Period" for this area April 1 – August 31, as identified on the Environment Canada website by "nesting zone" C: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html#toc0.

For more information on reducing risk to migratory birds, the contractor should consult Environment Canada's website at: https://www.canada.ca/en/services/environment/wildlife-plants-species/migratory-birds.html.

- Under no circumstances will active nests of migratory birds, or these birds or their young or eggs, protected under the Migratory Birds Convention Act, 1994 (MBCA), be knowingly disturbed or harmed. If an active nest is found in the

construction area, construction will cease until the young have fledged (to be determined by a qualified ecologist) and the CA has been notified.

- No vegetation clearing (including grubbing and removal of trees, shrubs, grasses and plants) will be conducted during the 'Regional Nesting Period' (April 1 – August 31). The Contractor will be made aware that occasionally bird species will precede or exceed the approximate nesting period or breeding bird window.
- Any wildlife incidentally encountered during construction will not be knowingly harmed and will be allowed to move away on their own. If they do not, the environmental inspector will capture and release any small wildlife (e.g., amphibians) stranded within the construction zone. If the animal is injured, a wildlife rehabilitator will be contacted.
- In the event that a SAR or possible SAR is found in the construction area, all construction that could potentially harm the animal will cease immediately and the Contract Administrator will be notified.
    - Confirm species identity, using a qualified ecologist if required, and notify MECP if the animal is a SAR or potential SAR.
    - Allow the animal to move away on its own.
    - Use a trained individual to move species that are not specifically protected under the ESA using accepted handling and relocation procedures.
    - The Contract Administrator will contact the MECP SAR Biologist for direction on relocation of SAR protected under the ESA (2007).
- For the works on Sixteen Mile Creek, Tributary NW-1-E of Sixteen Mile Creek, Unnamed Tributary of NW-1-E and for ELC Unit 17 (MAS2-9), it is recommended that instream works be avoided between September 1 and April 1 to protect the potential for hibernating turtles, unless work areas can be isolated from turtle entry (e.g., cofferdams) prior to September 1.
- With regard to SAR bats, the removal of the trees within the Study Area will be conducted outside of the bat active period (April 1 to September 30).
- The temporary ESC fencing that will be installed around the in-water and / or near-water construction zones to protect the adjacent watercourse habitats, can also function generally as exclusion fencing for turtles (or other small animals) that might 'wander' inadvertently into the construction areas;
    - Temporary ESC fencing adjacent to watercourses and wetlands should follow recommendations for general turtle / snakes provided in the MECP best practices guide (https://www.ontario.ca/page/reptile-and-amphibian-exclusion-fencing)

- The construction zones will be inspected prior to construction start-up each morning during the active period for turtles (approximately April 1 through October 1) to ensure none has become trapped inside the fencing.
- The use of nylon mesh-reinforced silt fencing should be avoided due to the risk of snake entanglement in this fencing material.

Fish and Aquatic Habitat

- Although Tributary NW-1-E of Sixteen Mile Creek is classified as warmwater, a Rainbow Trout fingerling was captured by WSP during the surveys and therefore a coldwater instream timing window (work permitted only between July 1 and September 15) should apply to the culvert crossings in-water work. This timing window should also be applied to the bridge construction and removal in-water works at the crossings of Sixteen Mile Creek and to the other proposed in-water works associated with the Unnamed Tributary of NW-1-E and the Swale feature. This timing window is appropriate for the protection of Redside Dace found downstream and outside the study area watercourses and for the protection of American Eel which uses Sixteen Mile Creek as a migratory corridor. This timing window should be confirmed with CH at detailed design.
- A fish salvage / rescue will be completed for the culvert construction and removal works on the Tributary NW-1-E of Sixteen Mile Creek, for the Sixteen Mile Creek bridge construction works (if instream bank works are proposed at detailed design) and bridge removal works, and at the Unnamed Tributary to NW-1-E (if a channel realignment is proposed at detailed design), with the use of a backpack electrofisher. Any captured fish will be removed and released unharmed to a site downstream of the work areas. A License to Collect Fish for Scientific Purposes permit from the MNRF will be required.
- Additional geomorphological assessments should be completed at detailed design, at the bridge crossings of Sixteen Mile Creek, the culvert crossings of Tributary NW-1-E and at the Unnamed Tributary of NW-1-E (if realignment of the channel is required) to further document existing conditions, make recommendations and provide appropriate designs. A geomorphologist should also be onsite for implementation of the designs.

Debris and Materials

- All construction-related debris and excess materials will be removed and properly disposed of following construction.

Inspection

- All construction activities and mitigation measures will be inspected and monitored on a regular basis (i.e., minimum daily). An environmental inspector will be responsible for ensuring the erosion and sediment control measures are functioning and all of the mitigation measures are being properly implemented and maintained, and that no wildlife are trapped within the inside of the fencing.
- A geomorphologist should be onsite during the Sixteen Mile Creek bridge construction works (if bank bioengineering works are proposed) along the preferred alignment and during the bridge removal works along the existing Steeles Avenue alignment. Also during the Tributary NW-1-E culvert construction (channel restoration) and removal work along the existing Steeles Avenue alignment, and during the Unnamed Tributary for NW-1-E works (if a channel realignment is proposed), to ensure the work and transition areas are completed according to the future detailed design drawings.

Restoration

- All exposed surfaces will be stabilized and re-vegetated following construction. Native tree and shrub plantings will follow the recommendations of Landscape Plan (**Appendix K**) once they are further developed at detailed design.
- Vegetation compensation will be assessed and determined during detailed design, in consultation with regulatory agencies (e.g., CH, Region of Halton, MECP and DFO, as appropriate). Vegetation compensation will follow the current policies and guidelines of agencies at that time.

8.2 Socio-Economic Environment

8.2.1 Land Use and Community Fabric

The preferred design avoids the hamlet of Peru. The preferred design is expected to improve active transportation connections with the planned multi-use trails and cycling facilities providing multi-modal travel options to residents, with connections to the broader active transportation network.

8.2.2 Noise

As part of the MCEA Study, a noise assessment has been completed to assess potential noise impact to adjacent Noise Sensitive Areas (NSAs) as a result of the proposed improvements. NSAs within the study area include rural residential properties

located on Steeles Avenue. The technical memo for the Noise Assessment can be found in **Appendix H**.

Noise levels are predicted in decibels in the A-weighted dBA scale, which best approximates the human perception of sound over a specified time period. An increase of 2 to 3 decibels in noise level is considered to be just perceivable to the average person. It should be noted that a 3 dBA increase in noise equates to a doubling of traffic volumes. MTO/MECP Noise Protocol and Halton Region's Noise Abatement Guidelines (2014) were used on the Noise Assessment.

There are a number of rural residential houses with direct access to existing Steeles Avenue. These residential houses would become reversed frontage to the proposed Steeles Avenue realignment. These properties are considered to be NSAs in this study (see **Exhibit 8-1**). Four of these properties were selected as the representative receivers for the noise assessment, as listed below:

- Receiver 1: 3190 Steeles Avenue W
- Receiver 2: 3170 Steeles Avenue W
- Receiver 3: 3164 Steeles Avenue W
- Receiver 4: 3156 Steeles Avenue W

Projected noise levels were calculated using STAMSON 5.0 program for the selected receiver locations under the future (2031) traffic conditions. As shown in **Table 8-3**, the projected increase in noise level as a result of the proposed realignment of Steeles Avenue under the future conditions is less than 5 dBA for all the representative receivers. The absolute noise levels for all representative receivers are projected to be less than 60 dBA. Based on findings of the noise assessment, the consideration of noise mitigation under the MTO/MECP Noise Protocol, as well as the Region's Noise Abatement Guidelines is not warranted.

Table 8-2: Summary of Noise Level Calculation

Receiver No.	Receiver Address	Noise Level (dBA)		Increase in Noise Level	Consideration of Noise Mitigation as per the Region's Noise Abatement Guidelines (2013) and MTO/MECP Noise Protocol
		Do-nothing (Future with No Improvements)	With Proposed Realignment of Steeles Ave		
1	3190 Steeles Avenue W	54.4	53.5	-0.9	No
2	3170 Steeles Avenue W	50.4	54.3	3.9	No
3	3164 Steeles Avenue W	51.4	54.8	3.4	No
4	3156 Steeles Avenue W	52.4	55.3	2.9	No

Exhibit 8-1: Noise Assessment Results at Representative Receivers in Noise Sensitive Areas

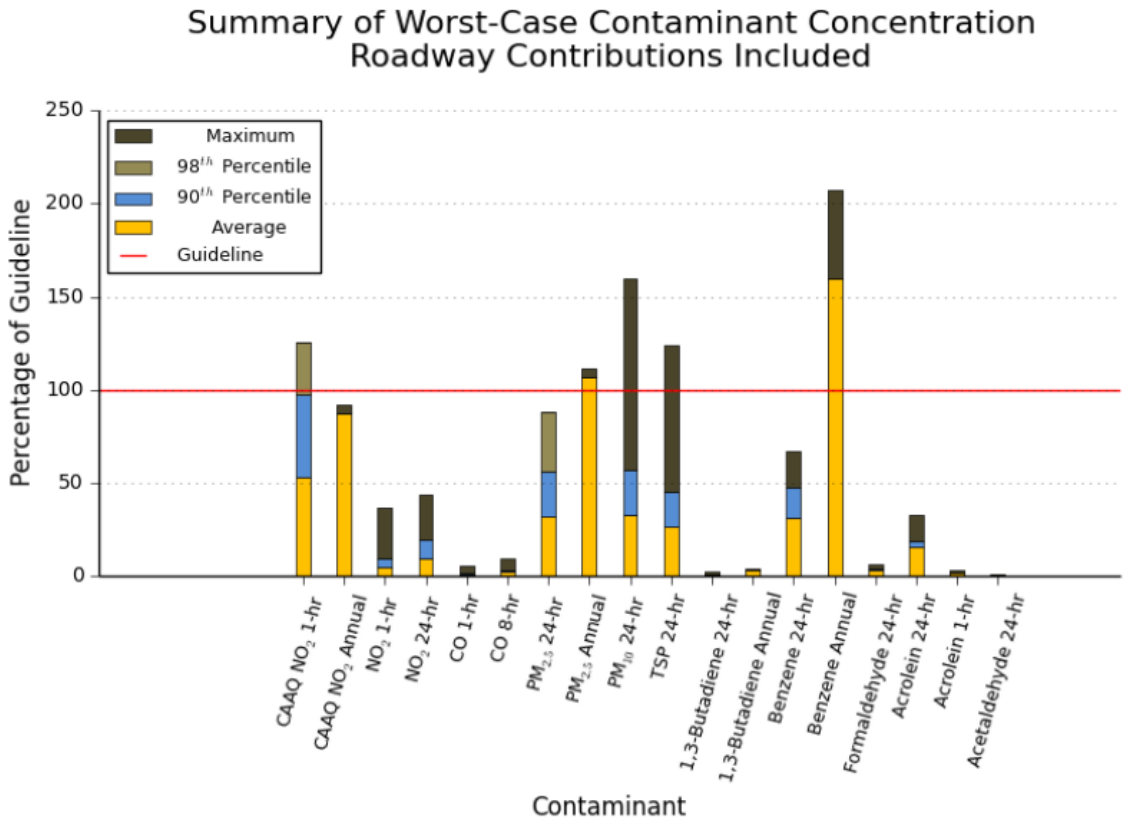
8.2.3 Air Quality

An Air Quality Assessment was carried out as part of this MCEA Study (see **Appendix I**). The potential impact of the proposed project infrastructure on local air quality has been assessed and the results are summarized in **Exhibit 8-2**. An assessment of GHG emissions was also conducted. The following conclusions and recommendations are a result of this assessment:

- The maximum combined concentrations for the future build scenario were all below their respective MECP guidelines or CAAQS, with the exception of the 1 hr NO_2 CAAQ, annual $PM_{2.5}$, 24 hr PM_{10}, 24 hr TSP and annual benzene. Note that for each of these contaminants, background concentrations alone exceeded the guidelines.
- Frequency Analysis determined that there were no additional days on which exceedances of PM_{10} or TSP occurred in 2031 Future Build scenarios in comparison to the 2020 Existing scenario. For both PM_{10} and TSP, exceedances of the guideline occurred less than 1% of the time.
- Mitigation measures are not warranted, due to the small number of days which are expected to exceed the guideline.
- Total GHG emissions from Steeles Avenue are expected to increase by 34% from the 2020 Existing scenario to the 2031 Future Build Scenario.

Exhibit 8-2: Summary of Worst-Case Contaminant Concentration Roadway Contributions Included

5 Year Statistical Summary



Note: The $PM_{2.5}$ results are in compliance with the CAAQS. The highest 3 year rolling average of the yearly 98th percentile combined concentrations was calculated to be 23.84 µg/m³ or 88% of the CAAQS.

% of Guideline	
2031 Future Build	
NO_2 CAAQS (1-hr)	126%
NO_2 CAAQS (annual)	92%
NO_2 (1-hr)	36%
NO_2 (24-hr)	4%
CO (1-hr)	6%
CO (8-hr)	9%
$PM_{2.5}$ (24-hr See Note)	88%
$PM_{2.5}$ (Annual)	107%
PM_{10}	159%
TSP	124%
Acetaldehyde	<1%
Acrolein (1-hr)	3%
Acrolein (24-hr)	33%
Benzene (24-hr)	67%
Benzene (Annual)	208%
1,3-Butadiene (24-hr)	2%
1,3-Butadiene (Annual)	4%
Formaldehyde	6%

8.3 Cultural Environment

8.3.1 Archeological Resources

As noted in **Section 3.3.1**, Stage 1 Archaeology Assessments were carried out as part of the Steeles Avenue MCEA Study from Tremaine Road to Industrial Drive for the full study area (see **Appendix C**). The results of the Stage 1 Archeological Assessments for the full study area are shown in **Exhibit 8-3**. To understand the impact of the preferred design, a schematic of the preferred design overlaid on the results of the Stage 1 Archaeological Assessments is shown in **Exhibit 8-3**.

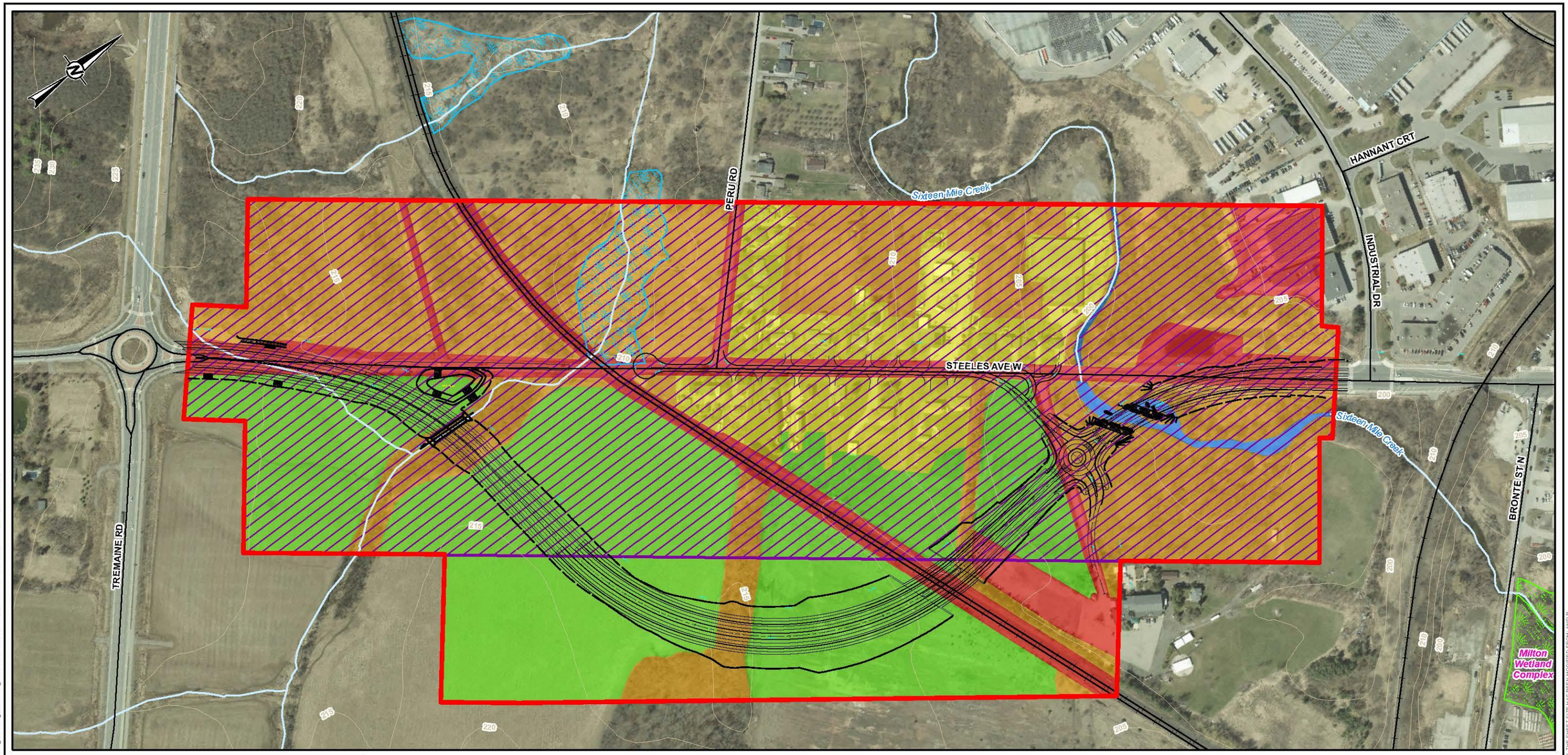
A portion of the study area impacted by the preferred alignment contains archaeological potential and requires further assessment. A Stage 2 Archeological Assessment will be carried out during detailed design prior to any ground disturbing activities as shown in **Exhibit 8-3** below. Areas required for easements (e.g. construction) including at key features (including but not limited to structures and watercourse crossings), may be refined during detailed design based on the findings of the technical studies.

The Stage 2 Archaeological Assessment and subsequent recommendations will be scheduled in advance of any Project activities that may have the potential to disturb archaeological resources. Prior to undertaking this Stage 2 Archaeological Assessment work, Indigenous communities will be advised and afforded the opportunity to have field liaison representative participation.

Below is a summary of the recommendations for the Stage 2 Archaeological Assessment based on the findings of the Stage 1 Archaeological Assessments:

- Recently ploughed agricultural fields must be subject to pedestrian survey at 5 m intervals as per Section 2.1.1 of the Standards and Guidelines for Consultant Archaeologists (2011). Prior to pedestrian survey, the field must be ploughed and weathered to allow for ideal conditions for the identification of archaeological resources. After ploughing, soil visibility must be at least 80% in order for pedestrian survey to proceed;
- Where ploughing is not possible, the property must be subject to test pit survey at 5 m intervals as per Section 2.1.2 of the Standards and Guidelines for Consultant Archaeologists (2011). This recommendation includes areas such as wood lots, manicured lawns, and areas of scrub overgrowth; and,

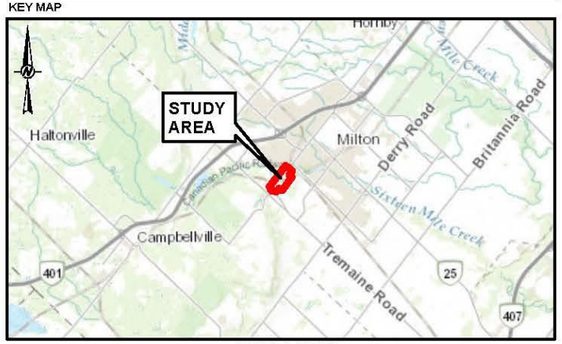
- The portions of the study area located within private residential properties that will be impacted by the project must be subject to a combination of test pit survey and detailed property inspection to confirm areas of disturbance as per Section 2.1.8 of the Standards and Guidelines for Consultant Archaeologists (MTCS 2011, p. 38). Test pit survey can be increased to 10 m intervals in areas of confirmed disturbance based on professional judgement.



LEGEND

- PEDESTRIAN SURVEY AT 5 M INTERVALS
- TEST PIT SURVEY AT 5 M INTERVALS
- TEST PIT SURVEY AT 10 M INTERVALS TO CONFIRM DISTURBANCE
- LOW-LYING AND WET - NO FURTHER WORK RECOMMENDED
- DISTURBED - NO FURTHER WORK REQUIRED
- PREVIOUSLY ASSESSED – FURTHER WORK REQUIRED
- STUDY AREA
- ROADWAY
- RAILWAY
- WATERCOURSE
- TOPOGRAPHIC CONTOUR, metres
- UNEVALUATED WETLAND
- EVALUATED WETLAND (NO SIGNIFICANCE)
- WATERBODY

KEY MAP



SCALE 1:250,000

DRAFT

0 40 80 160

1:4,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. DEVELOPMENT PLAN PROVIDED BY CLIENT TITLED "17M-00979-STEELES AVE-OPT B.DWG"
2. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
3. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
   SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

CLIENT
REGIONAL MUNICIPALITY OF HALTON

PROJECT
STAGE 1 ARCHAEOLOGICAL ASSESSMENT: STEELES AVENUE, TREMAINE ROAD TO INDUSTRIAL DRIVE MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

TITLE
RESULTS OF THE STAGE 1 ARCHAEOLOGICAL ASSESSMENT

CONSULTANT
wsp

YYYY-MM-DD	2022-10-26
DESIGNED	CR
PREPARED	BR
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	Exhibit
17M-00979-00	0001	A	8-3

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PATH: S:\Clients\Region_of_Halton\Steeles_Ave_Tremaine_Rd_to_Industrial_Dr\99_PROJ\17M-00979-00_Halton_MCEA\40_PRO\0001_S11\A\17M-00979-00-0001-s11A-0006.mxd PRINTED ON: 2022-10-26 AT 10:33:15 AM

8.3.2 Cultural Heritage

A Cultural Heritage Assessment was carried out and the Cultural Heritage Assessment Report is included in **Appendix D**. A list of the Built Heritage Resources (BHR) and Cultural Heritage Landscape (CHL) features present in the study area are listed in **Section 3.3.2**.

Based on the background review of the study area, which was conducted through the collection of available background data collection and a field review, the preliminary preferred design, which realigns Steeles Avenue to the south of Steeles Avenue West, avoids significant negative impacts to the existing character and setting of the historical hamlet of Peru on Steeles Avenue to Peru Road. The road improvement project does not include improvements to Steeles Avenue West through the historical hamlet of Peru. The termination of the Steeles Avenue West with a cul-de-sac immediately to the west of Peru Road will contribute to a decreased volume of regional road traffic travelling through the historical hamlet of Peru. The potential impacts and mitigation recommendations for all identified built heritage resources and cultural heritage landscapes can be found in **Table 8-4**.

Table 8-3: Potential Impacts and Mitigation Recommendations for Built Heritage Resources (BHR) and Cultural Heritage Landscapes (CHL) Located Within or Adjacent to the Preferred Design Alternative

Site	Category	Potential Impact	Mitigation Actions
13-15 Peru Road, east side (Residential)	BHR	No anticipated direct or indirect impacts.	No mitigation actions required to protect and conserve identified cultural heritage resource.
17-19 Peru Road, east side (Residential)	BHR	No anticipated direct or indirect impacts.	No mitigation actions required to protect and conserve identified cultural heritage resource.
Peru Road north of Steeles Avenue (Roadscape)	CHL	No anticipated direct or indirect impacts.	No mitigation actions required to protect and conserve identified cultural heritage resource.
CP Rail at Steeles Avenue (Railscape)	CHL	**Indirect Impacts** The existing character and setting of the CP at-grade separation on Steeles Avenue will be changed permanently due to the closure of Steeles Avenue to the east and west of the rail line. The existing at-grade separation will be removed, the remaining road to the west will	No mitigation actions required to protect and conserve identified cultural heritage resource.

Site	Category	Potential Impact	Mitigation Actions
		be removed and the terminated Steeles Avenue to the east will end in a new cul-de-sac.	
Historical Hamlet of Peru	CHL	**Indirect Impact** The existing character and setting of the historical hamlet to the west of Peru Road will be changed due to closure of Steeles Avenue to the west of Peru Road and the introduction of a new cul-de-sac in front of 220, 3222, 3224, 3226, 3228 and 3230 Steeles Avenue (See BHR 6).	No mitigation actions required to protect and conserve identified cultural heritage resource.
3220, 3222, 3224, 3226, 3228, and 3230 Steeles Avenue (Residential)	BHR	**Indirect Impact** The existing character and setting will be changed due to closure of Steeles Avenue to the west of Peru Road and the introduction of a new cul-de-sac in front of the row houses.	Appropriate landscaping treatment at the new cul-de-sac should be considered to enhance the character and setting of the adjacent listed properties comprising row housing at 3220, 3222, 3224, 3226, 3228 and 3230 Steeles Avenue.

Site	Category	Potential Impact	Mitigation Actions
3216 Steeles Avenue (Residential)	BHR	No anticipated direct or indirect impacts.	No mitigation actions required to protect and conserve identified cultural heritage resource.
3198 and 3204 Steeles Avenue (Residential)	BHR	No anticipated direct or indirect impacts.	No mitigation actions required to protect and conserve identified cultural heritage resource.
Steeles Avenue Bridge over Sixteen Mile Creek (Transportation)	BHR	**Direct impact** The existing Steeles Avenue Bridge over Sixteen Mile Creek will be removed and the new Steeles Avenue alignment will have a new bridge structure over Sixteen Mile Creek in a new location.	Built in 1985, the existing road bridge is not 40 years of age and older. The MCEA *Municipal Heritage Bridges Cultural, Heritage and Archaeological Resources Assessment Checklist* (2014) was completed and is contained in Appendix B of **Appendix D**. It concludes the completion of a CHER and/or an HIA for the bridge structure is not required as a mitigation action.
3090 Steeles Avenue (Residential)	BHR	**Indirect Impact** The house identified on the property and noted as possibly being 40 years and older in age is located	No mitigation actions required to protect and conserve identified cultural heritage resource.

Site	Category	Potential Impact	Mitigation Actions
		further to the east away from the new property entrance off the new Steeles Avenue alignment, therefore it is anticipated there are minimal impacts to the building due to the change in the existing environment and the introduction of new noise and dust impacts.	

8.3.3 Direct Impacts

There is one anticipated direct impact to a built heritage resource identified due to the Preferred Design. The existing Steeles Avenue Bridge over Sixteen Mile Creek will be removed and the new Steeles Avenue alignment will have a new bridge structure over Sixteen Mile Creek in another location. The MCEA *Municipal Heritage Bridges Cultural, Heritage and Archaeological Resources Assessment Checklist* (2014) was completed and is contained in Appendix B of **Appendix D**. It concludes the completion of a CHER and/or an HIA for the bridge structure is not required as a mitigation action.

8.3.4 Indirect Impacts

There are four anticipated indirect impacts to the cultural heritage resources identified in **Table 8-3** within and/or adjacent to the study area due to the Preferred Design.

The existing character and setting of the CP rail line will be altered due to the removal of the at-grade separation crossing on Steeles Avenue and the road closing to the east and west of the CP railway line. No mitigation actions are required to protect and conserve the identified cultural heritage resource.

The existing character and setting of the historical hamlet of Peru (Site #5: CHL) at Peru Road and the listed heritage properties located at 3220.to 3230 Steeles Avenue (Site #6: BHR) will be changed due to the termination of Steeles Avenue and the introduction of a cul-de-sac on Steeles Avenue immediately west of Peru Road. No mitigation actions are required to protect and conserve the identified cultural heritage resource for the historical hamlet of Peru. Appropriate landscaping treatment at the new cul-de-sac should be considered to enhance the character and setting of the adjacent listed properties comprising row housing at 3220, 3222, 3224, 3226, 3228 and 3230 Steeles Avenue.

8.4 Transportation

All modes of transportation will be accommodated on realigned Steeles Avenue The preferred design supports Halton Region’s Transportation Master Plan and Active Transportation Master Plan.

During the detailed design phase, the design of the roadway will be refined including the types of intersection controls. Additionally, the active transportation facilities will be designed and reviewed to be consistent to the 2021 revision of the updated Ontario Traffic Manual - Book 18 - Cycling facilities. Following the confirmation of the Preferred Design, the Ontario Traffic Council (OTC) and the Ministry of Transportation of Ontario (MTO) released an update to Ontario Traffic Manual Book 18: Cycling Facilities (OTM Book 18). The new OTM Book 18 provides updated active transportation guidelines. In terms of Steeles Avenue from Tremaine Road to Industrial Drive, new OTM Book 18 recommends at a minimum a buffered separated bike lanes preferably with separation and desirably cycle tracks above the curb. Based on a preliminary review of the preferred design and the new OTM Book 18 guidelines, the current proposed cross-section, which includes 1.8 m for a bike lane plus the boulevard provides enough room to make any required adjustments to the AT facilities to meet OTM Book 18 guidelines. A further review of the active transportation facilities will be completed in detailed design.

Commitments of the Detailed Design Stage is further detailed in **Section 8.8**.

8.5 Drainage and Stormwater Management

A Drainage and Stormwater Management Report assessment was conducted as part of the MCEA Study to provide a traceable decision-making process regarding the proposed watercourse crossing design and SWM design concept. A copy of the Drainage and Stormwater Management Report can be found in **Appendix F**.

Based on the proceeding assessments, the following conclusions can be made:

- The study area is Steeles Avenue between Tremaine Road and Industrial Drive. The existing land use on both sides of Steeles Avenue include residential and commercial sites and mainly meadow with some wooded and long grassed areas. The predominant soil type in the study is Chinguacousy clay loam with a topography sloping towards the Northwest.

Hydrologic Analysis:

- A SWMHYMO and Visual OTTHYMO based hydrologic models were developed to estimate runoff generated from the roadway pavements and from the external areas under existing conditions and to control flows from the road improvements to the pre-development levels in order to ensure that there will be no impact to the overall watershed hydrology.

- The pre-development flows for the study area were generated for the 2-year to 100-year storm events using the 24-hour Chicago storm distribution, all of which were used as the basis for the assessment of proposed conditions flows. The Town of Milton's rainfall IDF data was used to determine the flows and runoff volumes for the study area.
- Any localized increase in flows resulting from the roadway improvements will be controlled to the pre-development levels before discharging to the watercourses.

Hydraulic Analysis:

- Existing Conditions
  - The existing conditions hydraulic models for Sixteen Mile Creek and Tributary NW1-E, obtained from Conservation Halton have been revised to reflect the existing conditions.
  - There are three existing culverts (C1, C3 and C4) and a bridge over Sixteen Mile Creek within the study area limits that cross Steeles Avenue.
  - Under existing conditions Regional Storm will overtop the CP Rail culvert (Culvert C2), located immediately downstream of Steeles Avenue Culvert C1.
  - Due to Culvert C1, 5-year to Regional Storm flows will overtop Steeles Avenue.
  - Under the existing conditions, the current Steeles Avenue Bridge, does not meet any of the MTO HDDS criteria for water crossings. The structure will be overtopped during the 25-year to Regional Storm events.
- Proposed Conditions
  - In the proposed conditions, due to the new Steeles Avenue alignment shifting south, a new 6.5 m wide x 2.6 m rise culvert is proposed, while the existing Steeles Avenue Culvert (C1) is being removed. New culvert has been sized to meet all MTO HDDS Criteria.
  - A new 26.5 m, clear span Steeles Avenue bridge have been proposed over the Sixteen Mile Creek, downstream of the existing bridge.
  - Two Scenarios have been developed under proposed conditions and have been modelled hydraulically; Scenario 1 – with retaining the existing bridge; Scenario 2 – without the existing bridge. Under Scenario 2 water levels will significantly improve north of Steeles Avenue.

- All structures (underpass and Sixteen Mile Creek bridge) can accommodate the 100-year storm event. The new bridge will be overtopped by the Regional Storm due to the downstream CNR culvert controlling the flows; the proposed bridge will meet only the MTO HDDS Relief Flow (Velocity x Depth) criterion. It is not possible to meet freeboard and clearance criterion, due to site conditions, however the road profile as been raised by 0.43 m at the north end, which results in the bridge will having a 1.13 m clearance under the 2-year storm event, which is useful for maintenance purpose.
- The design team has identified an opportunity to improve the water surface elevations within the surrounding area, and specifically at the new Sixteen Mile Creek crossing along Steeles Avenue and CP Rail underpass, by improving the CNR culverts and replacing them with a bridge. **These culverts are owned by a third party and fall outside the scope of the current EA**. Modelling analysis has been undertaken to highlight the potential opportunity for improvements that **could** be achieved in the surrounding area through other capital works. Prior to any implementation of improvements at the CNR culverts, further analysis is required including a review of constructability and would be further investigated as part of other capital projects in the surrounding area.

Stormwater Management

- The proposed improvements of Steeles Avenue will result in an increase of impervious areas compared to the existing conditions.
- Under proposed conditions, improvements to quality and quantity controls will be achieved by directing some of the roadway areas to a proposed dry pond and an underground pipe storage facility to provide peak flow control.
- The new urbanized roadway will be drained by a new storm sewer system to be located within the right-of-way. Storm sewer designs are going to be provided during the detailed design phase.
- Enhanced level of quality treatment of the roadway will be provided by using OGSs, enhanced grassed swales, and LIDs where feasible to function as a treatment train.

Based on the conclusions above, the following recommendations are made:

- As an improvement to the stormwater management strategy, direct runoff from catchments of increased imperviousness will be directed to the SWM pond and underground pipe storage facility for peak flow control.
- OGSs and enhanced grassed swales will be provided where feasible for runoff quality treatment.
- Water balance requirements and LID practices be reviewed during the detailed design phase.

8.6 Source Water Protection

A hydrogeology assessment was conducted as part of the MCEA Study to broadly characterize the hydrogeological conditions in the overall study area between Tremaine Road and Industrial Drive. A copy of the Hydrogeology Report can be found in **Appendix G**.

As noted in **Section 3.6**, a total of eleven (11) areas of potential environmental concern (APEC) were identified as potential sources of soil and groundwater contamination and are ranked as high, moderate, or low potential concern (refer to Table 3.1 of **Appendix G**). For areas of both high and moderate potential concern, it is recommended that a soil contaminant investigation be carried out by a qualified environmental consultant to assess soil quality in support of property acquisition in areas within or in close proximity to the APECs with the moderate potential for contamination. This recommendation should be reviewed and refined during the detailed design stage.

Further, Table 3.2 of **Appendix G** presents the need to carry out additional investigations related to hydrogeology and erosion and sediment control, within seven sub-regions of the Site, during the preliminary design and detailed design stages of the Project. Specifically, this table evaluates the need for specific types of investigations in each respective sub-area, including: Construction dewatering, requirement for in-water works, nearby environmentally sensitive areas, erosion and sediment control, private water supply wells, and potential environmental contamination. The specific need and requirements for additional hydrogeological investigations will be determined during the preliminary and detailed design phases of the project, in co-operation with other disciplines, based on the preferred design, as the project progresses.

8.7 Summary of Mitigation Measures

Table 8-5 below summarizes the mitigation measures to be implemented during detailed design.

Table 8-4: Mitigation Measures to be Implemented During Detailed Design

Category	ID #	Environmental Concern	ID #	Proposed Mitigation Measures
Natural Environment	1.0	Design-related Mitigation Measures	1.1	The following have been incorporated into the design of the new Sixteen Mile Creek bridge and the Tributary NW-1-E culvert to minimize impacts to fish and fish habitat: ▶ the new bridge will completely span the bankfull channel of Sixteen Mile Creek. ▶ the bridge structure will be drained such that deck drains that outfall directly to the river are not required. ▶ An enhanced level of stormwater quality treatment is proposed to replace the existing drainage system and mitigate / treat the increased quantity and the quality of stormwater runoff from the preferred Steeles Avenue alignment, prior to entering the study area watercourses. The preliminary stormwater treatment plan may include the use of a dry pond that outlets to Tributary NW-1-E of Sixteen Mile Creek and an underground pipe storage facility for flows that ultimately drain to Sixteen Mile Creek. An enhanced level of quality treatment of the roadway will be provided by using oil grit separators (OGSs) enhanced grassed swales, and Low Impact Development (LID) practices to function as a treatment train. ▶ Further analysis and consideration to further mitigate the thermal impacts of the stormwater runoff will be completed at detailed design. For example, an underground storage facility / tank could be used for treating stormwater runoff to Tributary NW-1-E of Sixteen Mile Creek instead of a dry pond. Similarly, an underground storage tank could be used for treating stormwater runoff to Sixteen Mile Creek, instead of an underground pipe storage facility. Also, the use of potential cooling trenches in combination with the proposed dry pond and LID practices such as 'bio swales' could be used within the upstream drainage area or pond block to provide additional cooling measures and should be considered (the *Drainage and Stormwater Management Report can be found in* ***Appendix F***). ▶ The Tributary NW-1-E culvert will be an open bottom culvert that will include a low flow channel designed for fish passage. Wildlife passage / movement opportunities through culvert will include the use of overbank bench areas. The culvert will be designed and installed to transition smoothly with the up and downstream channel sections. ▶ Both the bridge at Sixteen Mile Creek and the open-bottom culvert at Tributary NW-1-E should be reviewed at detailed design to ensure the dimensions are suitable to ensure wildlife passage for a range of wildlife including White-tailed Deer, small to

Category	ID #	Environmental Concern	ID #	Proposed Mitigation Measures
				mid-sized mammals (e.g., voles, fox, skunk, raccoon) and herpetofauna (e.g., turtles, snakes and frogs). Conservation Halton's Road Ecology Best Management Practices: Quick Reference Guide (2018) should be consulted to ensure relevant measures are incorporated. At a minimum the following design guidelines should be targeted, in consultation with the Region and CH: • An openness ratio (OR) of **0.6 to 1.0** to ensure suitable passage for deer. This OR is also suitable for small and mid-sized mammals and herpetofauna. If this OR can't be achieved for the culvert, the minimum OR should be **0.1** (i.e., the minimum OR for turtles) • Minimum height of 2 m • Use of suitable substrates. Avoid use of rip-rap and fill voids between larger material with materials appropriate for wildlife footing (e.g., native substrates or granular B) • Install habitat features to provide cover for small wildlife (e.g., boulder piles, anchored logs), where appropriate ▶ Wildlife fencing to funnel wildlife to the two watercourse crossings (Tributary NW-1-E to Sixteen Mile Creek) should also be further explored at detailed design, in consultation with the Region and CH.
			1.2	▶ At detailed design, a Geotechnical Investigation and Hydrologic Investigation detailing groundwater quality and potential temporary and/or permanent (if applicable) dewatering impacts to natural heritage features due to dewatering will be required. Additional details on all CH permit requirements for all applicable permits will be provided prior to detailed design. This will include incorporating relevant information from ongoing studies in proximity to the proposed corridor improvements such as Conversation Halton's ongoing Floodplain Mapping Program work for Sixteen Mile Creek.
	2.0	Construction-related Mitigation Measures	2.1	▶ A comprehensive erosion and sediment control plan will be developed and implemented by the Contractor to prevent migration of sediment laden runoff (or other contaminants) from the construction zone to the watercourses, including inspection and maintenance, until final cover is established. These measures include but are not limited to the following elements: • Temporary erosion and sediment control measures will be installed prior to construction and maintained throughout to prevent / control erosion and prevent migration of sediment to watercourses or terrestrial features. • The erosion and sediment control measures will be routinely inspected, including after storms, and repaired as required.

Category	ID #	Environmental Concern	ID #	Proposed Mitigation Measures
			2.2	▶ Isolation of the near-water construction zones using standard perimeter silt fencing of the general construction zone up and downstream. Additional protection (e.g., two rows of standard silt fencing) will be used where needed for disturbed areas that drain to the watercourses.
			2.3	▶ At the crossing locations along the preferred design alternative (Sixteen Mile Creek and Tributary NW-1-E), isolation of the bridge bank areas (if bioengineering works are required) and culvert construction zones, should utilize cofferdams (e.g., gravel bags free of fines) where instream works are required. Cofferdams should also be used for the proposed bridge and culvert (C1) removal works (Sixteen Mile Creek and Tributary NW-1-E) along the existing Steeles Avenue alignment. Flow withdrawal hoses (if required) will be sited so as to avoid entrainment of fine sediment off the bed, and discharge hoses sited to prevent bed erosion and downstream sediment transport. Any hoses required to withdraw water from the watercourses (e.g., during temporary flow management) will be screened to prevent fish entrapment. The design opening of the screen material (or screen size) cannot exceed 2.54 mm and the contractor must refer to the Fisheries and Oceans Canada Interim Code of Practice https://www.dfo-mpo.gc.ca/pnw-ppe/codes/screen-ecran-eng.html to further identify the requirements relating to the shape, installation and maintenance for end-of-pipe fish protection screens. If outflow from dewatering is directed on to the land, the discharge station shall be located a minimum of 30 m from the channel edge into a vegetated area and supplemented with a filtration device (e.g., filter sock).
			2.4	▶ All exposed surfaces will be stabilized and re-vegetated following construction.
			2.5	▶ Monitoring of potential impacts to Woodlands and Wildlife habitat will be conducted during construction
	3.0	General Site Containment	3.1	▶ The extent of the disturbed areas along the project limits will be kept to a minimum and monitored to minimize the extent of construction-related disturbance. Defined construction access areas will be delineated to prevent unnecessary disturbance.
			3.2	▶ The Contractor will develop and implement appropriate spills prevention measures and a spills management plan, including spill control and absorbent materials, instructions regarding their use and notification procedures. The plan will be maintained on-site at all times, and all personnel will be familiar with its implementation. No storage, maintenance or refueling of equipment will be permitted near the watercourses. These measures will encompass: • Vehicle maintenance and fueling will be carried out at the maintenance areas in the works yards or at commercial garages whenever possible. • Refueling will only be carried out by trained personnel. Care will be taken to prevent the release of fuels to the environment when refueling small equipment in the field.

Category	ID #	Environmental Concern	ID #	Proposed Mitigation Measures
				• Refueling will not be permitted within 30 m of any woodland, wetland or watercourse, or the top of bank areas. • Vehicles will be maintained to minimize leaks. When detected, leaks will be repaired immediately. • The Contractor will have a Fuel and Hazardous Material Spill Contingency Plan in place and emergency spill equipment will be maintained on site. Any spilled product shall be contained and cleaned-up in accordance with the Spills Response Contingency Plan. • All spills will be immediately controlled and reported to the authorities having jurisdiction and the Owner's Representative. • Any potentially hazardous materials will be stored and handled according to applicable Regulations and all products shall be properly labeled. • Equipment will be generally free of fluid leaks and externally cleaned/degreased to prevent any deleterious substance from entering the area. • In dust-sensitive areas, dust will be controlled through the use of water. • All temporary storage of debris / excess materials generated from construction will be properly sited and contained to prevent migration offsite and specifically entry to the watercourse. • Storage sites will be inspected periodically for compliance with these requirements.
	4.0	Vegetation	4.1	▶ Vegetation that does not require removal for purposes of the construction will be protected through the installation and maintenance of temporary vegetation and tree protection measures (e.g., temporary fencing).
			4.2	▶ Appropriate vegetation clearing techniques will be used (e.g., felling trees away from retained natural areas).
			4.3	▶ Unnecessary traffic, dumping and storage of materials over tree roots will be avoided.
			4.4	▶ Edge management measures (e.g., planting to 'seal' the new forest edge) for Vegetation Units 1b, 9, 11 and 12 will be considered at detailed design and implemented where appropriate.
			4.5	▶ The Butternut tree in Unit 1b will be reviewed at detailed design. If it is determined that impacts are anticipated to occur within 50 m of the tree, a Butternut Health Assessment (BHA) (between May 15 and August 30) shall be completed to inform permitting or registration requirements.

Category	ID #	Environmental Concern	ID #	Proposed Mitigation Measures
			4.6	▶ The preferred alignment should be reviewed at detailed design to confirm that the SAR and provincially rare vascular plant species identified to have reasonable potential to occur, are not present.
			4.7	▶ The vegetation communities supporting regionally significant vascular plant species should be reviewed at detailed design to determine impacts to these individuals / populations, if any. Consultation with CH should then occur to determine appropriate mitigation measures, on a species-specific basis.
			4.8	▶ All exposed surfaces will be stabilized and re-vegetated following construction. Disturbed areas will be re-seeded with a native seed-mix. Native plantings suitable to the site conditions will also be used in the development of Landscape Plan (**Appendix K**) at the detailed design stage.
			4.9	▶ Tree Inventory and Removals within the Study Area are shown in **Appendix K** and will be refined at the detailed design stage. The Region's Tree Canopy Replacement Policy will be adhered to at detailed design, where applicable and through coordination with the Regional Foresters.
			4.10	▶ Vehicles, machinery and heavy equipment will arrive on-site in clean condition, including free of mud / soil / dirt from other locations and including clean wheel / tire / tracks, and will be maintained free of fluid leaks. In order to reduce the spread of invasive species, equipment will be thoroughly cleaned before being brought onsite and before leaving the site in accordance with the Clean Equipment Protocol (Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf (ontarioinvasiveplants.ca)).
			4.11	▶ A Tree Preservation Plan will be developed at the detailed design stage.
			4.12	▶ Consultation with Conservation Halton will occur to assess any potential wetland impacts during detailed design.
			4.13	▶ Please note that at detailed design, Unit 15 will be further assessed in the field to re-evaluate if the criterion for a Woodland and Significant Woodland is met.
	5.0	Wildlife and Wildlife Habitat (including SCC)	5.1	▶ The Contractor is responsible to protect migratory birds and to be in compliance with the Migratory Birds Convention Act (1994) and Regulations. The "Regional Nesting Period" for this area April 1 – August 31, as identified on the Environment Canada website by "nesting zone" C: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html#toc0. ▶ For more information on reducing risk to migratory birds, the contractor should consult Environment Canada's website at: https://www.canada.ca/en/services/environment/wildlife-plants-species/migratory-birds.html.
			5.2	▶ Under no circumstances will active nests of migratory birds, or these birds or their young or eggs, protected under the Migratory Birds Convention Act, 1994 (MBCA), be

Category	ID #	Environmental Concern	ID #	Proposed Mitigation Measures
				knowingly disturbed or harmed. If an active nest is found in the construction area, construction will cease until the young have fledged (to be determined by a qualified ecologist) and the CA has been notified.
			5.3	▶ No vegetation clearing (including grubbing and removal of trees, shrubs, grasses and plants) will be conducted during the 'Regional Nesting Period' (April 1 – August 31). The Contractor will be made aware that occasionally bird species will precede or exceed the approximate nesting period or breeding bird window.
			5.4	▶ Any wildlife incidentally encountered during construction will not be knowingly harmed and will be allowed to move away on their own. If they do not, the environmental inspector will capture and release any small wildlife (e.g., amphibians) stranded within the construction zone. If the animal is injured, a wildlife rehabilitator will be contacted.
			5.5	▶ In the event that a SAR or possible SAR is found in the construction area, all construction that could potentially harm the animal will cease immediately and the Contract Administrator will be notified. • Confirm species identity, using a qualified ecologist if required, and notify MECP if the animal is a SAR or potential SAR. • Allow the animal to move away on its own. • Use a trained individual to move species that are not specifically protected under the ESA using accepted handling and relocation procedures. • The Contract Administrator will contact the MECP SAR Biologist for direction on relocation of SAR protected under the ESA (2007).
			5.6	▶ For the works on Sixteen Mile Creek, Tributary NW-1-E of Sixteen Mile Creek, Unnamed Tributary of NW-1-E and for ELC Unit 17 (MAS2-9), it is recommended that instream works be avoided between September 1 and April 1 to protect the potential for hibernating turtles, unless work areas can be isolated from turtle entry (e.g., cofferdams) prior to September 1.
			5.7	▶ With regard to SAR bats, the removal of the trees within the Study Area will be conducted outside of the bat active period (April 1 to September 30).
			5.8	▶ The temporary ESC fencing that will be installed around the in-water and / or near-water construction zones to protect the adjacent watercourse habitats, can also function generally as exclusion fencing for turtles (or other small animals) that might 'wander' inadvertently into the construction areas; • Temporary ESC fencing adjacent to watercourses and wetlands should follow recommendations for general turtle / snakes provided in the MECP best practices guide (https://www.ontario.ca/page/reptile-and-amphibian-exclusion-fencing)

Category	ID #	Environmental Concern	ID #	Proposed Mitigation Measures
				• The construction zones will be inspected prior to construction start-up each morning during the active period for turtles (approximately April 1 through October 1) to ensure none has become trapped inside the fencing. • The use of nylon mesh-reinforced silt fencing should be avoided due to the risk of snake entanglement in this fencing material.
			5.9	▶ During detailed design, lighting design opportunities will be considered adjacent to the significant woodlands to minimize any potential impacts to wildlife habitat in Units 9, 12, 15, 1B ▶ Potential design opportunities will be considered during detailed design to create wildlife corridor linkages to protect and mitigate impacts to habitat connectivity in Units 9, 12, 15, 1B. ▶ Opportunities for invasive species management will be considered during detailed design, where appropriate
	6.0	Fish and Aquatic Habitat	6.1	▶ Although Tributary NW-1-E of Sixteen Mile Creek is classified as warmwater, a Rainbow Trout fingerling was captured by WSP during the surveys and therefore a coldwater instream timing window (work permitted only between July 1 and September 15) should apply to the culvert crossing works. This timing window should also be applied to the bridge construction and removal works at the crossings of Sixteen Mile Creek and to the other proposed works associated with the Unnamed Tributary of NW-1-E and the Swale feature. This timing window is appropriate for the protection of Redside Dace found downstream and outside the study area watercourses and for the protection of American Eel which uses Sixteen Mile Creek as a migratory corridor. This timing window should be confirmed with CH at detailed design.
			6.2	▶ A fish salvage / rescue will be completed for the culvert construction and removal works on the Tributary NW-1-E of Sixteen Mile Creek, for the Sixteen Mile Creek bridge construction works (if instream bank works are proposed at detailed design) and bridge removal works, and at the Unnamed Tributary to NW-1-E (if a channel realignment is proposed at detailed design), with the use of a backpack electrofisher. Any captured fish will be removed and released unharmed to a site downstream of the work areas. A License to Collect Fish for Scientific Purposes permit from the MNRF will be required.
			6.3	▶ As noted in Section 8.4.3.1, the small swale feature associated with the Sixteen Mile Creek crossing area is to be further assessed at the detailed design stage to determine the appropriate constraint level (e.g., low or medium).
			6.4	▶ Evaluation of impacts to form and function of the watercourses will be assessed at the detailed design stage to ensure road design related mitigation measures have no impacts to the system.

Category	ID #	Environmental Concern	ID #	Proposed Mitigation Measures
			6.5	▶ Additional geomorphological assessments should be completed at detailed design, at the bridge crossings of Sixteen Mile Creek, the culvert crossings of Tributary NW-1-E and at the Unnamed Tributary of NW-1-E (if realignment of the channel is required) to further document existing conditions, make recommendations and provide appropriate designs. A geomorphologist should also be onsite for implementation of the designs.
	7.0	Debris and Materials	7.1	▶ All construction-related debris and excess materials will be removed and properly disposed of following construction.
	8.0	Inspection	8.1	▶ All construction activities and mitigation measures will be inspected and monitored on a regular basis (i.e., minimum daily). An environmental inspector will be responsible for ensuring the erosion and sediment control measures are functioning and all of the mitigation measures are being properly implemented and maintained, and that no wildlife are trapped within the inside of the fencing.
			8.2	▶ A geomorphologist should be onsite during the Sixteen Mile Creek bridge construction works (if bank bioengineering works are proposed) along the preferred alignment and during the bridge removal works along the existing Steeles Avenue alignment. Also, during the Tributary NW-1-E culvert construction (channel restoration) and removal work along the existing Steeles Avenue alignment, and during the Unnamed Tributary for NW-1-E works (if a channel realignment is proposed), to ensure the work and transition areas are completed according to the future detailed design drawings.
	9.0	Restoration	9.1	▶ All exposed surfaces will be stabilized and re-vegetated following construction. Native tree and shrub plantings will follow the recommendations of Landscape Plan (**Appendix K**) once they are further developed at detailed design.
			9.2	▶ Vegetation compensation will be assessed and determined during detailed design, in consultation with regulatory agencies (e.g., CH, Region of Halton, MECP and DFO, as appropriate). Vegetation compensation will follow the current policies and guidelines of agencies at that time.
Archeological Resources	10.0	Stage 2 Archeological Assessment	10.1	▶ A portion of the study area impacted by the alignment contains archaeological potential and requires further assessment. A Stage 2 Archeological Assessment will be carried out during detailed design as shown in **Exhibit 3-2** (Section 3.3.1). Areas required for easements (e.g. construction) including at key features (including but not limited to structures and watercourse crossings), may be refined during detailed design based on the findings of the technical studies. ▶ The Stage 2 Archaeological Assessment and subsequent recommendations will be scheduled in advance of any Project activities that may have the potential to disturb archaeological resources. Prior to undertaking this Stage 2 Archaeological Assessment work, Indigenous communities will be advised and afforded the opportunity to have field liaison representative participation.

Category	ID #	Environmental Concern	ID #	Proposed Mitigation Measures
			10.2	▶ Ministry of Citizenship and Multiculturalism (formerly Ministry of Heritage, Sport, Tourism and Culture Industries) has noted that due diligence with respect to archaeological resources is only considered complete when all recommended stages of archaeological assessment have been completed and the associated reports have been accepted onto the Ontario Public Register of Archaeological Reports.
Cultural Environment	11.0	Indirect Impacts to 3220, 3222, 3224, 3226, 3228, and 3230 Steeles Avenue (Residential)	11.1	▶ Appropriate landscaping treatment at the new cul-de-sac should be considered to enhance the character and setting of the adjacent listed properties comprising row housing at 3220, 3222, 3224, 3226, 3228 and 3230 Steeles Avenue.
		Direct Impacts to Steeles Avenue Bridge over Sixteen Mile Creek (Transportation)	11.2	▶ Built in 1985, the existing road bridge is not 40 years of age and older. The MCEA Municipal Heritage Bridges Cultural, Heritage and Archaeological Resources Assessment Checklist (2014) was completed and is contained in Appendix B of **Appendix D**. It concludes the completion of a CHER and/or an HIA for the bridge structure is not required as a mitigation action.
		Potential Impacts Identified During Detailed Design	11.3	▶ Depending on the severity of the potential impact, typical mitigation actions for properties identified with having the potential for cultural heritage value or interest and/or properties municipally recognized as listed or designated property under the OHA, may include the following: • a Cultural Heritage Evaluation Report (CHER); • a Heritage Impact Assessment (HIA); and • a Cultural Heritage Documentation Report (CHDR) that may include a list of salvageable architectural elements for reuse if the built heritage resource is to be demolished.
Stormwater and Drainage	12.0	Hydrologic Analysis	12.1	▶ Any localized increase in flows resulting from the roadway improvements will be controlled to the pre-development levels before discharging to the watercourses. This will be reviewed during the detailed design phase.
			12.2	▶ Floodplain modelling and mapping will be required at the detailed design phase for areas being altered and/or influenced by the project.
			12.3	▶ Conservation Halton is currently undertaking a Floodplain Mapping Study (FPM), known as the Urban Milton FPM Study. The section of Steeles Avenue proposed to be widened and realigned is located within the FPM study area in proximity to the West Branch of the Sixteen Mile Creek. Draft modelling information was provided to Halton Region for this Class EA to establish base conditions. Further refinements to the study are currently being undertaken however it is not anticipated that these refinements will significantly change preliminary results. At detailed design, Halton Region will consult with Conservation Halton regarding the status of the FPM and its use in the project.

Category	ID #	Environmental Concern	ID #	Proposed Mitigation Measures
			12.4	▶ The specifics of the storm sewers from the grade separation and the conveyance method will be refined in detail design; the outlets will be contained within the identified proposed right-of-way.
			12.5	▶ During detailed design, the Region will assess how resulting floodplain elevation at the Steeles Avenue bridge interact with the CPR underpass. While backflow preventers are the current recommendation, the method will be confirmed during detailed design.
			12.6	▶ At detailed design, a Geotechnical Investigation and Hydrologic Investigation detailing groundwater quality and potential temporary and/or permanent (if applicable) dewatering impacts to natural heritage features due to dewatering will be required. Additional details on all CH permit requirements for all applicable permits will be provided prior to detailed design. This will include incorporating relevant information from ongoing studies in proximity to the proposed corridor improvements such as Conversation Halton's ongoing Floodplain Mapping Program work for Sixteen Mile Creek.
			12.6	▶ In light of the Town of Milton plans to remove the existing bridge on Peru Road, consultation with the Town of Milton and the appropriate emergency services will be required at detailed design to review emergency access and routing plans for emergency services in the area.
		Hydraulic Analysis	12.7	▶ During the analysis during the detailed design phase, include preliminary floodplain mapping to supplement the numerical floodplain elevations developed during this MCEA.
			12.8	▶ In addition to the MTO Highway Drainage Design Standards (2008), where practical and feasible, it is desirable for Regional roads to achieve a flood-free condition in the Regional Storm.
		Stormwater Management	12.9	▶ The new urbanized roadway will be drained by a new storm sewer system to be located within the right-of-way. Storm sewer designs are going to be provided during the detailed design phase.
			12.10	▶ Enhanced level of quality treatment of the roadway will be provided by using OGSs, enhanced grassed swales, and LIDs where feasible to function as a treatment train. This will be reviewed during the detailed design phase and will include an impact assessment for the Regional SWM policies and guidelines.
			12.11	▶ As an improvement to the stormwater management strategy, direct runoff from catchments of increased imperviousness will be directed to the SWM pond and underground pipe. This will be reviewed during the detailed design phase and should follow all relevant CH and Regional SWM policies and guidelines.

Category	ID #	Environmental Concern	ID #	Proposed Mitigation Measures
			12.12	▶ OGSs and enhanced grassed swales will be provided where feasible for runoff quality treatment. This will be reviewed during the detailed design phase.
			12.13	▶ Water balance requirements and LID practices be reviewed during the detailed design phase.
			12.14	▶ The requirement for quantity control requirement will include an impact assessment for the Regional storm at detailed design.
			12.15	▶ Preliminary design for emergency overflow weird will be completed at detailed design
			12.16	▶ Further analysis on the location of the proposed dry pond will be carried out at the detailed design stage.
			12.17	▶ Underground pipe storage facility type will be reviewed and confirmed during detailed design. Conservation Halton has noted that underground tank systems have the added benefit of providing some quality control and easier maintenance via isolated rows.
			12.18	▶ At the detailed design stage, inlet capture efficiency will be evaluated for the full range of storm events.
		Source Water Protection	12.19	▶ Further investigation is needed for specific types of mitigation, including: Construction dewatering, requirement for in-water works, nearby environmentally sensitive areas, erosion and sediment control, private water supply wells, and potential environmental contamination. The specific need and requirements for additional hydrogeological investigations will be determined during the preliminary and detailed design phases of the project, in co-operation with other disciplines, based on the preferred design, as the project progresses.
Structural Design	13.0	Proposed Culverts and Bridges	13.1	▶ Dimensions of proposed culverts and bridges are to be confirmed during detailed design.
			13.2	▶ A geotechnical analysis will be required at detailed design to confirm stable top of bank, footing design, and abutment location.
			13.3	▶ A value engineering exercise for the grade separation and Sixteen Mile Creek structures will be completed during detailed design.
			13.4	▶ A fill management plan will be completed at detailed design.
Construction	14.0	Utility Impacts and Relocation	14.1	▶ The ownerships, the existing utility locations and municipal services and associated impacts are to be confirmed in detailed design.
		Property Impacts and Acquisitions	14.2	▶ Affected property owners will be contacted again during detailed design to further address mitigation measures, property negotiation and to discuss project details and timing.

8.8 Detailed Design Commitments

Environmental concerns, anticipated impacts, and proposed mitigation measures as they relate to the project, have been described in Chapter 8. Many of the environmental concerns have been mitigated through the process by which the recommended design was selected, as described in the ESR. This section provides an additional list of standard commitments to be carried forward into Phase 5 of the MCEA process – Implementation Phase. These commitments have been developed through consultation with various agencies throughout the study process. A key component of detailed design is refining and detailing the impact assessment and mitigation measures as the design is developed and refined, in consultation with the agency staff.

Specific mitigation measures have been selected and committed to by Halton Region to address potential impacts as discussed throughout Chapter 8, specifically in **Section 8.7**. It is recommended that these commitments, as presented in the ESR, become part of the contract package so that Contractors are aware of the requirements prior to tendering. Monitoring of construction activities must ensure that all environmental standards and commitments for construction are met. Halton Region will work with Conservation Halton and other authorities, during detailed design and prior to the start of construction to ensure that the proposed works are acceptable and to obtain required permits.

At detailed design, a Geotechnical Investigation and Hydrogeologic Investigation detailing groundwater quality and potential temporary and/or permanent (if applicable) dewatering impacts to natural heritage features due to dewatering will be required. Additional details on all Conservation Halton permit requirements for all applicable permits will be provided prior to detailed design.

Natural Environment specific commitments are listed below:

- Ongoing consultation with CH and the relevant technical agencies (e.g., DFO and MECP) to address any respective surveys, permitting or clearance requirements.
- Document any changes in the terrestrial and aquatic habitat features at detailed design within the preferred alignment to ensure the preliminary design measures are still appropriate. Evaluation of impacts to form and function of the watercourses will be assessed to ensure road design related mitigation measures have no impacts to the systems.

- The impacted swale associated with the Sixteen Mile Creek bridge crossing will be further assessed at the detailed design stage during early spring (after snow melt and / or a rainfall event) and if standing water is present, it should be sampled with an electrofisher to confirm fish absence or presence. Subsequent constraint levels (e.g., low or medium) will then be attributed and used to determine if further review is required by DFO for the removal of this habitat.
- SAR and SAR potential will be reviewed at detailed design to address any species that may have been uplisted since completion of the ESR.
- The preferred alignment should be reviewed at detailed design to confirm that the SAR and provincially rare vascular plant species identified to have reasonable potential to occur, are not present.
- The vegetation communities supporting regionally significant vascular plant species should be reviewed at detailed design to determine impacts to these individuals / populations, if any. Consultation with CH should then occur to determine appropriate mitigation measures, on a species-specific basis.
- Impacts to the unevaluated wetland north of the existing Steeles Avenue (Vegetation Unit 4a – Exhibit 1, **Appendix E**) are not anticipated with the works. If design changes occur at detailed design such that impacts to this feature will occur, a more detailed assessment of this feature could be completed, if required through consultation with MNRF, the Region and CH. Similarly, consultation with MNRF, the Region and CH regarding impacts to Unit 17 (MAS209) will occur at detailed design to determine if an evaluation under OWES is required.
- The Butternut tree in Unit 1b will be reviewed at detailed design. If it is determined that impacts are anticipated to occur within 50 m of the tree, a Butternut Health Assessment (BHA) (between May 15 and August 30) shall be completed to inform permitting or registration requirements.
- Both the bridge at Sixteen Mile Creek and the open-bottom culvert at Tributary NW-1-E should be reviewed at detailed design to ensure the dimensions are suitable to ensure wildlife passage for a range of wildlife including White-tailed Deer, small to mid-sized mammals (e.g., voles, fox, skunk, raccoon) and herpetofauna (e.g., turtles, snakes and frogs). Conservation Halton's Road Ecology Best Management Practices: Quick Reference Guide (2018) should be consulted to ensure relevant measures are incorporated. At a minimum the following design guidelines should be targeted, in consultation with the Region and CH:
    - An openness ratio (OR) of **0.6 to 1.0** to ensure suitable passage for deer. This OR is also suitable for small and mid-sized mammals and herpetofauna. If this OR can't be achieved for the culvert, the minimum OR should be **0.1** (i.e., the minimum OR for turtles)

    - Minimum height of 2 m
    - Use of suitable substrates. Avoid use of rip-rap and fill voids between larger material with materials appropriate for wildlife footing (e.g., native substrates or granular B)
    - Install habitat features to provide cover for small wildlife (e.g., boulder piles, anchored logs), where appropriate
- Wildlife fencing to funnel wildlife to the two watercourse crossings (Tributary NW-1-E and Sixteen Mile Creek) should also be further explored at detailed design, in consultation with the Region and CH.
- Review the terrestrial and aquatic impacts of the preferred alignment and the associated mitigation measures, which will be refined and finalized at detailed design. The environmental mitigation measures will be integrated into the construction documents.
- Tree Inventory and Removals within the Study Area are shown in **Appendix K** and will be refined at the detailed design stage. The Region's Tree Canopy Replacement Policy will be adhered to at detailed design, where applicable and through coordination with the Regional Foresters.
- Develop detailed landscape plans for tree and shrub plantings and include edge management measures (e.g., planting to seal a forest edge) at ELC Units 1b, 9, 11 and 12). Planting plans at detailed design will include native species suitable to the site conditions. All exposed surfaces will be stabilized and re-vegetated where appropriate following construction. A Tree Preservation Plan will be developed at the detailed design stage.
- Additional geomorphological assessments should be completed at detailed design, at the bridge crossings of Sixteen Mile Creek, the culvert crossings of Tributary NW-1-E and at the Unnamed Tributary of NW-1-E (if realignment of the channel is required) to further document existing conditions, make recommendations and provide appropriate designs. A geomorphologist should also be onsite for implementation of the designs.
- The stormwater quantity and quality treatment plan will be further reviewed and finalized at detailed design in coordination with CH. Further review of the impacts of increased stormwater runoff on the receiving watercourses within the study area, and the proposed mitigation measures (with particular attention on mitigating thermal impacts), will also be completed at that time to ensure that any direct and indirect impacts are minimized as much as possible.
- The timing windows for the in-water works associated with the bridge works at Sixteen Mile Creek, the culvert works at Tributary NW-1-E, and for the potential

stream realignment works at the Unnamed Tributary of NW-1-E (if these works are required at detailed design) will be confirmed with CH at detailed design.

- The CH Regulation Limits and associated Natural Hazard Limits will be added to the Contract Drawings at detailed design.
- Opportunities for restoration and enhancement of natural features and functions within the study area, will be reviewed with CH and the Region at detailed design once impact areas are finalized. Along with detailed landscape plans this may include edge management measures (e.g., planting to 'seal' the new forest edge) for Vegetation Units 1b, 9, 11 and 12 as well as restoration of the watercourse channels (Tributary NW-1-E of Sixteen Mile Creek and Sixteen Mile Creek) and riparian zones at the existing culvert and bridge crossings that are proposed to be removed (C1 and Sixteen Mile Creek Bridge) along existing Steeles Avenue.
- Vegetation compensation will be assessed and determined during detailed design, in consultation with regulatory agencies (e.g., CH, Region of Halton, MECP and DFO, as appropriate). Vegetation compensation will follow the current policies and guidelines of agencies at that time.
- A detailed figure will be provided at detailed design once the final grading limits are determined, and the restoration and enhancement plans and their boundaries have been developed. The figure will show where the preferred alignment intersects the Key Natural Heritage Features and in relation to the proposed restoration and enhancement plans.
- A post construction monitoring program will be developed at detailed design in coordination with CH and DFO (if an Authorization is required). The monitoring program will include the watercourse works associated with the bridge works at Sixteen Mile Creek, the culverts work at Tributary NW-1-E, and for the potential stream realignment works at the Unnamed Tributary of NW-1-E (if these works are required at detailed design). Areas of restoration (e.g., vegetation compensation and survival) and areas where erosion and sediment control measures were applied during the construction period will also be assessed. The monitoring program will follow current policies and guidelines of the agencies.

Environmental monitoring will be combined with construction supervision to include periodic site visits and inspections throughout the course of the work.

8.9 Design and Construction Considerations

8.9.1 Potential Impacts During Construction

The following sections describe the potential environmental impacts during construction and proposed mitigating measures. The following potential adverse effects are identified:

- disruption/removal of existing vegetation
- construction noise and air quality
- disruption to vehicle traffic
- mud and dust during construction
- impacts to quality of well-water
- vibration

During the detailed design stage and prior to construction, Halton Region will be responsible for obtaining approval from the Ministry of the Environment, Conservation and Park, as well as the Ministry of Natural Resources and Forestry for stormwater management. Permit approval will be required from Conservation Halton for all culvert installations, watercourse realignments, structures, site alteration, etc. within areas regulated pursuant to Ontario Regulation 162/06. Halton Region will also be responsible for obtaining approvals / permits from the Niagara Escarpment Commission, as required, during the detailed design stage and prior to construction.

It is intended that the works proposed are executed in such a manner, which to the fullest possible extent, minimizes any adverse effects on the natural environment of the project area. The Contractor will be responsible to ensure all their personnel are sufficiently instructed so that the work is carried out in a manner consistent with minimizing environmental impact. The Region will assign a qualified environmental inspector whose responsibility will be to ensure compliance with the environmental objectives.

Also, a post construction monitoring program will be developed at detailed design in coordination with CH and DFO (if an Authorization is required). The monitoring program will include the watercourse works associated with bridge construction and removal works at Sixteen Mile Creek, the culvert construction and removal works at Tributary NW-1-E, and for the potential stream realignment works at the Unnamed Tributary of

NW-1-E (if these works are required at detailed design). Areas of restoration (e.g., landscape plantings survival) and areas where erosion and sediment control measures that were applied during the construction period will also be assessed.

8.9.2 Disposal of Excess Materials

The MECP new excess soil management regulatory framework is outlined in O. Reg. 406/19 as such the following documentation will be required to be completed during Detailed Desing and during the construction activities for the improvements of Steeles Avenue:

- Assessment of Past Uses
- Sampling and Analysis Plan
- Excess Soil Characterization
- Excess Soil Destination Assessment
- Tracking System Requirements
- Qualified Person Declaration

Furthermore, the placement of fill within any area associated with valleys, wetlands, shorelines and other hazardous lands that are regulated pursuant to Ontario Regulation 162/06 requires the written permission of Conservation Halton. A future permit condition will be that any generated fill from the project will be required to be placed outside of a CH regulated area.

If this is not possible or not included in the detailed design submission, separate approval from CH will be required for fill placement. As a part of that approval, it will be required that CH's Large Fill policy (2.47 of *Conservation Halton Policies and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning Document*). Approval of the applicable municipal Site Alteration permits will also be required, and the Town of Milton will be engaged as needed.

All approvals and permits will have to be obtained. Relevant MECP policy framework and best management practices should be referenced and applied where applicable.

Upon completion of the disposing, levelling and grading of surplus excavated material on any property, a written statement shall be obtained from the property owner(s) releasing the Contractor and Region from any claims and accepting the condition of the property as satisfactory.

8.9.3 Mud and Dust Control

The Contractor shall take such steps as may be required to prevent dust nuisance resulting from their operations. The Contractor shall be responsible for all dirt and mud that is tracked onto the roadways from vehicles entering or leaving the job site. The Contractor shall, upon request from the CA, immediately proceed with cleanup operations, or in the opinion of the CA, the Contractor has not or cannot sufficiently remove the mud from the road, the CA will proceed with the necessary clean up.

8.10 Permits and Approvals

The following permits and approvals will be obtained during the detailed design phase which may include but are not limited to:

- CP Rail approvals / permits
- Stage 2 Archaeological Assessment and Ministry of Tourism, Culture and Sport (MTCS) compliance
- Notifications/permissions from respective utilities with facilities in the area
- Some utilities and municipal services works may require separate permits under Halton Region Conservation Authority regulations
- Category 3 Permit to Take Water (PTTW) per the Ontario's Water Taking Regulation (O. Reg. 387/04 made under the Ontario Water Resources Act). The permit application will be accompanied by all appropriate supporting hydrogeological assessment information.
- License to Collect Fish from the Ministry of Natural Resources and Forestry**.**
- Permit from the Niagara Escarpment Commission.
- An Information Gathering Form (IGF) will be completed and submitted to the Ministry of the Environment Conservation and Parks (MECP) at detailed design, to determine SAR approval requirements under the Endangered Species Act (ESA).

- A Request for review (RfR) will be submitted to Fisheries and Oceans Canada (DFO) for the bridge works at Sixteen Mile Creek, the culvert works at Tributary NW-1-E, and for the potential stream realignment works at the Unnamed Tributary of NW-1-E (if these works are required at detailed design). This will determine if Authorization under the Fisheries Act is required.

8.11 Monitoring and Maintenance

During construction, the Region will ensure that the environmental protection recommendations in the ESR and other subsequent agency approval conditions are complied with.

During construction, the on-site Contract Administrator will ensure that implementation of mitigating measures and key design features are consistent with the contract and external commitments (e.g., permit conditions/requirements and EA commitments). In addition, the effectiveness of the environmental mitigating measures established during detailed design will be assessed to ensure that:

- Individual mitigation measures are providing the expected control and / or protection;
- Additional mitigation measures are provided, as required, for any unanticipated environmental problems that may develop during construction.

On-site construction administration staff will ensure that the environmental measures outlined in this report (**Section 8**) and further developed during detailed design are carried out. In an event that problems arise, appropriate agencies will be contacted to provide further input.

If the impacts of construction are different than anticipated, or if the method of construction is such that there are greater than anticipated impacts, the Contractor's methods of operation will be changed or modified to reduce those impacts.

A comprehensive monitoring plan will be established as part of detailed design to ensure that there are no impacts to the remaining natural features during construction and no impacts to the wetlands to the north during and post-construction.