Municipal Class Environmental Assessment

Ninth Line (Regional Road 13) Transportation Corridor Improvements from Dundas Street (Regional Road 5) to 407 ETR (Express Toll Route)

Environmental Study Report

December 2020

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Executive Summary

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In April 2016, Halton Region (the Region) commenced a Municipal Class Environmental Assessment (MCEA) Schedule 'C' Study to identify roadway improvements for the Ninth Line (Regional Road 13) corridor in the Town of Oakville, pursuant to the MCEA process (October 2000, as amended in 2007, 2011 and 2015, which is an approved process under the Ontario Environmental Assessment Act (EA Act). The purpose of the MCEA study was to address roadway improvements, taking into consideration the future transportation needs within the corridor and the potential impacts on the natural, socio-economic and cultural environments.

Environmental Study Report

The Environmental Study Report (ESR) documents the planning and decision making process, including public consultation, to determine the preferred design for improvements to Ninth Line from Dundas Street to 407 ETR. The ESR also sets out the mitigation measures proposed to avoid or minimize environmental impacts. Specifically, this ESR documents:

- Study Background
- Need and Justification
- Identification of Problem and Opportunities
- Identification of the Analysis and Evaluation of Preliminary Design Alternatives
- Preferred Design
- Public Consultation; and
- Mitigating Measures

Study Background

Ninth Line is a two-lane arterial road located near the eastern limits of Halton Region, which provides a connection from the Town of Oakville northerly to the Town of Halton Hills.

Within the study limits, the roadway borders the Town of Oakville to the west, the City of Mississauga to the east and the Town of Milton to the north. The corridor is a major connecting route for these municipalities as well as Highway 401, Highway 403 and 407 ETR (Express Toll Route).

Problem and Opportunities

Ninth Line is currently experiencing significant delays during peak periods and is reaching capacity. It is projected that traffic volumes will continue to increase in the future. Future traffic is expected to grow by over 45% by 2031 in the PM peak hour. To support future growth and travel demands, improvements to the Ninth Line corridor are required. The improved corridor should support all modes of transportation including active transportation, transit services, inter-regional travel, agricultural vehicles and goods movement. Therefore, Halton Region is carrying out this study to address these requirements in accordance with the MCEA.

Preferred Design

Based on findings from the analysis and evaluation of alternative design concepts discussed in Section 5.4 of the report, it is proposed that Ninth Line will be a combination of an east and west widening from 2 to 4 lanes along the centerline of Ninth Line to mitigate environmental and residential impacts. In the constrained areas of the corridor, a modified cross-section is proposed

while still maintaining a centre-left turn lane for easier access to local drive-ways and accommodation for both on and off road active transportation.

The proposed stormwater management design for the Ninth Line corridor includes a stormwater management system for managing flows within the right of way, road crossing culverts, associated channel work, and ditching to capture flows outside the right-of-way. Infiltration trenches are provided under the multi-use path along most of the south section. Proposed superpipes provide quality control upstream of the discharge points for the system. The proposed ditches will convey any areas draining toward the proposed road.

Property totaling approximately 29,400 m^2 will be required to widen the Ninth Line corridor.

The Region proposes that Ninth Line from Dundas Street to Highway 407 ETR will be constructed to a 4 lane roadway. The preliminary construction cost estimate (excluding property cost) is estimated at approximately $13,474,000 for the south section and $16,055,000 for the north section.

Consultation Process

Public consultation is a key feature of the Municipal Class Environmental Assessment planning and design process. Through an effective public participation program, the proponent can generate meaningful dialogue between the project team and the public and agencies, allowing an exchange of ideas and the broadening of the information base, leading to better decision-making process.

The following are a highlight of the consultation process carried out for the project:

- Two Public Information Centres were held;
- Extensive liaison Conservation Halton to discuss environmental issues related to the project;
- Individual property owner meetings with those identified as having significantly property impacts;
- Agencies involved in the study included: Town of Oakville, Conservation Halton, Oakville Hydro, City of Mississauga, Ministry of Environment, Conservation and Parks, Ministry of Heritage, Sport, Tourism and Culture, Infrastructure Ontario. Communication with these agencies was maintained through the study process.
- Other major stakeholders notified about the study and requested to provide their input included: other federal and provincial ministries and agencies, municipal agencies, utilities, First Nations and property owners.

Environmental Impacts and Mitigation Measures

The preferred design has been developed to fulfill the objectives of the project while minimizing the negative impacts on the surrounding natural, cultural and socio-economic environment, adjacent property and utilities. As these impacts are unavoidable, the study team conducted a detailed impact assessment and consulted results of investigations and analyses with review agencies. Based on the assessment and input received from review agencies, specific mitigating measures were developed for the project. The Environmental Study Report provides detailed description of the identified impacts and proposed mitigation measures for detailed design and implementation of the project. The details of the potential environmental effects, mitigation measures, detail design commitments and permitting requirements are provided in Section 9 of the Environmental Study Report.

1. Introduction

1.1. Introduction and Background

Ninth Line is a two-lane arterial road located near the eastern limits of Halton Region, which provides a connection from the Town of Oakville northerly to the Town of Halton Hills.

Within the study limits, the roadway borders the Town of Oakville to the west, the City of Mississauga to the east and the Town of Milton to the north. The corridor is a major connecting route for these municipalities as well as Highway 401, Highway 403 and 407 ETR (Express Toll Route).

Halton Region retained CIMA+ to complete a Municipal Class Environmental Assessment (MCEA) study for the Ninth Line (Regional Road 13) Transportation Corridor Improvements from Dundas Street (Regional Road 5) to 407 ETR. The Halton Region Transportation Master Plan– The Road to Change (2011), herein referred to as the TMP, concluded that the existing capacity of the Ninth Line transportation corridor would be insufficient to accommodate expected growth within the planning time horizons of the TMP. The TMP recommend that Ninth Line be widened from two lanes to four lanes. The Halton Region Active Transportation Master Plan (ATMP) (2015) proposes cycling lanes and a boulevard multi-use trail on Ninth Line.

1.2. Study Area

Figure 1 illustrates the study area corridor. The Ninth Line transportation corridor is a two-lane major arterial roadway within Halton Region's jurisdiction within the study area limits. The study corridor is approximately 3.8km from Dundas Street to 407 ETR with a 60km/h speed limit. The corridor intersects with Dundas Street to the south and William Halton Parkway (Regional Road 40) (formerly Burnhamthorpe Road) to the north. Additionally, the corridor crosses a culvert conveying the Joshua Creek tributary located approximately 745m north of Dundas Street and Highway 403/407 ETR at the North Limit (2 underpasses and 2 overpasses). Ninth Line has an existing 2-lane rural cross section within the study limits. The Ninth Line Transportation Corridor (Ninth Line) is an important corridor connecting Georgetown to the north, with Milton, Oakville, Mississauga and Highways 401/407/QEW to the south.

1.3. Ontario Environmental Assessment Act

The Ninth Line Transportation Corridor Improvements from Dundas Street to 407 ETR follows the Municipal Engineers Association (MEA) Municipal Class Environmental Assessment process for a Schedule C project (October 2000, as amended in 2007, 2011 and 2015).

The Ontario Environmental Assessment Act (2010) guides the process for reviewing the environmental impact of proposed activities. The Act applies to government agencies, conservation authorities and municipalities. Halton Region is the proponent in this study and the Municipal Class Environmental Assessment for the Ninth Line Transportation Corridor Improvements is completed in accordance with the Ontario Environmental Assessment Act (2010).

Figure 1: Study Area

1.3.1. Climate Change

The Ministry of Environment, Conservation and Parks (MECP) has set expectations for considering climate change in the preparation, execution and documentation of environmental assessment studies. The MECP has developed codes of practice (codes) to provide guidance on key aspects of the environmental assessment process. This guide covers the consideration of:

- the impacts of a project on climate change;
- the impacts of climate change on a project; and
- various means of identifying and minimizing negative impacts during project implementation.

The directions and methods outlined in the MECP guidance complement and support the climate-focused policies of the 2014 Provincial Policy Statement. The 2014 Provincial Policy Statement issued under the Planning Act advises planning authorities of the need to consider development that reduces greenhouse gas emissions and reduces the potential risk of climate change related events like droughts or intense precipitation. A partial listing of applicable policies in the 2014 Provincial Policy Statement include:

- Policies 1.6.2, 1.6.6.7 — Encourage green infrastructure (e.g. permeable surfaces) and strengthen stormwater management requirements

- Policy 1.8 — Require the consideration of energy conservation and efficiency, reduced greenhouse gas emissions and climate change adaptation (e.g. tree cover for shade and for carbon sequestration)
- Policy 3.1.3 — Requires consideration of the potential impacts of climate change that may increase the risk associated with natural hazards (e.g. flooding due to severe weather)

The potential impacts on climate change have been considered and documented throughout the study as documented in Sections 5.4 and 7.5 in accordance with the MECP guidelines. Consideration for how the preferred alternative is expected to perform with regard to climate change is discussed in Section 7.

1.3.2. Municipal Class Environmental Assessment Process

Municipal projects that affect the purpose, capacity or function of a roadway, or propose new roadways are subject to the Municipal Engineers Association Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 and 2015). The Municipal Class Environmental Assessment (MCEA) is a planning and design process for transportation/transit and water/wastewater infrastructure projects which have a predictable range of impacts that can be mitigated. The MCEA process is approved by the Ministry of Environment, Conservation and Parks to meet the requirements of the Environmental Assessment Act (2010).

Based on their potential range of impacts, projects are classified under the MCEA by Schedules:

Schedule A Activities have minimal environmental effects. Projects are pre-approved.

Schedule A+ Activities have minimal environmental effects. Projects are pre-approved so long as the public is advised prior to implementation.

Schedule B Activities have some adverse environmental effects. Projects typically involve improvements and minor expansions to existing facilities. These projects proceed through a screening process (Phases 1 and 2 of the MCEA), including consultation with the potentially affected public.

Schedule C Activities have some adverse environmental effects. Projects typically involve the construction of new facilities and major expansions to existing facilities. These projects proceed through the full MCEA planning and design process (Phases 1 through 5).

In particular, road widening or extensions with an estimated construction cost of $1.2M or more are classified as a **Schedule C** project under the MCEA. As noted above, Schedule C projects must follow Phases 1 through 5 of the MCEA process:

Phase 1 Identify the problem or opportunity.

Phase 2 Identify alternative solutions to address the problem or opportunity.

This Phase will identify and assess the positive and negative effects of alternative planning solutions for the identified problem and/or opportunity, taking into account the natural, social, cultural, and economic environment and input from all agencies and the public.

Phase 3 Examine alternative methods of implementing the preferred solution.

Phase 3 will identify and assess the positive and negative effects of alternative design concepts for the preferred solution, taking into account the natural, social, cultural, and economic environment and input from all agencies and the public.

Phase 4 Document the rationale for the preferred solution and design concept, and the planning, design and consultation process in an Environmental Study Report for public and agency review.

The Environmental Study Report is placed on the public record for at least 30 calendar days. If any outstanding issues raised by the public or agencies cannot be resolved during this review period, the public and agencies have the right to request the Minister of the Environment, Conservation and Parks to order an Individual Environmental Assessment as per Part II of the Ontario Environmental Assessment Act. If no requests for a Part II order are received during the review period, the project will proceed to Phase 5 for implementation.

Phase 5 Complete contract drawings and documents, and proceed to construction, operation and environmental monitoring.

1.3.3. Comments and Request for Order for Higher Level of Study

Interested persons may provide written comments to Halton Region for a response using the following contact information:

Ann Larkin, P.Eng.
Supervisor, Transportation Planning
Halton Region
1151 Bronte Road,
Oakville ON L6M 3L1
ann.larkin@halton.ca

Further, a request may be made to the Ministry of the Environment, Conservation and Parks for an order requiring a higher level of study (i.e. requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g. require further studies), only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other grounds will not be considered. Please see Section 6.7 for further information.

1.4. Study Approach

Figure 2 demonstrates the process for a Schedule C project under the MCEA. This study approach begins with a thorough understanding of the problem being addressed followed by assessing the alternative solutions and alternative design concepts. The approach is organized around study phases, including Public Information Centres (PICs), stakeholder engagement and participation of technical review/regulatory agencies at study milestones. This study began in April 2016 and was completed in 2020.

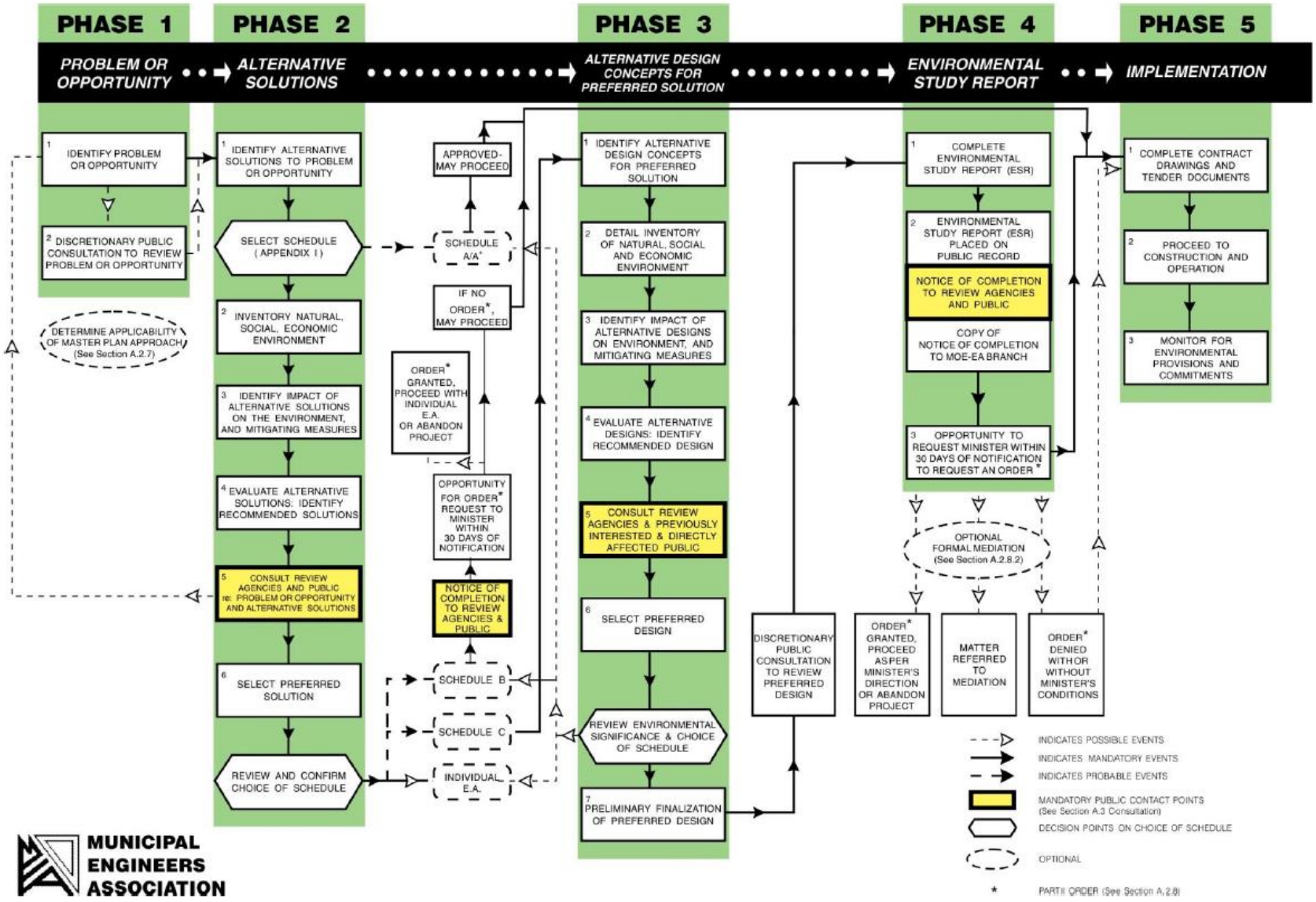

Figure 2: Municipal Class EA Flow Chart

1.5. Study Organization

The study was organized to ensure meaningful input is gathered from internal and external stakeholders, including review agencies. Figure 3 illustrates the key stakeholders included in the study.

Figure 3 : Study Organization

1.5.1. Project Team

The project team as illustrated in Table 1 is comprised of Halton Region senior staff whom are leading the direction of the study.

Table 1: Project Team

Member	Role
Ms. Alicia Jakaitis	Project Manager
Ms. Ann Larkin, P.Eng.	Supervisor, Transportation Planning

1.5.2. Consultant Team

The consultant team has been retained by Halton Region to assist in carrying out the study. As outlined in Table 2, the consultant team is comprised of CIMA+ as the prime consultant and Golder Associates as the sub-consultant.

Table 2: Consultant Team

Consultant	Role
CIMA+	Project Management and Consultation MCEA Requirements Transportation and Traffic Analysis Roadway Design Structural Design Active Transportation Design Landscaping and Streetscaping Utilities
Golder Associates Ltd. (Golder)	Stormwater Management Fluvial Geomorphology Geotechnical and Hydrogeology Noise Analysis Air Quality Natural Environment Archaeology Built Heritage

1.5.3. Technical Agencies Committee

A committee was formed consisting of technical agencies that may be affected by the MCEA study. Members include municipal and provincial government, conservation authorities and utilities. The Technical Agencies Committee (TAC) acts as a forum for interested agencies to review the study progress and provide input in order for the project team to address issues and concerns. Input from these stakeholders was gathered at study milestones. The agencies invited to participate as part of the Technical Agencies Committee are listed below.

Federal

- Aboriginal Affairs and Northern Development Canada
- Canadian Environmental Assessment Agency
- Environment Canada
- Fisheries and Oceans Canada

Provincial

- 407 ETR
- GO Transit
- Infrastructure Ontario
- Ministry of Aboriginal Affairs
- Ministry of Environment, Conservation and Parks
- Ministry of Municipal Affairs and Housing
- Ministry of Natural Resources and Forestry
- Ministry of Tourism, Culture and Sport
- Ministry of Transportation

Municipal/Local

- City of Mississauga
- Conservation Halton
- Halton Catholic District School Board
- Halton District School Board
- Halton Region
- Oakville Fire Department
- Oakville Transit
- Region of Peel
- Town of Milton
- Town of Oakville

Utilities

- Bell Canada
- COGECO Cable Canada Inc.
- Enbridge Gas Inc.
- Hydro One Networks Inc.
- Oakville Hydro
- Ontario One Call
- TransCanada Pipelines
- Union Gas Ltd (prior to merge with Enbridge Gas Inc.)

Table 3 lists the meetings that were held for TAC throughout the study:

Table 3: Technical Agencies Committee Meetings

Date	Event Name	Purpose
June 1, 2016	TAC Meeting #1	To review project information including background, existing conditions, problems and opportunities, planning solutions and potential impacts
June 8, 2017	TAC Meeting #2	To present the design options being considered, evaluation of alternative designs and preliminary preferred design.

1.6. Indigenous Communities Consultation

The following Indigenous Communities were notified of the commencement of this study and also notified at key study milestones.

- Alderville Indigenous Communities
- Curve Lake Indigenous Communities
- Mississaugas of New Credit First Nation
- Mississaugas of Scugog Island First Nation
- Mohawk Council of Akwesasne
- Oneida Nation of the Thames
- Six Nations Haudenosaunee Confederacy Council
- Six Nations of the Grand River Territory
- The Mohawks of the Bay of Quinte First Nation
- Wahta Mohawk Territory
- Williams Treaty Indigenous Communities

Letters provided to Indigenous Communities and correspondence from Indigenous Communities are included in Appendix A.

1.7. Public Consultation

1.7.1. Public Consultation

The public consultation process ensures that public concerns are noted and addressed in the beginning stages of and throughout the study. Public input is taken into consideration when determining and evaluating alternative solutions and design concepts. Two Public Information Centres (PICs) were held in order to gather public and review agency input. The date and purpose of each PIC is listed in Table 4.

Table 4: Public Information Centres

Date	Event Name	Purpose
June 16, 2016	Public Information Centre #1	To review and obtain public input on the study, background information and the corridor planning alternatives being considered.
June 22, 2017	Public Information Centre #2	To present and obtain public input on the evaluation of the design options, preliminary preferred design plan and proposed improvements.

1.7.2. Filing of Environmental Study Report

The Environmental Study Report (ESR) for the Ninth Line (Regional Road 13) Transportation Corridor Improvements from Dundas Street (Regional Road 5) to 407 ETR documents the planning and design process, in accordance with the MCEA. Following the Notice of Study Completion, the ESR will be available for review for a minimum 30-day period online at www.halton.ca.

2. Problems and Opportunities

2.1. Background and Study Context

Phase 1 of the MCEA process involves the identification of the problems and opportunities to be addressed by the study. For this study, this included a review of the following background material:

- Halton Region Official Plan (2016), ROPA 38 (December 2009)
- Halton Region Transportation Master Plan (TMP) – The Road to Change (2011)
- Halton Region Active Transportation Master Plan (ATMP) (2015)
- North Oakville Creeks Subwatershed Study (NOCSS) (2006)

A traffic analysis was completed as part of Phase 1 including a review of existing traffic conditions and future traffic conditions (2031). A problem and opportunity statement, to be addressed by the study was developed following the review of the background information.

2.1.1. Halton Region Official Plan

The Halton Region Official Plan (2016) guide land use planning and helps Regional Council and staff make decisions regarding Halton's growth and development. Regional Official Plan Amendment No. 38 (ROPA 38) was adopted by Regional Council on December 16, 2009 and approved by the Ministry of Municipal Affairs and Housing with modifications on November 24, 2011.

The Regional Official Plan classifies Ninth Line as a Major Arterial roadway within the study limits. The function of a Major Arterial is to:

- Serve mainly inter-regional and regional travel demands;
- Possibly serve an Intensification Corridor;
- Accommodate all truck traffic;
- Accommodate higher order transit services 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; and
- Accommodate active transportation.

2.1.2. Halton Region Transportation Master Plan

The Halton Region Transportation Master Plan (TMP) - The Road to Change (2011) was established in order to develop a sustainable, cohesive transportation plan that considers all modes of transportation. The TMP identifies existing problems and opportunities and evaluates solutions to optimize the transportation system throughout the Region to the year 2031. Within the study area, the TMP recommends widening Ninth Line from Dundas Street to the 407 ETR from two to four lanes with a 35m right-of-way and an urban cross-section.

2.1.3. Halton Region Active Transportation Master Plan

As recommended in the Halton Region TMP, the Region developed the Halton Region Active Transportation Master Plan (ATMP) (2015) to outline the required strategy, infrastructure, initiatives and programs to promote non-motorized travel throughout the Region. The Halton Region ATMP

(2015) provides a 20-year vision for active transportation in Halton Region which was endorsed by Council "in principle" in November 2015. The ATMP (2015) includes proposed cycling lanes and a boulevard multi-use trail on Ninth Line.

2.1.4. North Oakville Creeks Subwatershed Study

The North Oakville Creeks Subwatershed Study (NOCSS) (2006) was developed to support the Town's North Oakville Secondary Plan. The NOCSS provides a management strategy to assist the Town, Conservation Halton and Halton Region in setting policy direction for future development in the catchment areas that are part of the larger subwatersheds that flow directly into Sixteen Mile Creek or Lake Ontario including the Joshua's Creek tributary present in the study area. The Study outlines an approach to manage resource use that will protect, rehabilitate and enhance the environment within the North Oakville Creeks Subwatershed.

2.1.5. Provincial Policy Statement

The 2014 Provincial Policy Statement (PPS) sets out the foundation for sustainable land use vision and integrated land use planning policies. It accounts for the three (3) lenses of sustainability: economy, society and environment. The PPS provides for appropriate development and protects resources of public interest through long-term planning that integrates the principles of strong communities.

Section 1.6.7 of the PPS describes policies related to transportation systems, including:

- "Transportation systems should be provided which are safe, energy efficient, facilitate the movement of people and goods, and are appropriate to address projected needs."
- "Efficient use shall be made of existing and planned infrastructure, including through the use of transportation demand management strategies, where feasible."
- "As part of a multimodal transportation system, connectivity within and among transportation systems and modes should be maintained and, where possible, improved including connections which cross jurisdictional boundaries."

Section 1.6.8 of the PPS describes policies related to transportation and infrastructure corridors, including:

- "Planning authorities shall plan for and protect corridors and rights-of-way for infrastructure, including transportation, transit and electricity generation facilities and transmission systems to meet current and projected needs."
- "Major goods movement facilities and corridors shall be protected for the long term."
- "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." (e.g., protection of natural features and water quality/quantity; and conservation of built heritage resources and cultural heritage landscapes).

This MCEA study and the proposed widening of Ninth Line are consistent with the above policies by:

- Providing additional capacity at all subject intersections, by means of geometric improvements (e.g. roadway widening) to reduce the potential for a failure of operations;
- Considering travel demand management strategies as an alternative planning solution; and

- Natural Environment and Heritage Impact Assessments were completed to assess the impacts of the project.

2.1.6. Greenbelt Plan

The Greenbelt was introduced in 2005 to help shape the future of the Greater Golden Horseshoe (GGH). The GGH is located in the heart of the Great Lakes region. The Greenbelt is the cornerstone of Ontario's Greater Golden Horseshoe Growth Plan (Growth Plan) which is an overarching strategy that provides clarity and certainty about urban structure, where and how future growth should be accommodated and what must be protected for current and future generations. The Greenbelt Plan (2017) provides the policy framework for the Greenbelt. Lands within the study area are located with the Parkway Belt West Plan Area, which is situated at the north end of the study area.

2.2. Transportation and Traffic Operations

2.2.1. Existing Conditions

A Traffic Study and Safety Study was conducted for the study area (Appendix B). The study area includes the intersections of Ninth Line with Dundas Street and Burnhamthorpe Road. Along the study corridor, Ninth Line is an undivided two-lane road with a posted speed of 60 km/h, a rural cross-section (narrow unpaved shoulders) and urban treatments at the signalized intersections. Burnhamthorpe Road is an undivided two-lane road, while Dundas Street is a divided six-lane road. Both intersections within the study area (at Dundas Street and Burnhamthorpe Road) are signalized. Intersection lane configurations are shown in Figure 4.

Dundas Street was widened from 4 to 6 lanes between 2014 and 2016. William Halton Parkway is proposed to be an east-west road to replace Burnhamthorpe Road. The land uses north of Burnhamthorpe Rad are transitioning from agricultural to employment uses. William Halton Parkway is part of the planned community.

Turning movement counts were obtained from Halton Region. The counts in Figure 5, which were taken in June 2015, show the following:

- Pedestrian activity is very low at the intersections;
- The heaviest approach volumes are along the intersecting roadways (Burnhamthorpe Road and Dundas Street);
- There are high truck volumes along Dundas Street; and
- Overall intersection volumes are higher in the AM peak hour.

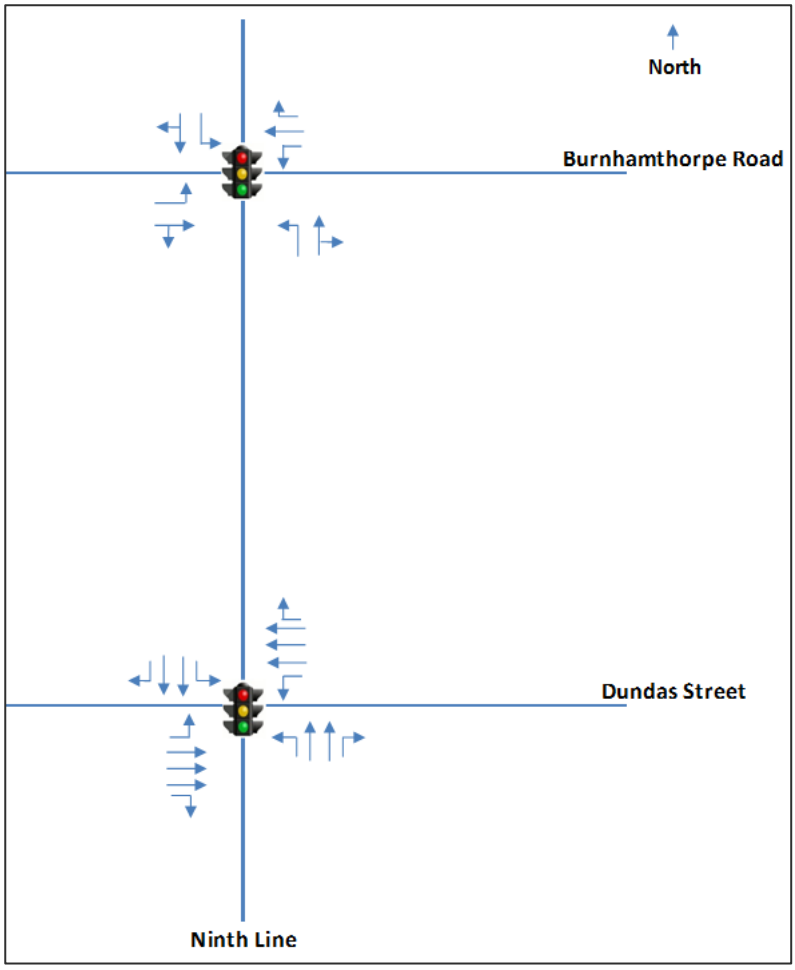

Figure 4: Existing Lane Configuration (2015)

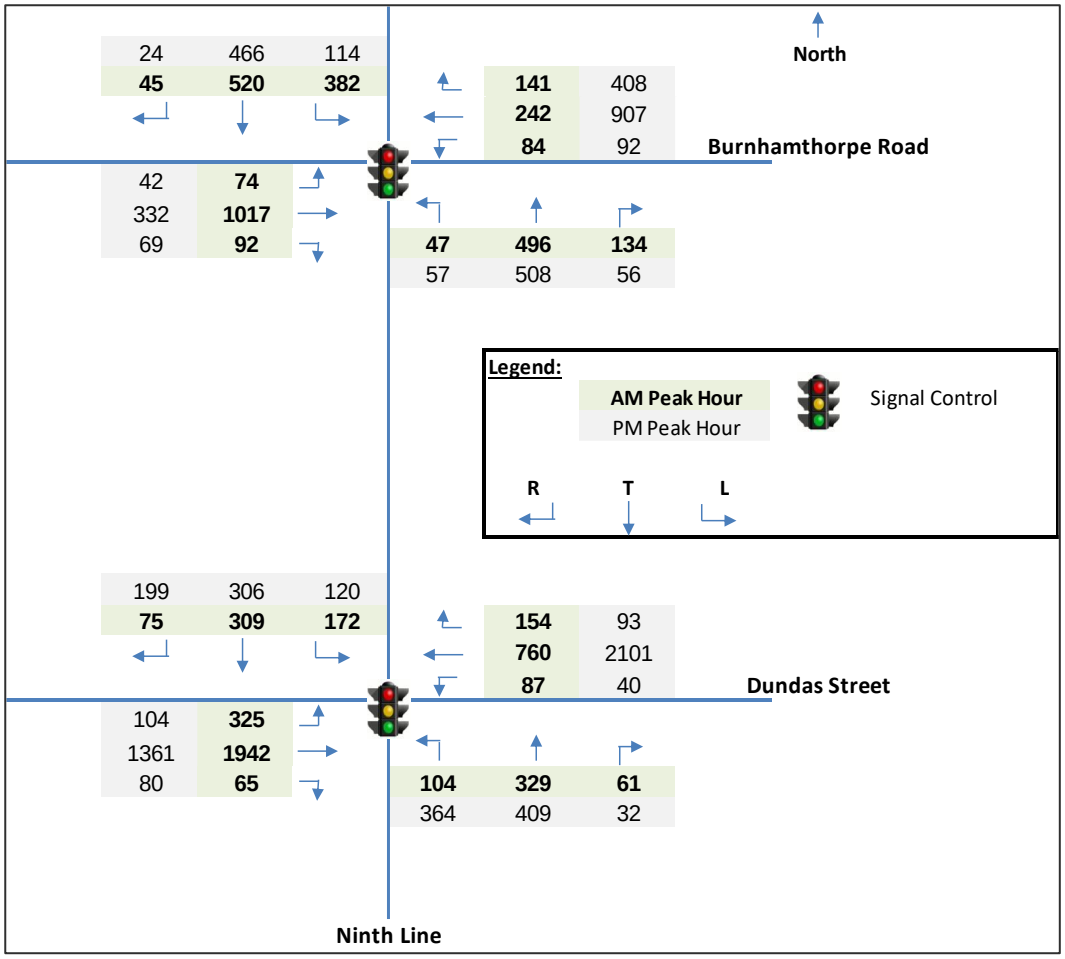

Figure 5: Existing Traffic Volumes (2015)

Analysis results for existing conditions traffic operations for the study area intersections are shown in Table 5. The analysis was based on the current signal timing plans provided by the Region.

Key conclusions from the traffic analysis are as follows:

- Ninth Line at Burnhamthorpe Road – The intersection operates above capacity with an overall Level of Service (LOS) F during both peak periods. The northbound and southbound travel directions along Ninth Line operate poorly with LOS E or F during the AM and PM peak hours. Traffic along Burnhamthorpe Road is directional with AM peak flows highest in the eastbound direction (i.e. toward Mississauga) and evening PM peak flows highest in the westbound direction. Peak flow directions experience LOS F.
- Ninth Line at Dundas Street – The intersection operates well during the AM peak with a LOS C, and above capacity during the PM peak hour with a LOS F. The only critical through movements are the westbound through and northbound left, both with a LOS F.

Table 5 : Existing Traffic Conditions

Intersection	Movement	Weekday AM Peak Hour			Weekday PM Peak Hour		
		LOS	v/c	Control Delay (s)	LOS	v/c	Control Delay (s)
Ninth Line at Burnhamthorpe Road	**Overall**	**F**	**1.45**	**190.0**	**F**	**1.18**	**88.2**
	EB L	C	0.18	20.3	D	0.49	35.6
	EB TR	F	1.45	239.7	C	0.61	23.0
	WB L	F	1.39	279.0	C	0.37	20.7
	WB T	C	0.32	21.8	F	1.33	181.3
	WB R	B	0.10	18.9	B	0.41	19.3
	NB L	F	0.78	83.5	C	0.61	33.6
	NB TR	F	1.37	219.1	F	1.10	95.5
	SB L	F	1.45	253.8	C	0.61	23.7
	SB TR	F	1.20	149.2	E	0.97	56.9
Ninth Line at Dundas Street	**Overall**	**C**	**0.77**	**34.9**	**D**	**1.09**	**46.6**
	EB L	C	0.65	21.5	D	0.73	37.2
	EB T	C	0.88	34.1	C	0.65	20.5
	EB R	B	0.05	16.5	B	0.06	12.9
	WB L	D	0.65	46.3	B	0.22	12.7
	WB T	C	0.49	33.0	D	0.96	37.9
	WB R	C	0.10	27.6	B	0.06	13.5
	NB L	D	0.41	40.0	F	1.33	209.4
	NB T	D	0.44	44.5	D	0.72	49.8
	NB R	D	0.05	39.1	D	0.02	39.9
	SB L	D	0.60	46.1	D	0.56	41.6
	SB T	D	0.40	43.7	D	0.66	50.8
	SB R	D	0.05	39.0	D	0.54	49.6

Note: The table assumes Ninth Line to have a north/south alignment.

Key: EB–Eastbound; WB–Westbound; NB–Northbound; SB–Southbound; L–Left; T/TR–Through; R-Right

Results of the link analysis presented in Table 6 and Table 7 indicate that Ninth Line presently operates over capacity north of Burnhamthorpe Road (Segment 2) during both the AM and PM peak hours. In addition, Segment 1 is nearing capacity with a v/c ratio of 0.95 during the AM peak hour.

Table 6: AM Peak Hour – Link Analysis for Existing Conditions

Ninth Line Segment	Number of Lanes	Peak direction traffic volume	v/c ratio
1 – from Dundas Street to Burnhamthorpe Road	1	808	0.95
2 – north of Burnhamthorpe Road	1	947	1.14

Table 7: PM Peak Hour – Link Analysis for Existing Conditions

Ninth Line Segment	Number of Lanes	Traffic Volume Peak Direction (2015)	v/c ratio
1 – from Dundas Street to Burnhamthorpe Road	1	625	0.73
2 – north of Burnhamthorpe Road	1	958	1.12

2.2.2. Future Conditions

Halton Region is planning for roadway capital projects for the 2018 – 2031 period including the following projects in and around the study area as outlined in Table 8. Trafalgar Road is a north-south arterial roadway located to the west of Ninth Line. Since the intersections of Ninth Line with Dundas Street and William Halton Parkway are considered as part of previous and/or current MCEAs conducted by others, operational analysis of the intersections were not included as part of this study.

Table 8: Halton Region Capital Projects (2018 – 2031)

Roadway	Proposed works	Location	Proposed construction start	In study area? (Y/N)
Trafalgar Road	Widening from 4 to 6 lanes	Dundas Street to Highway 407	2018	N
Ninth Line	Widening from 2 to 4 lanes	Dundas Street to William Halton Parkway	2025	Y
Ninth Line	Widening from 2 to 4 lanes	William Halton Parkway to Highway 407	2023	Y

Additionally, as discussed above, the Region is planning to construct a new east-west transportation corridor from Regional Road 25 to Ninth Line. This new corridor, named William Halton Parkway, will have a four-lane urban cross-section with on-road cycling lanes, sidewalks and a multi-use trail. As part of these works, the signalized intersection of Ninth Line at Burnhamthorpe Road will be replaced with an approved roundabout with construction to start late 2018. The roundabout will be constructed as a two-lane roadway.

The projected traffic volumes are shown in Figure 6.

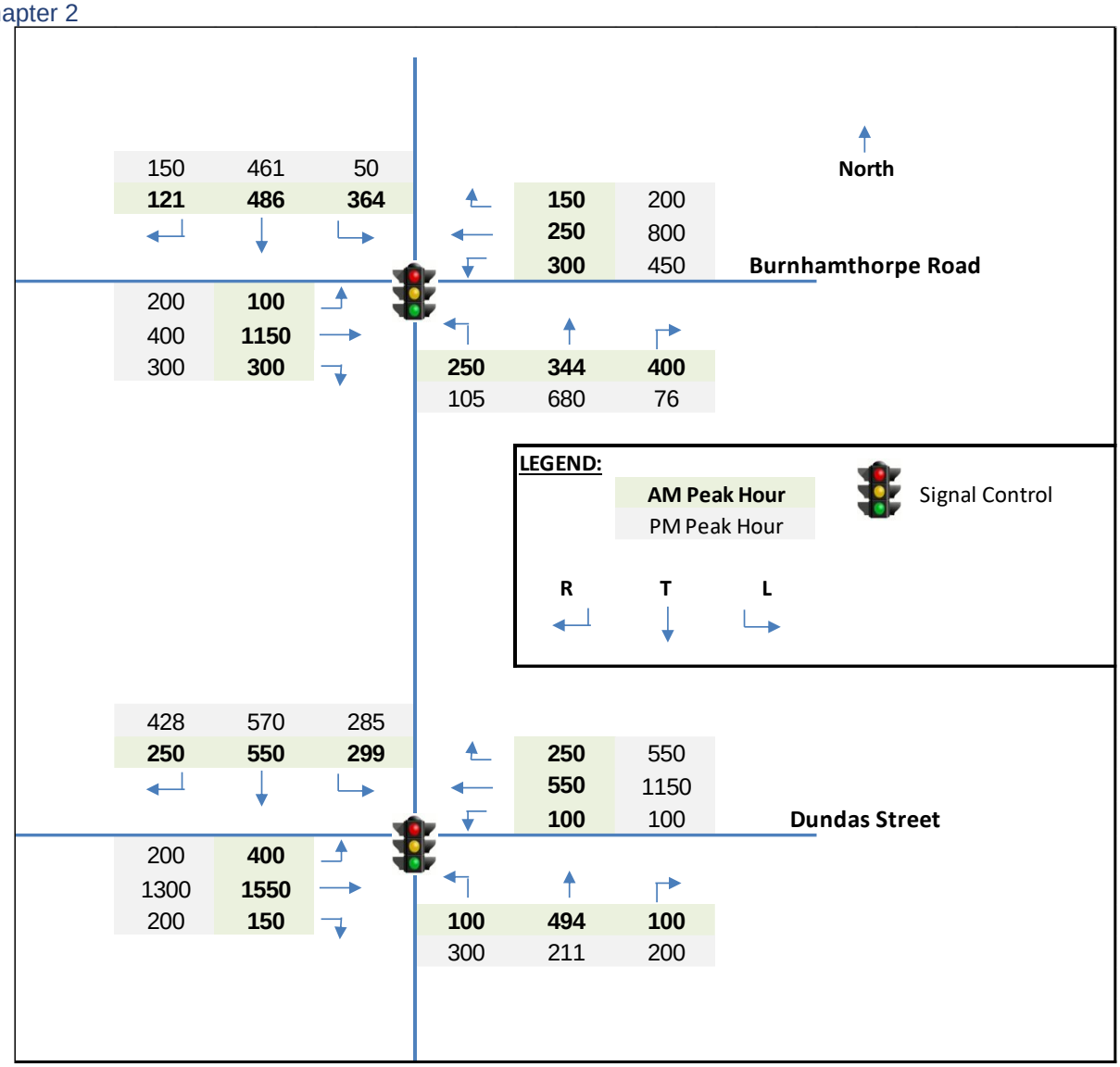

Figure 6: 2031 Future Link Traffic Volumes

The analysis of future conditions was conducted for two scenarios, i.e. “Do Nothing” and “With Improvements”. The “Do Nothing” scenario maintains Ninth Line as a two-lane road, and the “With Improvements” scenario widens Ninth Line to 4 lanes. The following assumptions were made:

- Existing configuration of the intersection with Dundas Street will remain the same with no modifications for future conditions as per work previously conducted by the Region; and
- The existing signalized intersection with Burnhamthorpe Road will be replaced with a 2-lane roundabout.

The link analysis for the “Do Nothing” scenario shows that the Ninth Line corridor would be operating well above capacity during both the AM and PM peak hours (Table 9 and Table 10). Widening of Ninth Line to four lanes is expected to provide sufficient road capacity to accommodate 2031 forecast traffic volumes.

Table 9: AM Peak Hour – Link Analysis for 2031

Ninth Line Segment	Number of Lanes	Traffic Volume Peak Direction (2031)	v/c ratio		Level of Service (LOS)	
			Do Nothing (1 lane per direction)	With Improvements (2 lanes per direction)	Do Nothing (1 lane per direction)	With Improvements (2 lanes per direction)
1 – Dundas Street to Burnhamthorpe Road	2	1144	**1.34**	0.67	F	C
2 – north of Burnhamthorpe Road	2	971	**1.14**	0.57	F	C

Table 10: PM Peak Hour – Link Analysis for 2031

Ninth Line Segment	Number of Lanes	Traffic Volume Peak Direction (2031)	v/c ratio		Level of Service (LOS)	
			Do Nothing (1 lane per direction)	With Improvements (2 lanes per direction)	Do Nothing (1 lane per direction)	With Improvements (2 lanes per direction)
1 – Dundas Street to Burnhamthorpe Road	2	1211	**1.42**	0.71	F	C
2 – north of Burnhamthorpe Road	2	1080	**1.27**	0.63	F	C

2.3. Traffic Safety

The objectives of the road safety assessment are to evaluate whether road safety issues exist under existing conditions and to recommend mitigation measures as appropriate. The safety assessment consists of three separate tasks:

- Descriptive analysis of collision data to identify collision types and trends;
- Predictive analysis of collision data to evaluate potential for improvement; and
- Field investigation with respect to road design elements.

From the analysis of collision history and detailed field investigations, the following improvements are suggested based on the identified deficiencies for the potential widening of Ninth Line:

- Enhance shoulder widths to minimum standards, remove shoulder edge drop-offs, and maintain eroded shoulders;
- Wherever possible, flatten the side slopes to recoverable slopes. If flattening of slopes is not possible due to property constraints, consider providing appropriate shielding by using steel beam guide rails;
- Consider relocating utility poles and other fixed objects, such as culvert head walls outside of the clear zone;
- Protect the ends of guide rails by using approved end treatments; and
- Provide appropriate storage lengths for left turn lanes at the intersection of Ninth Line and Burnhamthorpe Road.

2.4. Problem and Opportunity Statement

Ninth Line is currently experiencing significant delays during peak periods and is reaching capacity. It is projected that traffic volumes will continue to increase in the future. Future traffic is expected to grow by over 45% by 2031 in the PM peak hour. To support future growth and travel demands, improvements to the Ninth Line corridor are required. The improved corridor should support all modes of transportation including active transportation, transit services, inter-regional travel, agricultural vehicles and goods movement. Therefore, Halton Region is carrying out this study to address these requirements in accordance with the MCEA.

3. Existing Conditions

Background information was collected from various sources in order to analyze the existing conditions of the study area:

- Various background studies and reports;
- Data provided by Halton Region and Conservation Halton;
- Investigations undertaken as part of this MCEA study;
- Meetings with the Project Team;
- Meetings and correspondence with agencies including Conservation Halton, Ministry of Transportation, Ministry of Natural Recourses and Forestry, 407 Express Toll Route (ETR), Town of Oakville, and City of Mississauga;
- Consultation with members of the public.

As discussed in Section 1.2, the study area focuses on Ninth Line from Dundas Street to 407 ETR as illustrated in Figure 1.

3.1. Transportation

A review of the existing transportation features within the study limits was conducted including the existing transportation network, active transportation facilitates and transit service.

3.1.1. Transportation Network

The key components of the existing road network are discussed in Table 11.

Table 11: Existing Road Network

Road	Description
Ninth Line (Regional Road 13) - Dundas Street (Regional Road 5) to 407 ETR (Express Toll Route)	• Under the jurisdiction of Halton Region • 2-lane rural cross-section • Major arterial road • Dundas Street at Ninth Line is a signalized intersection with urban cross-section • Posted speed is 60 km/h • Roundabout at William Halton Parkway planned for construction as part of a separate study • Minimal existing provisions for cyclists or pedestrians • Limited illumination
Dundas Street (Regional Road 5)	• Under the jurisdiction of Halton Region • Major arterial road • Signalized intersection at Ninth Line • 6-lane urban arterial east and west of Ninth Line
William Halton Parkway	• Under the jurisdiction of Halton Region • Planned for a roundabout with Ninth Line as part of a separate study

Highway 403 and 407 ETR (Express Toll Route) Structures	• Four Ministry of Transportation structures with limited right-of-way:
	  ○ Ramp W-S underpass (Highway 403/407 interchange) over Ninth Line
	  ○ Ninth Line over Highway 403/407 Interchange
	  ○ Ramp 407N-403E, S over Highway 407 and Ninth Line
	  ○ Ninth Line over Ramp 403S-407N and Ramp 403E-407N

3.1.2. Active Transportation

There are currently no dedicated active transportation facilities along Ninth Line between Dundas Street and 407ETR to accommodate cyclists or pedestrians except for pedestrian crossings at the signalized intersection of Dundas Street and Ninth Line.

Halton Region has completed an Active Transportation Master Plan Study to create a 20- year vision for active transportation in Halton Region. As part of the Ninth Line corridor improvements, features of active transportation were considered, such on-road bicycle lanes and multi-use paths for pedestrians and cyclists.

3.1.3. Transit

There are currently no transit services that operate on Ninth Line between Dundas Street and 407ETR.

3.2. Socio-Economic Environment

The Halton Region, the Town of Oakville and the Province of Ontario have developed planning documentation with planning policies to guide development within the Region:

- Halton Region Official Plan
- Halton Region Transportation Master Plan
- Halton Region Active Transportation Master Plan
- Provincial Policy Statement
- North Oakville Creeks Subwatershed Study
- Greenbelt Plan (Parkway Belt West Plan Area)

The Regional planning policies are discussed in Section 2.1.

As discussed in Section 1.1, within the study limits, the Ninth Line borders the Town of Oakville to the west, the City of Mississauga to the east and the Town of Milton to the north. Each of the municipalities have Official Plans with policies that set guidelines for urban development, changes in land use and transportation and environmental features. The land use guidelines of the various Official Plans are discussed below.

3.2.1. Existing Communities and Land Use

Currently, Ninth Line between Dundas Street and 407ETR consists of rural areas on both sides of the road with intermittent institutional, commercial, residential and community properties adjacent to Ninth Line.

The following notable features are located throughout the corridor.

- Glen Oaks Funeral Home and Cemetery;
- Kingdom Hall of Jehovah's Witnesses;
- Open Space;
- Residential Homes;
- Fern Hill School;
- Ninth Line Sports Park; and
- The Tennis School

3.2.2. Future Land Use

As discussed in Section 1.1, within the study limits, Ninth Line borders the Town of Oakville to the west, the City of Mississauga to the east and the Town of Milton to the north. The corridor is planned for varying land uses within each municipality as per the Town of Milton, Town of Oakville and City of Mississauga Official Plans.

Figure 7 shows the planned land uses in the Town of Milton, north of 407 ETR as designated in the Town of Milton Official Plan (2008). The land within the Town of Milton's jurisdiction is designated as Parkway Belt West Plan Area.

The Town of Oakville Official Plan (2009) designates the planned land use on the west side of study corridor as seen in Figure 8. The land uses include; cemetery area, institutional, employment, utility corridor, stormwater management and Natural Heritage System. Within the Town of Oakville Ninth Line is a designated Major Arterial/transit corridor. Figure 8 identifies a

potential future local road connection to Ninth Line south of Burnhamthorpe Road as an "Avenue/Transit corridor." The Town of Oakville Official Plan also identifies an existing watercourse traversing Ninth Line as a "high constraint stream corridor". This means that the form and function of the stream is to be maintained.

The City of Mississauga Official Plan (2018) designates land use on the east side of the Ninth Line. The majority of land on the east side is classified by the City of Mississauga Western Business Park District Land Use Map (2012) as Business Employment, Parkway Belt West and Public Open Space as shown in Figure 9. North of the intersection of Ninth Line and Dundas Street, a plot of land is designated as open space and Parkway Belt West Plan Area.

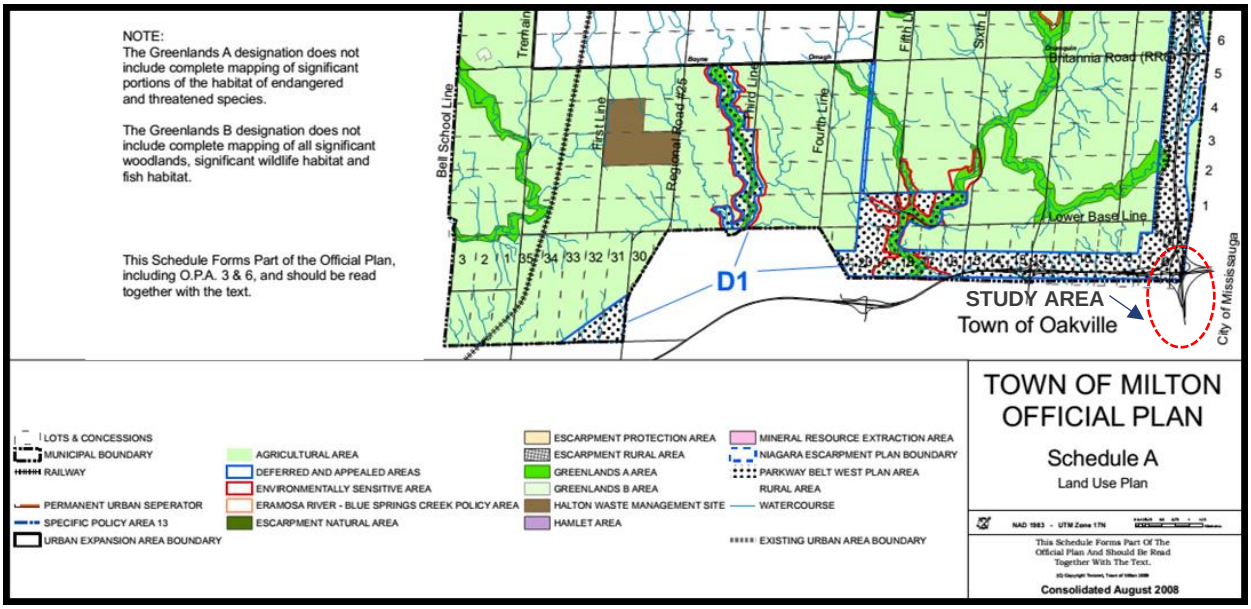

Figure 7: Town of Milton Official Plan Land Use Map (Source: Town of Milton)

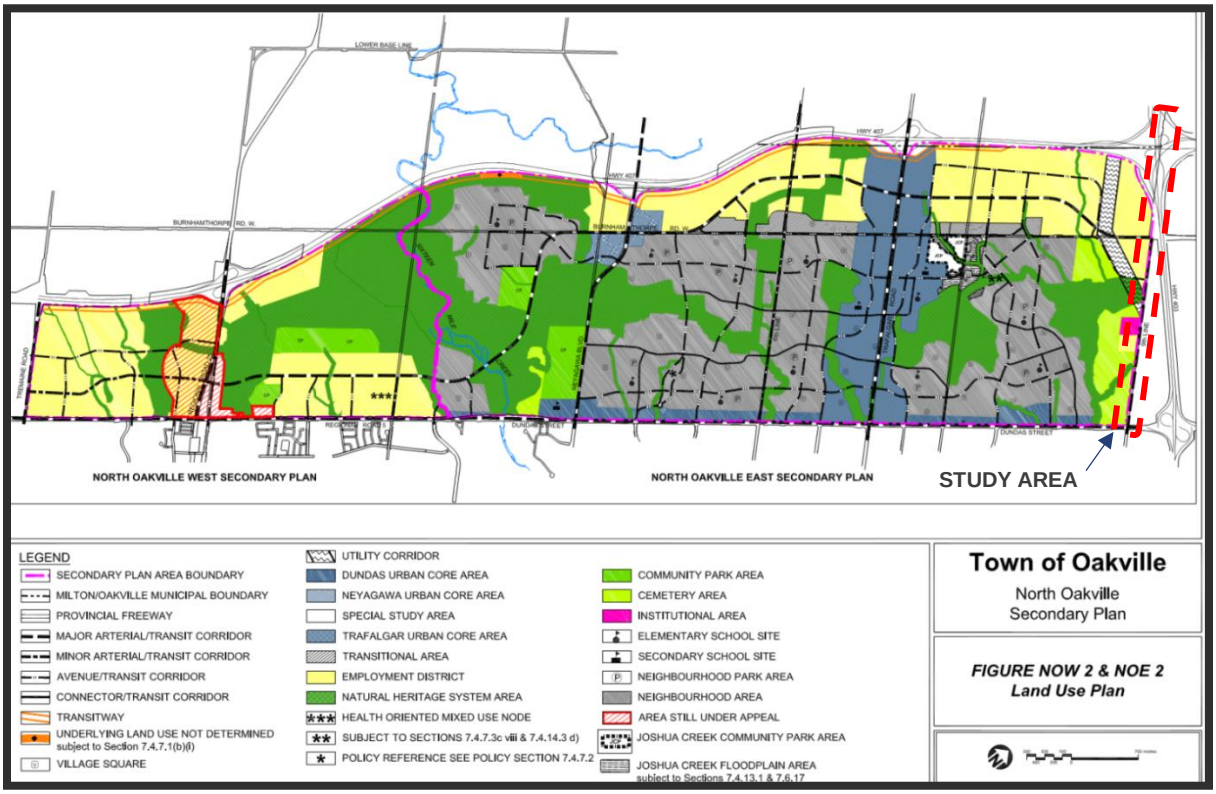

Figure 8: Town of Oakville Secondary Plan Land Use Map (Source: Town of Oakville)

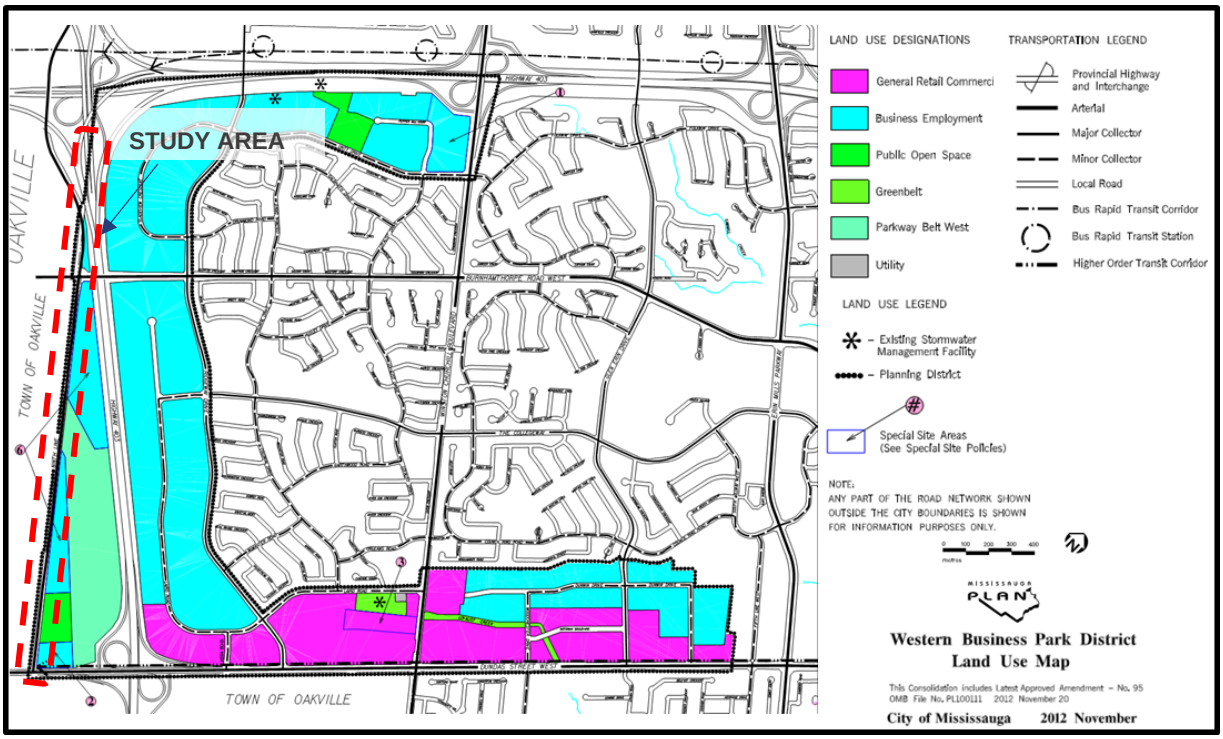

Figure 9: City of Mississauga Western Business Park District Land Use Map (Source: City of Mississauga)

3.2.3. Pedestrian and Cycling Facilities

As noted in Section 3.1.2, Ninth Line within the Study Area is a 2-lane roadway with a rural cross section with few existing active transportation facilities to accommodate cyclists or pedestrians. An active transportation strategy has been considered in this study.

3.3. Natural Environment

3.3.1. Natural Features

A Natural Environment Assessment (Appendix C) was conducted to determine the natural heritage constraints within the Ninth Line study limits. Based on the background review, Species at Risk screening and field surveys, the natural heritage constraints within the Study Area include:

- North Oakville-Milton East Wetland Complex Provincially Significant Wetland;
- Conservation Halton regulated areas;
- Municipal and Regional Official Plans – Natural Heritage System;
- North Oakville Creeks and Subwatershed Study (NOCSS) areas; and
- Habitat for provincially threatened species (bobolink and barn swallow).

The natural features within the study area are illustrated in Figure 10.

The vegetation communities along the study corridor are classified as greenland, cultural meadow, cultural savannah, open agricultural fields, open water, deciduous swamp, deciduous thicket and deciduous woodland. Plant communities in the Study Area are largely of anthropogenic origin and include annual row crop agriculture, old field cultural meadow, a large cemetery and sports fields. Agricultural fields were identified between Dundas Street and Burnhamthorpe Road East, east of Ninth Line and west of Highway 403, which were noted to be soy fields.

As previously mentioned, several provincially significant wetlands, as part of the North Oakville-Milton East Wetland Complex, exist between William Halton Parkway and Dundas Street. The wetlands are present east and west of the corridor with classified land also passing under the roadway. These wetlands were dominated by broad-level cattail (typha latifolia) and European common reed grass (Phragmites australis). A tributary leading into Joshua's Creek passes through the study area between Burnhamthorpe Road and Dundas Street. This tributary leads into the Joshua's Creek watershed that enters into Lake Ontario. The tributary is a high constraint stream corridor and therefore, the form and function of the stream is to be maintained. There are no Areas of Natural and Scientific Interest in or adjacent to the Study Area.

3.3.2. Natural Heritage Constraints

Significant Wetlands

The MNRF designates provincially significant wetlands (PSWs). PSWs are determined based on a scientific point-based ranking system known as the Ontario Wetland Evaluation System (OWES). A part of the North Oakville-Milton East Wetland Complex is present in the study area.

Conservation Halton

The project crosses two Conservation Halton (CH) regulated areas. One regulated area is associated with the North Oakville-Milton East Wetland Complex, which is a PSW. The other CH regulated area is associated with the Joshua Valley Park North.

Municipal and Regional Official Plans – Natural Heritage System

On Map 1G of the Region of Halton Official Plan (OP), the lands associated with the PSW and the reach of Joshua's Creek are identified as Key Features within the Natural Heritage Systems (Region of Halton, 2015). The remainder of the study area is mapped as Urban Area. The Region's OP states that local municipalities in their official plans shall ensure that these Key Features are protected through appropriate area-specific plans or studies related to development and/or site alteration.

Under the North Oakville East Secondary Plan, the lands in the study area that are west of Ninth Line are designated as Cemetery Area, Employment Area, Institutional Area, Utility Corridor and Natural Heritage System Area. The lands within the study area are zoned Existing Development in accordance with By-law 2009-189. All new development requires a zoning amendment.

On Schedule 2 of the City of Mississauga OP, a portion of the study area is designated as Significant Natural Areas and Natural Green Spaces under the Natural Heritage System.

Development or site alteration in areas designated as Natural Heritage System under the Regional and Municipal Official Plans must comply with the requirements of these plans.

North Oakville Creeks Subwatershed Study (NOCSS)

The NOCSS (Oakville 2006) identified each subwatershed and includes recommendations on setbacks and protective measures. The Joshua Creek Core Area (#11) was delineated based on the combination of wetland and upland communities and the drainage system of several tributaries which come to a confluence at the Joshua Creek. The Joshua Creek Core Area also includes open country habitat, which are the fields located on the west side of Ninth Line. The boundary of the Joshua Creek Core Area on the northeast corner abuts Ninth Line and is recognized as part of the Natural Heritage System. Within this core area, there are several sensitive plant species identified in the wetlands that are part of the North Oakville-Milton East Wetland Complex. The NOCSS suggests setbacks from wetlands of at least 30 metres, but as much as 100 to 200 metres for more sensitive wetland features.

One of the key sensitive communities within the Joshua Creek Core Area is Buttonbush Swamp. Although a larger portion of Buttonbush Swamp is located within Core Area #10 to the west of Joshua Creek Core Area, there are small patches of this community of Joshua Creek Core Area. Buttonbush communities were not observed from Ninth Line, but a small Buttonbush community (0.06 ha) was identified in the North Oakville-Milton Wetland evaluation approximately 65 metres to the east of Ninth Line. There is another small Buttonbush community (0.08 ha) to the west of Ninth Line, approximately 130 metres from Ninth Line. Ninth Line appears to be a partial barrier to water flow from the wetland pockets on the east side to the west side of the road, with only one small culvert connecting these wetlands, but not directly where the wetlands would cross Ninth Line. The NOCSS management recommendations for the Joshua Creek Core Area includes retention of the woodlands and wetlands. Other recommendations include improving the linkages between this Core Area and Core Area #10 or between the Joshua Creek Core Area and the natural areas to the south across Dundas Street. Improving the linkages within the Joshua Creek Core Area itself, including across Ninth Line could also prove beneficial to the quality of the wetland.

Species at Risk (Endangered and Threatened Species)

Based on the breeding bird surveys conducted in 2016, it was determined that bobolink habitat is present within the study area. Active barn swallow nests were also observed in the study area. Both bobolink and barn swallows are species at risk (SAR). Although bank swallows were observed flying over the study area, no nesting habitat was observed. No other threatened or endangered species were observed in the study area.

3.3.3. Field Surveys

The terrestrial and aquatic features of the Study Area were characterized though field surveys conducted between April and September of 2016. The schedule of surveys is provided in Table 12.

Table 12: Natural Environment Field Survey Schedule

Date	Type of Survey
April 20, 2016	• Site Reconnaissance • Visual Encounter Survey for Reptiles • General Wildlife Survey
April 21, 2016	• Anuran Call Count Survey
May 11, 2016	• Anuran Call Count Survey
May 18, 2016	• Visual Encounter Survey • General Wildlife Survey • Ecological Land Classification • Investigation of culvert for Barn Swallow nesting
June 9, 2016	• Anuran Call Count Survey
June14, 2016	• Breeding Bird Survey • General Wildlife Survey
July 3, 2016	• Breeding Bird Survey • General Wildlife Survey
September 21, 2016	• Aquatic Habitat Survey

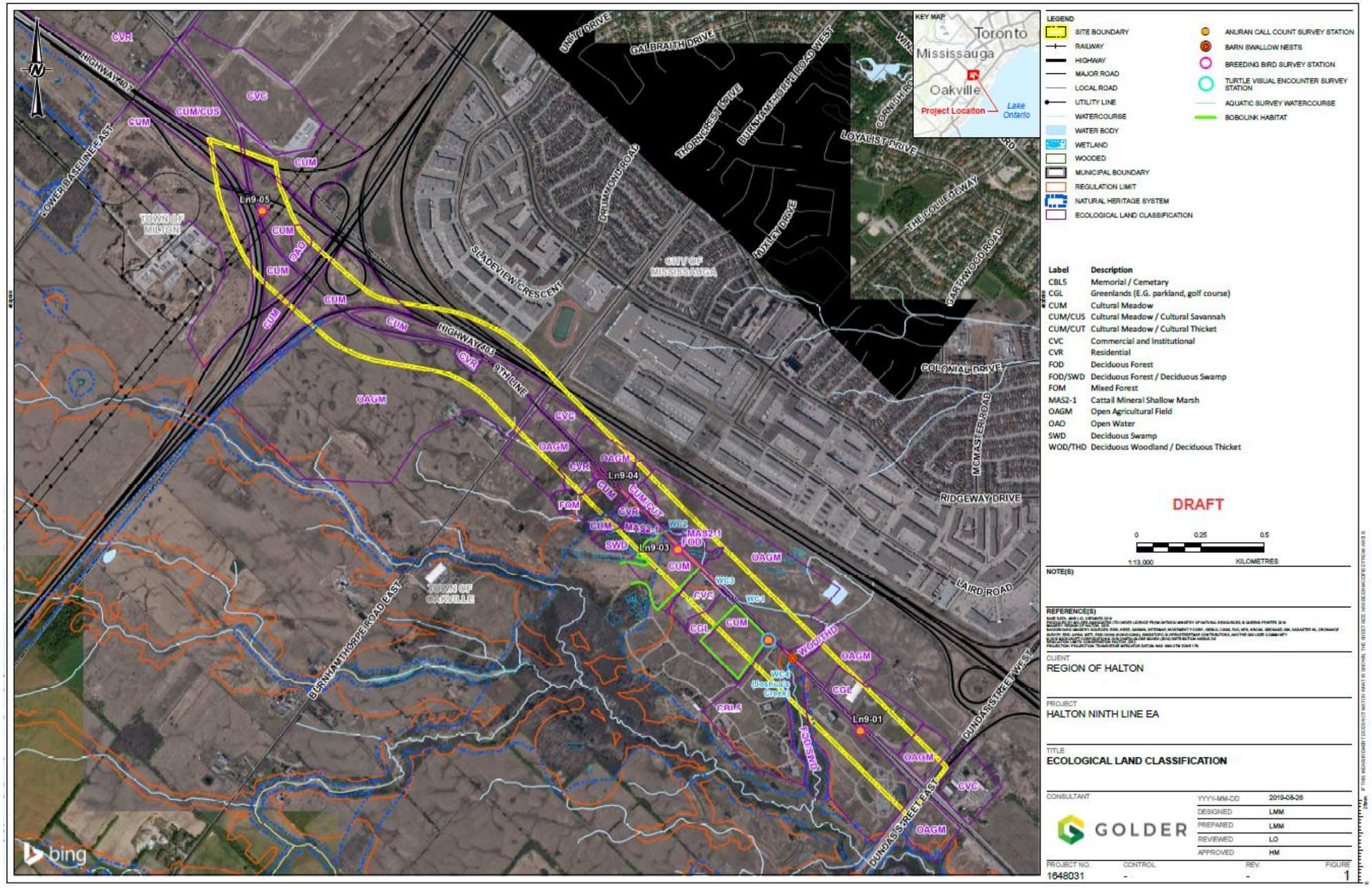

Figure 10: Existing Conditions – Natural Heritage Constraints

3.3.4. Wildlife

The following observations were made regarding wildlife species within the Study Area during the field surveys:

- No frogs were observed calling within 100m of the road at any other of the survey locations, however a full chorus of distant spring peepers was observed calling southwest of station Ln9-01 from the wooded riparian area of Joshua's Creek (WC4) outside of the Study Area;
- No turtles were observed during the two visual encounter surveys for turtles, or during any of the general wildlife surveys; and
- Three Species at Risk bird species were observed in the Study Area. All three species are designated as threatened under the ESA.

3.3.5. Aquatic Habitat

During the aquatic habitat survey, four surface water features were identified in the Study Area and identified as WC1, WC2, WC3 and WC4 (Figure 10).

WC1 is an agricultural ditch, which originates on the east side of Ninth Line, just southeast of Fern Hill School. The stream flows east, and the channel form is straightened. The watercourse was identified as a portion of RL-03 in the fluvial geomorphic assessment. The watercourse was surveyed starting at Ninth Line and ending approximately 30 metres east of Ninth Line.

Flow was observed at the culvert on the east side of Ninth Line. At the 30 metre downstream location the channel was wetted but flow was not discernable. The channel was observed to be choked with cattails and terrestrial grasses. The substrate was silt and no barriers to fish were observed. No evidence of groundwater discharge was observed. Overall habitat potential for fish in this reach was considered low.

WC2 is a marshy area northwest of Fern Hill School, within the Hydro One property. It was dry at the time of the survey and no defined channel could be located. This watercourse was identified as RL-04 in the fluvial geomorphic assessment. The area was choked with cattail and European common read. The watercourse is likely seasonally wetted/flowing but was not providing habitat to fish under the flow conditions observed during the survey. The culvert connection to the watercourse through Ninth Line is 0.30 metres in diameter. No barriers to fish passage were observed. No evidence of groundwater discharge was observed.

WC3 is a roadside ditch that runs along the west side of Ninth Line from WC2 to just past Fern Hill School. This watercourse is connected to WC1 though a culvert. It was identified as a portion of RL-03 in the fluvial geomorphic assessment. The ditch was overgrown with cattails and European common reed. The ditch was not flowing at the time of the survey, but there was standing water in some locations. Representative measurements were collected near the north driveway to Fern Hill School. Substrate was silt with sparse gravel and the ditch was not considered as value fish habitat, as it would only contain water during runoff periods and did not appear to be connected to the permeant watercourses.

Joshua's Creek (WC4) was surveyed from approximately 125 metres south from Ninth Line where the watercourse meanders through Glen Oaks Funeral Home and Cemetery. This watercourse was identified as RL-02 (upstream of Ninth Line) and RL-01 (downstream of Ninth Line) in the fluvial geomorphic assessment. The watercourse continues upstream where it crosses Ninth Line. Upstream of Ninth Line, the watercourse flows southwest through a riparian area between agricultural fields. The survey extended approximately 80 metres east of Ninth Line. This

watercourse is also referred to as JC22 in the North Oakville Creeks Subwatershed Study where is it identified as being “high constraint – requiting rehabilitation”.

The majority of the downstream reach (from Ninth Line to 125 metres downstream of Ninth Line) has defined channel, but the channel was poorly defined in areas. The channel form is irregular meander, and high flows have carved out pools and caused bank scouring on inside turns. Banks were frequently unstable along this reach due to erosion. Substrate is dominated by silt, with sparse gravel and cobble. The riparian area was manicured lawn right to the edge of the bank on both sides of the watercourse. The watercourse was dry at the time of the survey, and not providing habitat to fish. Evidence of flow from bank erosion suggests the watercourse sustains flow during high water periods such as freshet or after rainfall events, and the habitat would be available to fish at these times.

Upstream of Ninth Line, the watercourse is broader and poorly defined as it widens into a low area choked with grasses and cattails. Substrate was silt and the riparian area within 10 to 15 metres of the watercourse consisted of long grasses, goldenrod, thistles and deciduous trees. The narrow riparian area was adjacent to soybean fields on either side. The reach was also dry during the survey.

Under high flow conditions, it is expected that the culvert allows for fish passage. No barriers to fish passage were observed along the reaches surveyed. No evidence of groundwater discharge was observed. No fish were observed during the aquatic habitat surveys.

3.3.6. Species at Risk

A desktop screening was conducted to determine which Species at Risk (SAR) have potential to occur within the Study Area. Species with ranges overlapping the Study Area, or with recent occurrence records in the vicinity of the Study Area, were screened by comparing their habitat requirements to habitat conditions in the Study Area. Habitats for endangered or threatened species were observed in the Study Area. As discussed in Section 3.3.2, bobolink habitat is present within the study area. Active barn swallow nests were also observed in the study area. Although bank swallows were observed flying over the study area, no nesting habitat was observed. No other threatened or endangered species were observed in the study area.

3.3.7. Source Water Protection

The Clean Water Act (2006) and Ontario Regulation 287/07 establish the legal framework for drinking water source protection. 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. Protecting municipal sources of drinking water from becoming contaminated or overuse will ensure a sufficient supply of clean, safe drinking water. 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 Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 and 2015) requires that proponents identify whether a project is occurring within a source water protection vulnerable area. This includes areas close to a municipal drinking water well or intake. In these areas certain land or water activities, if left unchecked, could pollute the water supply. Halton

Conservation and Hamilton Conservation Authority represent the Halton-Hamilton Source Protection Region which govern the study area.

The study area is located in the Halton source protection area and is not identified as being located within a wellhead protection area, intake protection zone or an issue contributing area. A portion of the study corridor surrounding the Joshua's Creek Tributary is identified by the Halton-Hamilton Source Protection Region as being located within a vulnerable area within an Intake Protection Zone 3 Event Based Area (Figure 11) with a pipeline (Enbridge, formerly Union Gas) that is close to rivers, streams or other water bodies which is associated with a low level of vulnerability. It has been confirmed with the Halton-Hamilton Source Protection Region that no project activities associated with the Ninth Line Transportation Corridor Improvements would result in a significant drinking water threat or a risk to drinking water. Therefore, no source water protection policies apply to the project and no mitigation is warranted.

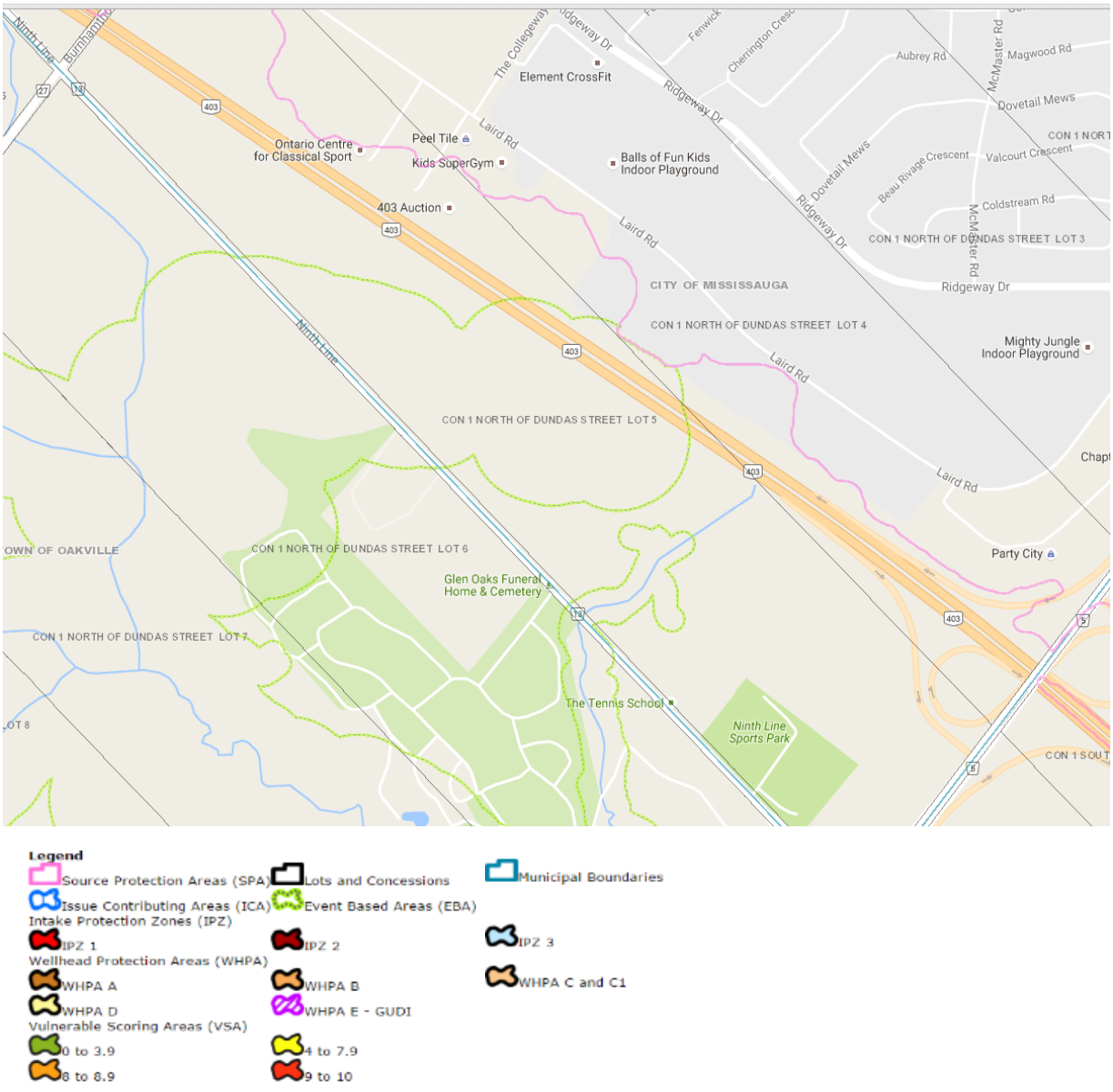

Figure 11: Study Area Source Water Protection Designation

3.4. Stormwater Management

A Stormwater Management Assessment was conducted to outline the constraints for the proposed Ninth Line transportation corridor improvements. A copy of the Stormwater Management report is available in Appendix D.

The existing stormwater controls for the Ninth Line corridor are discussed below. This section includes the general layout of the road, the adjacent drainage ditches and stormwater management systems, as well as the exiting road crossing culverts and estimates of their ability to convey estimated target flow rates.

The study area is located along Ninth Line between Dundas Street and the 407 ETR interchange. Starting at the Dundas Street intersection and moving north:

- At the Dundas Street intersection, Ninth Line is a 4-lane urban cross section with a concrete median and two additional turning lanes from the southbound Ninth Line, with catch basins along the curb and ditch inlet catch basins to either site of the road.
- 200m north of the Dundas Street intersection, Ninth Line narrows to a 2-lane rural section with a gravel shoulder and ditches on both sides of the road.
- At William Halton Parkway, 2.1 km north of the Dundas Street intersection, the existing road widens to include a turning lane on either side of the interchange. The intersection is planned to be redeveloped as a two-lane roundabout. As part of the proposed roundabout, approximately 200 m of Ninth Line north and south of the roundabout will be widened to 4 lanes, curving back to connect to the existing road alignment. The planned construction includes a system of catch basins at the roundabout, draining to the existing crossing 150m southwest along William Halton Parkway.
- North of William Halton Parkway, Ninth Line passes through the 407 ETR interchange with a series of two bridges and two underpasses. At these locations, the ditching to either side is reduced or eliminated, and gravel shoulder is reduced (for underpasses) or eliminated (on bridges). There are no deck drains on the bridges, and runoff drains along the concrete barriers on either side of the road to the edge of the bridge. Drainage in this section is to 407 ETR SWM ponds at the intersection (either directly or through crossing culverts).

Runoff from the existing road right of way generally flows uncontrolled into roadside ditches, which in turn convey the flow to nearby road crossing streams and culverts.

3.4.1. Road Crossing Culverts

There is a total of twelve road crossing culverts within the study area, as shown in Figure 12. The culvert sizes and materials listed in Table 13. The majority of culverts are corrugated steel pipes (CSP) while two are concrete box culverts. Culvert information is generally taken from the topographic survey, in three cases (CC#1, CC#1.5 and CC#3.5), some information for the culverts was not shown on the survey and the culvert hydraulics could not be assessed.

Table 13: Exisiting Culverts

Culvert ID #	Culvert Size and Material	Culvert Length (m)
CC#1	Triple Barrel CSP	-
CC#1.5	4.0 m Wide Concrete Box	-
CC#2	1600 mm CSP	75
CC#3	800 mm CSP	29
CC#3.5	500 mm CSP	-
CC#4	750 mm CSP	24.3
CC#5	700 mm CSP	25.0
CC#6	400 mm CSP	14.8
CC#7	600 m CSP	15.3
CC#8	1200 mm CSP	18.3
CC#9	1.9 m x 1.1 m Concrete Box	17.9
CC#10	500 mm CSP	14.7

3.4.2. Hydrology

The Region provided GIS catchment areas for the existing crossing culverts, which are shown in Figure 12. The catchments provided do not include drainage to the culverts at 407 ETR. The remaining areas (CC#4 through CC#10) drain to the same catchment, which is a tributary of Joshua Creek. Flow in this catchment:

- originates near the 407ETR interchange;
- crosses Ninth Line a first time at CC#4;
- flows through a swale before crossing William Halton Parkway to the southwest of the Ninth Line intersection;
- passes through the wetland west of Ninth Line before flowing into the roadside ditch west of the road in front of the Fern Hill school;
- crosses Ninth Line a second time at CC#8;
- flows across the fields east of the road before emptying into a defined floodplain (becoming the Joshua Creek tributary at this point), and finally;
- crosses Ninth Line a third time through the CC#9 concrete box culvert and flows south across the cemetery property towards Joshua Creek.

As a regional road, road crossing culverts are required to be able to pass the peak runoff from both the 1:100 year and Regional storm events without overtopping the road. Peak runoff rates for each

road crossing culvert were estimated using either the Rational method or EPA SWMM5 peak runoff values. The results are shown in Table 14.

Table 14: Estimated Peak Flows at Watercourse Crossing Locations

Watercourse Crossing and Culvert ID	Catchment Area (ha)	EPA SWMM 5 Estimated Peak Flows from Supplementary Analyses		Rational Method Estimated Peak Flows	
		1:100 year Peak Flow (m^3/s)	Regional Storm Peak Flow (m^3/s)	1:100 year Peak Flow (m^3/s)	Regional Storm Peak Flow $m^3/s)$
CC#4	3.0	0.90	0.44	**2.16**	0.41
CC#5	3.4	0.99	0.50	**2.45**	0.47
CC#6	4.4	0.64	0.61	**1.7**	0.45
CC#7	8.4	1.29	2.71	**3.32**	0.86
CC#8	78.2	3.53	**8.96**	7.98	8.17
CC#9	119.7	5.56	**12.95**	10.67	7.98[1]
CC#10	5.8	0.52	0.75	**3.14**	0.59

Note: Values in bold denote highest flow rate for the selected methods and events.

A comparison of the EPA SWMM 5 peak flow estimates relative to the corresponding estimates from the draft stormwater management report showed the following:

- EPA SWMM 5 estimated flows under Regional Storm conditions generated the highest flow rates for CC#8 and CC#9 (i.e., 62% higher than the associated flows from the Town of Oakville model in the case of CC#9); and,
- Rational method estimated flows under 1:100 year conditions generated the highest flow rates for CC#4, CC#5, CC#6, CC#7, and CC#10 (i.e., as much as 6 times higher than the corresponding EPA SWMM 5 estimated flows).

Based on these results, and, in the interest of advancing a conservative design for the crossing structures, the following approach was utilized:

- The rational method estimated flows will be relied on for assessing capacity for CC#4, CC#5, CC#6, CC#7, and CC#10; and
- The EPA SWMM 5 estimated flows will be relied on for assessing capacity for CC#8 and CC#9.

[1] Peak flow information for Regional Storm conditions at CC#9 were obtain from the Town of Oakville model.

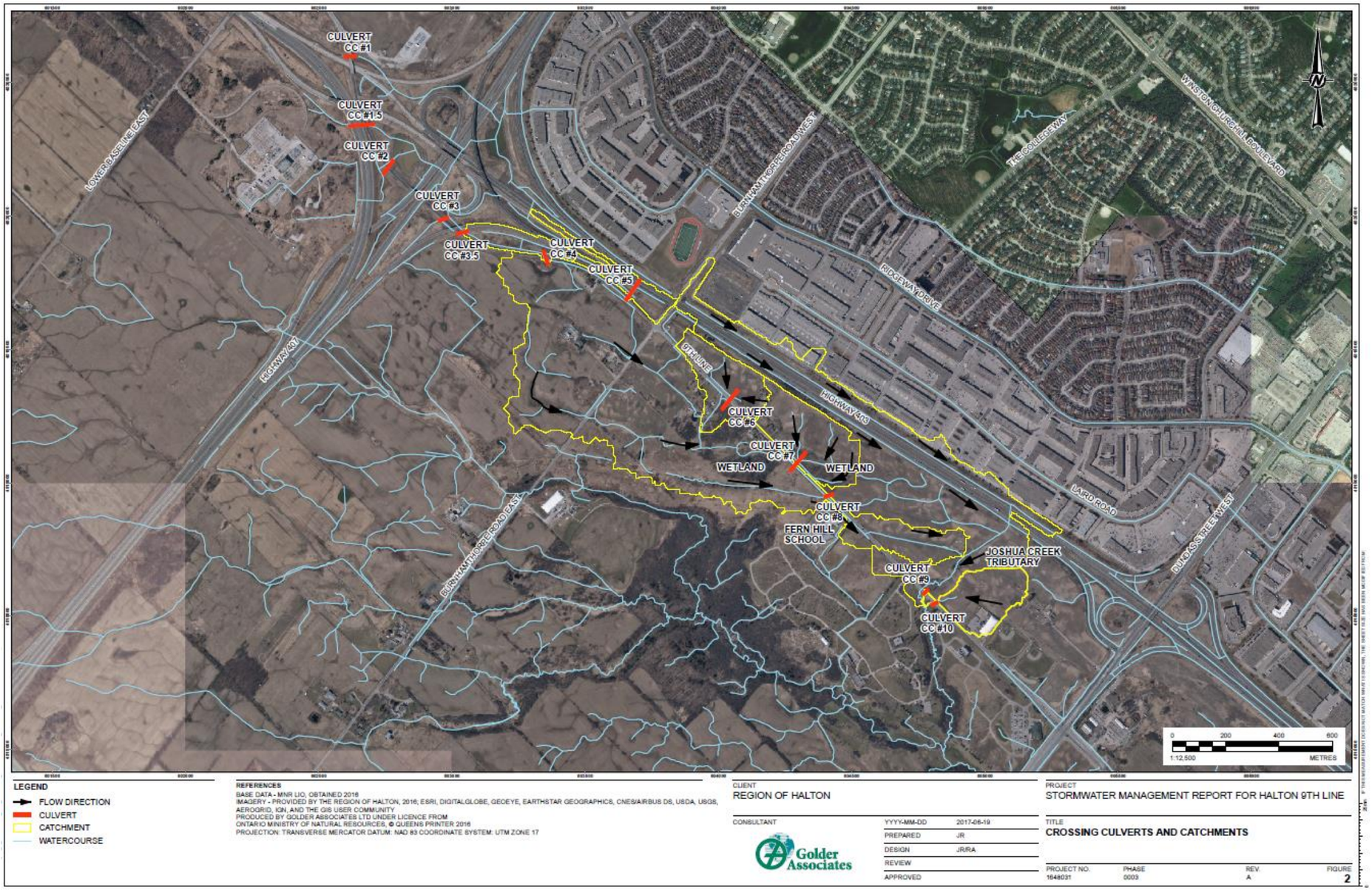

Figure 12: Crossing Culverts and Catchments

3.4.3. Hydraulics

The hydraulic characteristics of the existing culverts were estimated using HEC-RAS hydraulic models.

- In the case of CC#9, the existing HEC-RAS model for Joshua Creek (which includes the CC#9 culvert) was used. This included updating the model based on the topographic survey results as well as the measured channel and floodplain cross sections taken during the fluvial geomorphology fieldwork.
- For the remaining culverts CC#4 through CC#8, and CC#10, individual culvert models were created in HEC-RAS using available topographic survey results and assumptions concerning downstream channels and boundary conditions.
- The roadway was entered as broad spillways at the elevation of the surveyed centerline, allowing water to flow over the road if the centreline elevation was exceeded.

The results, shown in Figure 14 below, suggest that the existing crossing culvert are not able to pass the estimated design peak flows (1:100 year or Regional) without overtopping the existing road, and that water would spill over the road in all cases.

Table 15: Existing Road Crossing Culvert Hydraulics

Culvert ID #	Culvert Size and Material	Estimated Peak Design Flow Rate (m^3/s)	Modelled Upstream Water Level (masl)	Existing Road Centreline Elevation (masl)	Overtopping Road
CC#4	750 mm CSP	2.16	181.32	181.20	Yes
CC#5	700 mm CSP	2.45	181.74	181.63	Yes
CC#6	400 mm CSP	1.70	179.88	179.57	Yes
CC#7	600 m CSP	3.32	176.45	175.95	Yes
CC#8	1200 mm CSP	8.96	174.37	173.73	Yes
CC#9	1.9 m x 1.1 m Concrete Box	12.95	169.98	169.75	Yes
CC#10	500 mm CSP	3.14	171.07	170.50	Yes

3.4.4. Existing Stormwater Management Features

407 ETR

Based on discussions with 407 ETR, it has been assumed that the highway drainage system at the 407 ETR interchange (including ditches, culverts, and ponds) has been designed to accommodate widening of Ninth Line. Stormwater plans for the interchange were not provided by 407 ETR. Future Ninth Line road drainage in that area (i.e. between the overpass over the 407/403 east-west connection and the north limit of the Site) will be captured in proposed catch basins in the new right-of-way and routed to the nearest 407 ETR ditch or crossing culvert. The capacity of the

existing interchange stormwater features to receive this flow will be verified during detailed design in consultation with 407 ETR.

William Halton Parkway Roundabout

Drawings obtained for the planned William Halton Parkway roundabout indicate the intersection will be drained by a system of catch basins that collect runoff and convey it 100 metres southwest to an existing crossing culvert and channel. The channel flows south towards the wetland and ultimately through CC#8 and CC#9. In addition, the proposed design includes the replacement of the existing Culvert CC#5 with a 900 mm diameter concrete culvert.

The existing road elevation at CC#5 is 181.7 masl (140 m north of the intersection) and approximately 184 masl at the intersection. Furthermore, the "Stormwater Management Design Report – William Halton Parkway, Ninth Line to Trafalgar Road" (Stantec, 2016) shows minor drainage from the intersection routed to an oil grit separator sized for only the 0.79 hectare roundabout catchment. It is therefore unlikely that any storm sewer system for Ninth Line north of the William Halton Parkway can be connected to the proposed William Halton Parkway system. The section of the Ninth Line storm sewer north of William Halton Parkway would therefore have to discharge to the local low point (in this case, the channel downstream of CC#5).

Dundas Street Intersection

Currently, a section of the ditches on the east and west side of Ninth Line at Dundas Street drain to ditch inlet catch basins on both sides of Ninth Line, located approximately 120 metres north of the Dundas Street intersection. The elevation and inverts of the catch basins was not surveyed as part of Ninth Line topographic survey. A relatively flat slope is present between Dundas Street and CC#9.

3.5. Fluvial Geomorphology

A fluvial geomorphic assessment was completed in the vicinity of the proposed development for Ninth Line between Dundas Street and 407ETR (Appendix E) as modifications to the roadway have the potential to influence channel conditions at Joshua's Creek. The fluvial geomorphic assessment was completed along defined 'reach lengths' (i.e. sections of the watercourse that include similar geomorphic characteristics and controls) to assess meander potential and channel stability.

Agriculture is the prominent land use adjacent to Ninth Line; however, there are several notable developments in the local area. A site reconnaissance was conducted on September 21, 2016, which included a walk-over at all relevant reach lengths to assess channel morphology and to identify any area of instability. The reach lengths within the study area are illustrated in Figure 14.

The results of the field reconnaissance and an air photo analysis at the study area confirmed that defined channel conditions are limited to the stream reach downstream of the concrete box culvert (CC#9) and, to a lesser extent, at the stream reach upstream of CC#9. It should be noted that there is no defined bed and bank in the area immediately upstream of CC#9, but an incised channel feature becomes apparent on an intermittent basis further upstream. The channel at RL-01 follows a meandering pattern and includes numerous instances of instability. Channel conditions at RL-02 are comparatively stable, recognizing that the channel in the area immediately upstream of the culvert appears to have aggraded during the most recent portion of the historical air photo record. The area further upstream in the local drainage system is characterized by either wetland or roadside ditch/swale, suggesting that natural channel form is largely absent and any fluvial geomorphic function would be limited to mostly flow conveyance alone.

The results of the desktop analysis at RL-01 and RL-02 suggest a meander belt width and an associated 100-year erosion limit of approximately 30m. As such, the following should be noted:

- The estimated meander belt width is relatively consistent with the associated belt width boundaries from the North Oakville Creeks Subwatershed Study;
- The existing concrete box culvert (CC#9) is located within the boundaries of the estimated width and 100-year erosion limit of the channel;
- Spanning a new crossing structure the length of the estimated belt width or 100-year erosion limit of the channel would be impractical and cost prohibitive; and
- The existing concrete box culvert is designated to covey up to and including the Regional flow event, hence, major flows will be directed through the culvert, with limited opportunities to outflank the crossing feature and erode a separate flow path.

3.6. Hydrogeology

A hydrogeological assessment was completed as part of this MCEA study to assess the geology and hydrogeological conditions of the study area and assess the potential impacts of the proposed project on groundwater quality and quantity. The Hydrogeological Assessment Report can be found in Appendix F. Based on the hydrogeological assessment it was determined that the study area does not occur within a groundwater recharge area, well head protection area or highly vulnerable aquifer. The study area is underlain by silty clay, silty sand and sand silt indicative of the Wildfield and/or Halton Till.

Based on the water quality samples collected, groundwater quality is hard and mineralized with naturally occurring substances such as calcium, magnesium, sodium, sulphate and chloride. Elevated sodium (290 mg/L) may be indicative of road salt contamination.

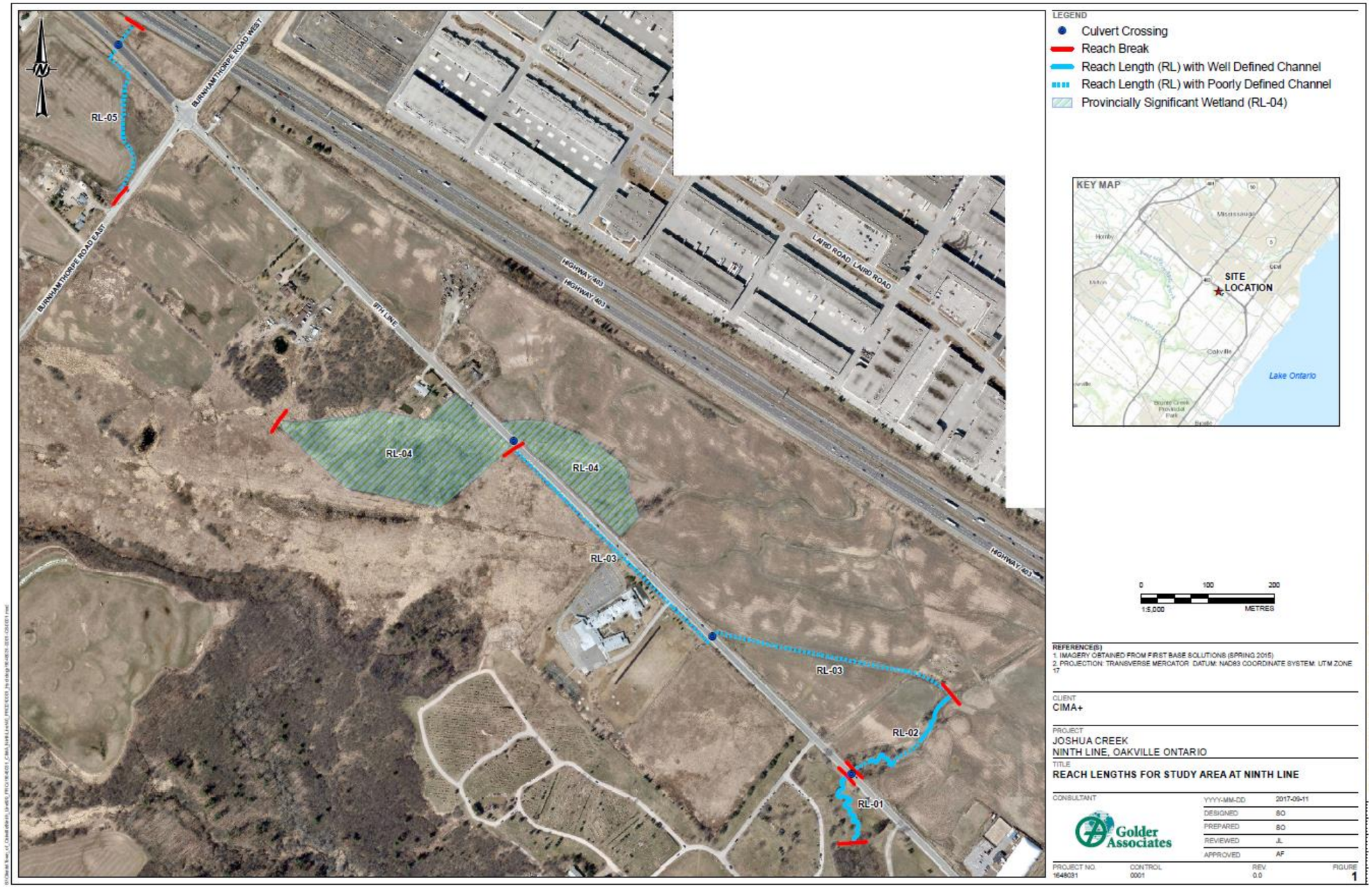

Figure 13: Reach Lengths

3.7. Cultural Environment

3.7.1. Built Heritage and Cultural Heritage Landscapes

A Heritage Impact Assessment (HIA) was conducted to review the Built Heritage Resources (BHRs) and Cultural Heritage Landscapes (CHLs) present within the study area and determine whether the proposed undertaking will adversely impact the cultural heritage resources (see Appendix G). The assessment followed guidelines provided in the Ministry of Tourism, Culture and Sport (MTCS), municipal official plans and other heritage policies. The HIA identified two properties of cultural heritage value or interest adjacent to Ninth Line within the study limits:

1. Ephram Post, F. M. Brown Farm (c. 1886) at 3480 Ninth Line in the Town of Oakville, southwest of the intersection of Burnhamthorpe Road and Ninth Line, is listed in the Town of Oakville's heritage register as a Built Heritage Resource; and
2. A barn structure located on a farm within the City of Mississauga, PIN: 14731600 (no street address available), has potential for Built Heritage Resources.

Figure 15 outlines the heritage resources identified adjacent to Ninth Line.

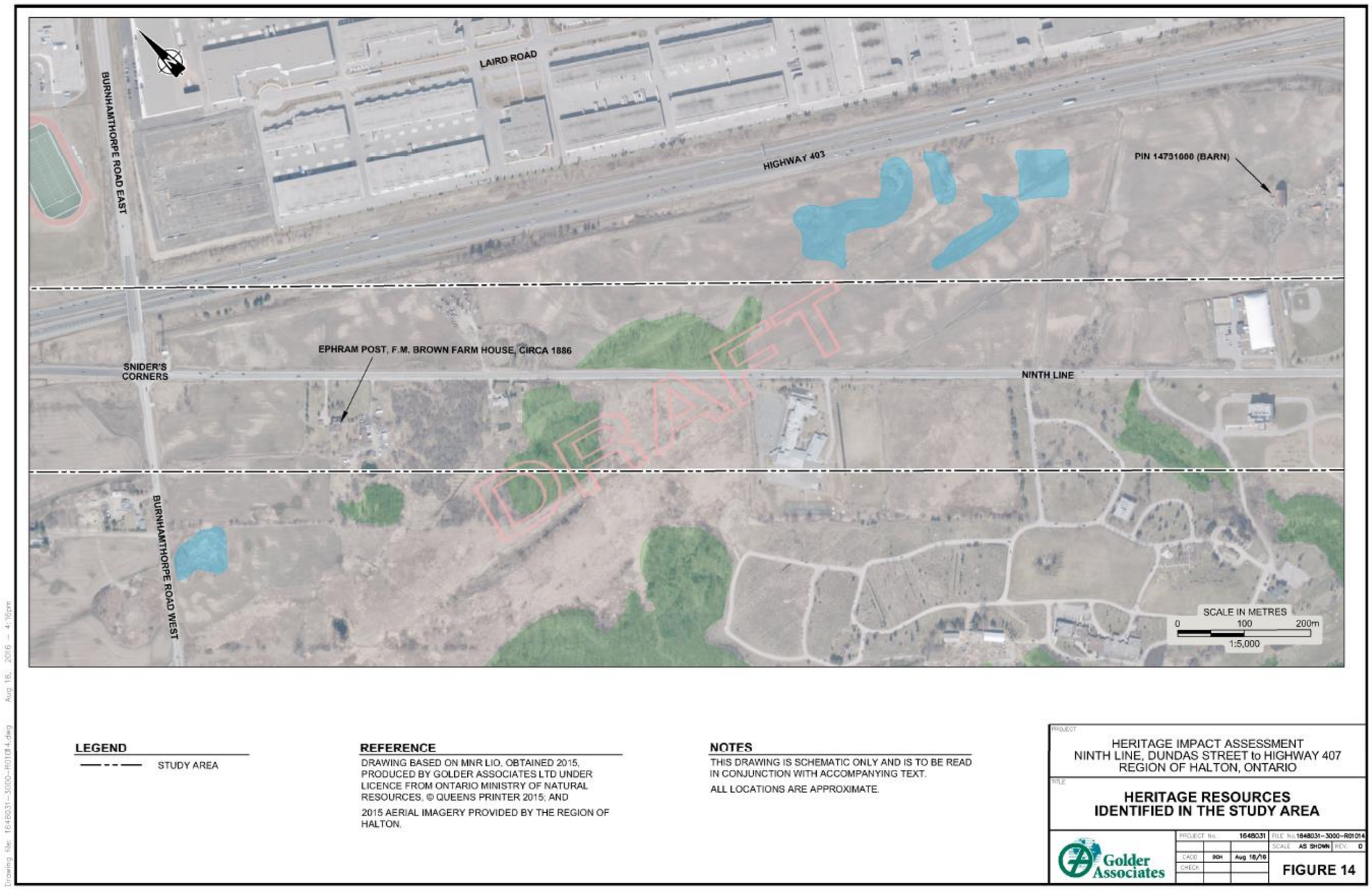

Figure 14: Cultural and Built Heritage Landscapes

3.7.2. Archaeological Assessment

A Stage 1 Archaeological Assessment was conducted for the proposed transportation corridor improvements to Ninth Line within the study area (see Appendix H). The Stage 1 Archaeological Assessment was completed in order to evaluate the available information regarding the known and potential archaeological resources and to provide recommendations for the protection, management and/or recovery of these resources consistent with the Ministry of Tourism, Culture and Sport (MTCS) guidelines. Archaeological potential is established by determining the likelihood that archaeological resources may be present on a subject property.

When the MTCS archaeological potential criteria were applied to the study area, the study area exhibits archaeological potential for pre-contact and post-contract Aboriginal sites. While areas of previous disturbance eradicate the potential for the recovery of potential archaeological resources, areas of no or low levels of previous disturbance retain their archaeological potential. In the areas that were identified as poorly drained or previously disturbed (Figure 16A-C) no further archaeological assessment of these areas is required. All remaining portions of the study area that exhibit archaeological potential, as illustrated in Figure 16A-C, are recommended for Stage 2 Archaeological Assessment (test pit survey or pedestrian survey, as indicated on Figure 16A-C) prior to ground disturbance associated with any future development.

The Stage 1 Archaeological Assessment Report was entered into the Ontario Public Register of Archaeological Reports on November 23, 2017. A copy of the confirmation letter from the Ministry of Tourism, Culture and Sport can be found in Appendix A.

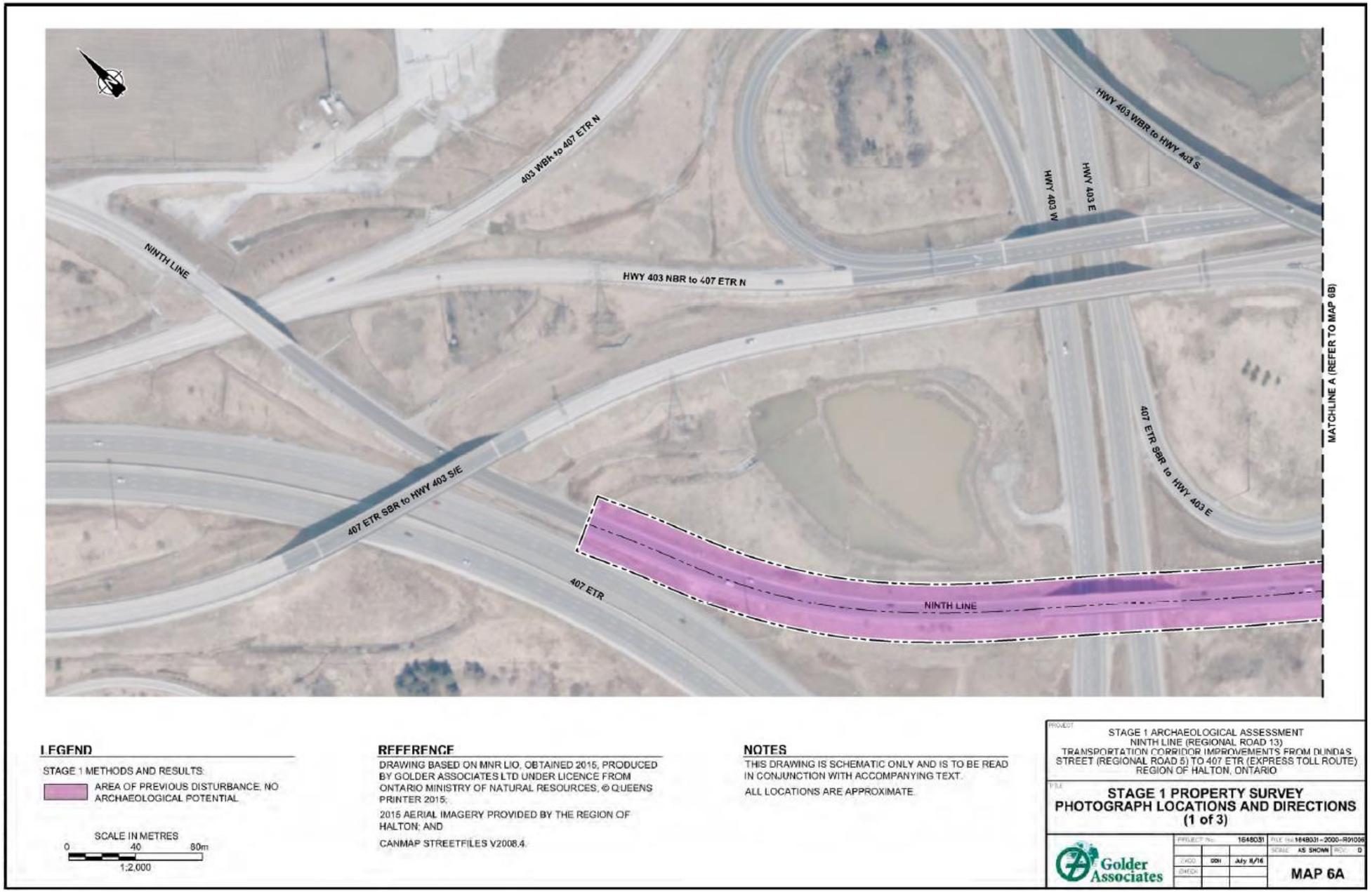

Figure 15A: Stage 1 Archaeological Assessment Map

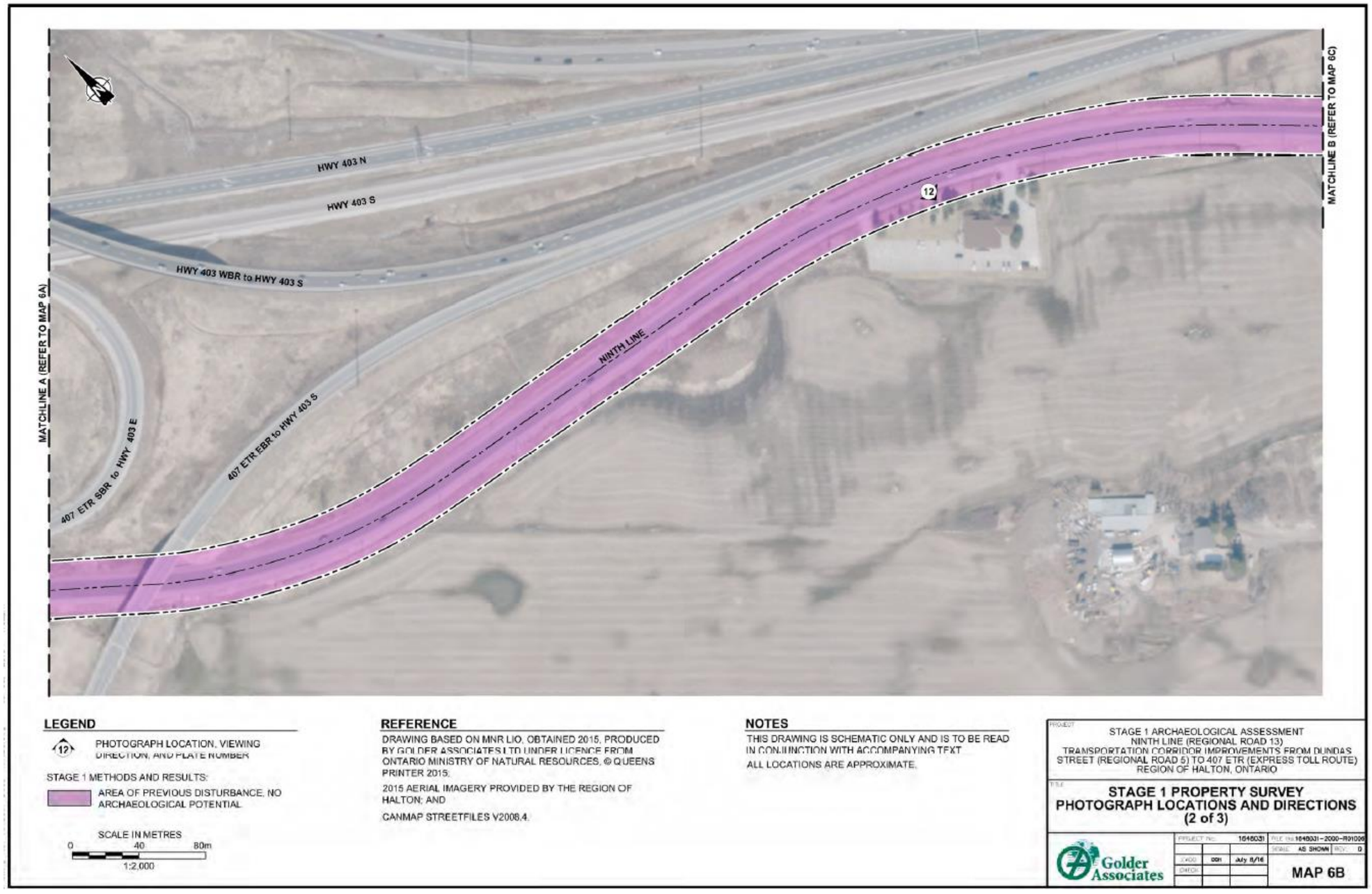

Figure 13B: Stage 1 Archaeological Assessment Map

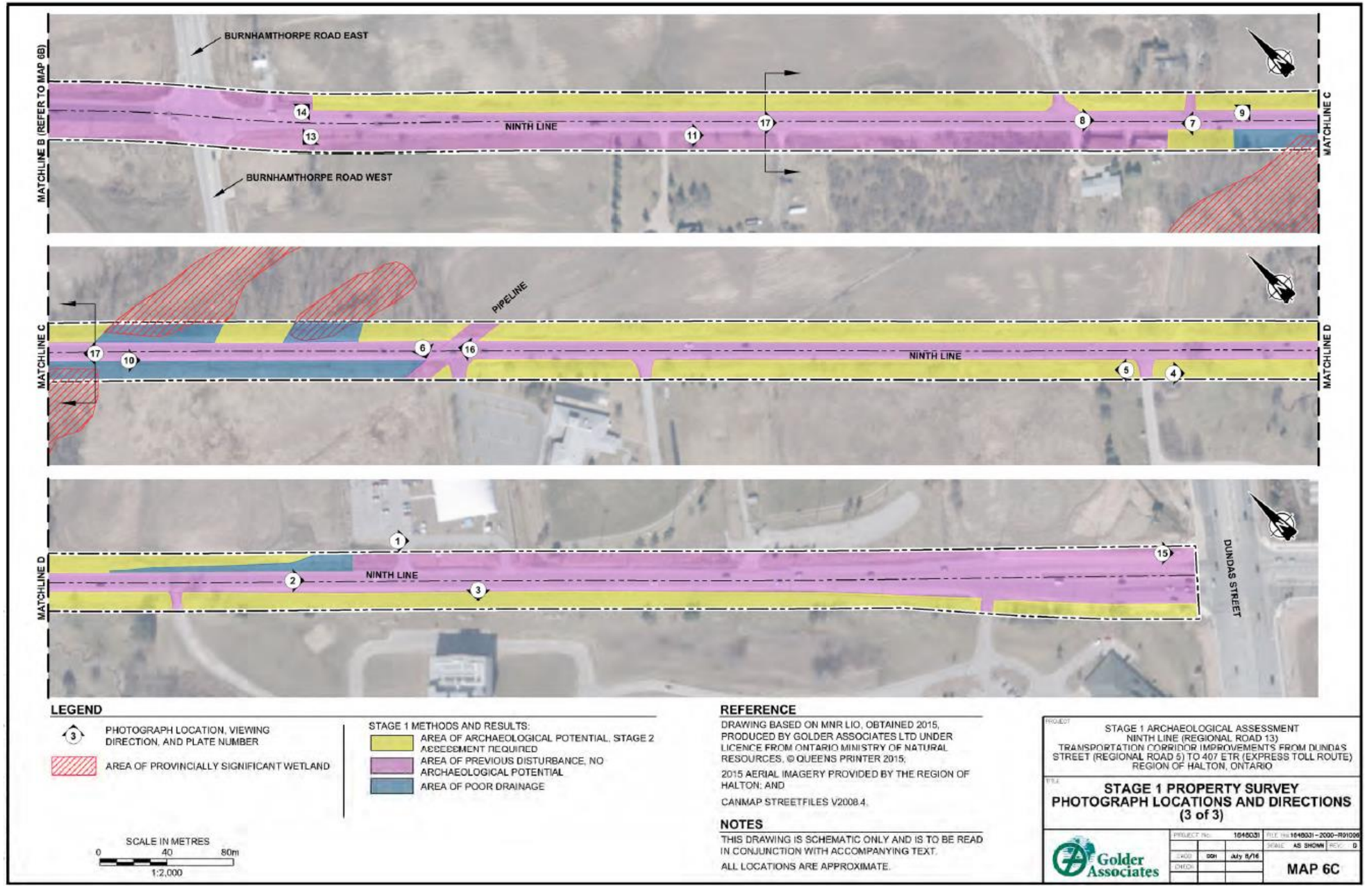

Figure 13C: Stage 1 Archaeological Assessment Map

3.8. Municipal Infrastructure

Under existing conditions, Ninth Line within the study limits presents a rural cross-section with ditches along both sides of the roadway. There are no regional watermains or wastewater mains within the study area with the exception of a 400 mm watermain and 300 mm watermain in the intersection of Ninth Line and Dundas Street. Halton Region is not proposing to construct new watermains or wastewater mains within the study limits.

An existing watermain is present along Ninth Line from Dundas Street to approximately 100 metres north. There are no other existing water of sewer infrastructure in the study area.

All future development requires full urban services (water and sanitary) prior to development occurring.

3.9. Utilities

Hydro One Networks Inc. (HONI) has transmission assets in parallel to the study area east and west of Ninth Line between William Halton Parkway and Dundas Street and has proposed future development for its lands within the study limits.

Enbridge Gas Inc. (Enbridge) owns and operates a 762mm diameter and a 610mm diameter pipeline across the study area. Enbridge is also in the process of implementing a high-pressure line north and west of the corridor.

Two Enbridge (formerly Union Gas) facilities including a 12-inch and 20-inch dimeter pipeline are also present within the study area.

Oakville Hydro has existing aerial hydro located on the east side of Ninth Line

The existing utilities are illustrated on the Existing Utilities Plan in Appendix I.

3.10. Infrastructure Ontario Lands

A portion of the study area as illustrated in Figure 17 and Figure 18 is located within lands under the control of the Minister of Economic Development, Employment and Infrastructure (MEDEI). Lands controlled by MEDEI may be identified under the name of MEDEI or one of its predecessor ministries or agencies which may include but is not limited to variations of the following: Her Majesty the Queen/King, Hydro One, MBS, MEI, MGS, MOI, OLC, ORC, PIR or Ministry of Public Works. Infrastructure Ontario (IO) is the provincial agency responsible for ensuring MEDEI's obligations as part of the environmental assessment.

As shown in Figure 17, Hydro One land is adjacent to Ninth Line on the east and west sides of the roadway within the south section of the study area. The section of Ninth Line that passes through the 407 ETR interchange in the north section is also managed by MEDEI. Infrastructure Ontario was notified at key study milestones as discussed in Section 6.

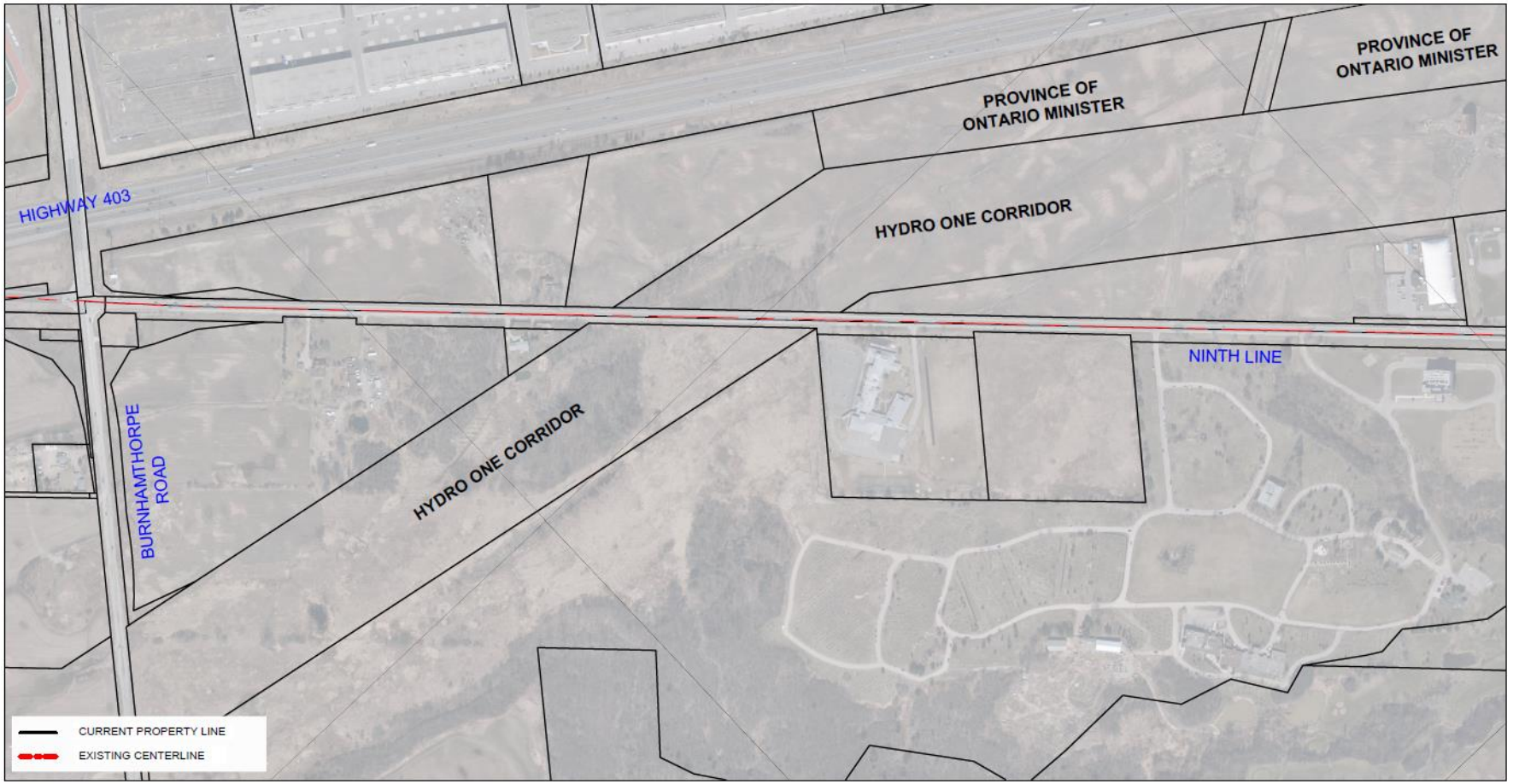

Figure 16: Property Ownership in South Section – MEDEI Land

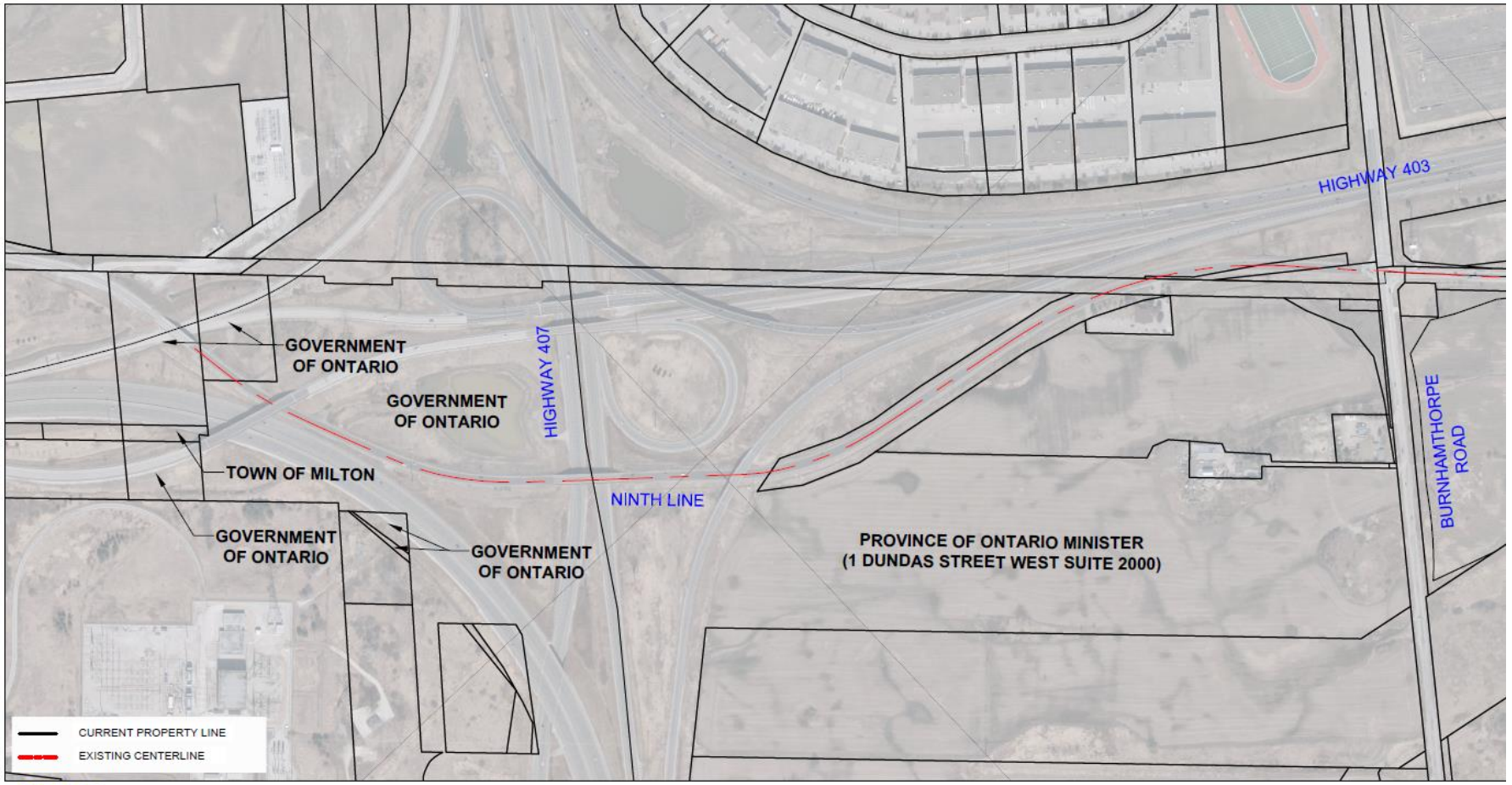

Figure 17: Property Ownership in North Section – MEDEI Land

3.11. Illumination

Under existing conditions, illumination is not provided along Ninth Line within the study limits except at the intersections of Dundas Street and Ninth Line and William Halton Parkway and Ninth Line.

3.12. Noise

There are four (4) existing noise sensitive receptors present within the study limits. These are private residential houses located adjacent to Ninth Line. A noise assessment was carried out as part of the Ninth Line MCEA Study with reference to the Ontario Ministry of Transportation (MTO)/Ministry of the Environment and Climate Change (MECP) Noise Protocol and the Halton Region Noise Abatement Policy. The existing noise levels at the noise sensitive receptors range from 46 to 59 dBA. The results of the noise assessment are discussed in Section 7.9.

3.13. Air Quality

An air quality assessment was conducted as part of this study to evaluate the projected change in air quality within the study limits as result of the proposed project. Under existing conditions, levels of particulate matter are shown to be below current standards and guidelines. The results of the air quality assessment are discussed in Section 7.7.

3.14. Structures

As discussed in Section 3.1.1, within the north section of the Ninth Line study area, there are four existing Ministry of Transportation structures. The existing structures were constructed with provision for a future 4-lane cross-section on Ninth Line however; provisions for active transportation facilities such as bicycle lanes and multi-use trails were not provided. A list of the existing structures and the available right-of-way (pier to pier) is summarized in Table 16.

Table 16: Existing Structures

Structure	Available Right-of-Way (m)
403/407 underpass	23.5
403/407 bridge	12.5
407 underpass	22.0
403/407 bridge	12.5

3.15. Roadway Access

Within the study limits, access is provided to the residential and commercial establishments along both sides of the roadway. Exclusive left-turn lanes are not provided for any entrances within the study area.

4. Alternative Solutions

4.1. Description of Alternative Planning Solutions

Alternative solutions were identified and evaluated as part of Phase 1 and 2 of the MCEA process as there are numerous potential solutions for the corridor improvements to Ninth Line. Seven (7) alternatives were examined as part of this MCEA study:

Do Nothing

Leave Ninth Line unmodified in an “as is” state.

Limit Development

Limit development within the Town of Oakville and Town of Milton to reduce future traffic demand.

Accommodate Other Travel Modes

Promote and facilitate the use of alternative modes of transportation including improved transit, cycling and walking facilities.

Travel Demand Management Measures

Implement measures to manage travel demand, such as carpooling, flexible work hours, telecommuting, etc.

Intersection and/or Operational Improvements

Improve traffic operations, such as the retiming of traffic signals and provision of turning lanes, to improve the overall efficiency of a roadway (i.e. maximize throughput) and the surrounding road network.

Improvements to Other Roadways

Widen regional roadways in the immediate study area to reduce future traffic demand on Ninth Line.

Improvements to (Widen) Ninth Line

Widen the roadway to increase capacity with additional travel lanes, including active transportation facilities to support future traffic demands.

4.2. Assessment and Evaluation of Alternative Solutions

Each of the seven (7) alternative solutions were assessed for effectiveness based on their advantages and disadvantages. The alternatives were evaluated to determine the recommended solution based on a comparison as illustrated in Table 17 and Section 4.3 discusses the preferred planning solution.

Table 17: Evaluation of Alternative Solutions

Alternative	Assessment	Recommendation
Do Nothing	Does not support active modes of transportation Does not accommodate projected traffic volumes	Not recommended Problem/Opportunity is not addressed
Limit Development	Future projections based on approved future urban area Halton Region Official Plan vision is to create places to grow with planned population and employed growth which cannot be achieved by limiting development	Not carried forward Future projections based on approved future urban area and the vision of the Regional Official Plan
Accommodate Other Travel Modes	Will support active modes of transportation and transit Does not accommodate projected traffic volumes	Recommended as part of preferred solution Problem/Opportunity is partially addressed
Travel Demand Management Measures	Does not address the problem on its own Part of overall transportation strategy	Recommended as part of preferred solution Problem/Opportunity is partially addressed
Intersection and/or Operational Improvements	Does not address the problem on its own Part of overall transportation strategy	Recommended as part of preferred solution Problem/Opportunity is partially addressed
Improvements to Other Roadways	Part of regional transportation strategy (Transportation Master Plan)	Carried forward as part of regional transportation strategy (Transportation Master Plan)
Improvements to (widen) Ninth Line	Needs identified in Halton Region Transportation Master Plan to support future growth Will accommodate projected traffic volumes	Recommended and carried forward within overall strategy Problem/Opportunity is addressed

In summary, two (2) alternatives were not carried forward and five (5) alternatives were carried forward for further assessment:

- 'Do Nothing' is not a feasible solution as it would not address the problems and/or opportunities identified for the study corridor. Although this alternative is not feasible, it was included in the assessment as a benchmark for comparison purposes.
- The Limit Development alternative was considered as an alternative solution. However, this alternative will not be carried forward in the MCEA because limiting development would not be consistent with existing Official Plans for growth.
- The Accommodate Other Travel Modes alternative does not fully address the problems and/or opportunities identified for the study corridor. This alternative will be carried forward in the MCEA as part of the preferred solution.
- The Implement Travel Demand Management Measures alternative does not fully address the problems and/or opportunities identified for the study corridor. This alternative will be carried forward in the MCEA as part of the preferred solution.
- The Intersection and/or Operational Improvements alternative does not fully address the problems and/or opportunities identified for the study corridor. This alternative will be carried forward in the MCEA as part of the preferred solution.
- The Improvements to Other Roadways alternative was also considered as an alternative solution. However, this alternative was identified in the Halton Region TMP and will be implemented separately as part of a region-wide transportation improvement strategy to support 2031 travel demand. The TMP confirmed the need for improvements to Ninth Line in addition to other roadways, and therefore any plans to improve other roadways as part of the region-wide transportation strategy does not eliminate the need to improve Ninth Line.
- The Improvements to (widen) Ninth Line alternative was recommended in the Halton Region TMP as part of the region-wide transportation improvement strategy, and further justified by the needs analysis completed during Phase 1 of this MCEA. Improving Ninth Line is the only solution among the alternatives considered that fully addresses the problems and/or opportunities identified in this study.

Based on the evaluation of alternative planning solutions, a combination of alternatives was selected as the recommended solution, subject to agency and public review:

- Accommodate Other Travel Modes;
- Travel Demand Management Measures;
- Intersection and/or Operational Improvements; and
- Improvements to (Widen) Ninth Line.

4.3. Preferred Planning Solution

The results of Phases 1 and 2 of the MCEA, including the recommended planning solution, was presented to agencies and the public for review and input at a Technical Agencies Committee meeting and Public Information Centre (see Section 5). No comments were received that could not be addressed or which were not in support of the recommended solution. Feedback generally focused on considerations for the next phase of the study (e.g., requests to be kept informed; questions regarding potential property impacts, project schedule, and previous studies; and plans for transportation improvements along adjacent corridors).

Based on consultation with agencies and the public, the preferred planning solution was selected as a combination of the following:

- Accommodate Other Travel Modes;

- Travel Demand Management Measures;
- Intersection and/or Operational Improvements; and
- Improvements to (Widen) Ninth Line.

5. Alternative Designs

5.1. Approach to Developing Alternative Designs

Following the selection of the preferred planning solution for the Ninth Line Transportation Corridor Improvements, alternative designs were developed and evaluated as part of Phase 3 of the MCEA process. The following factors were considered in the development of the alternative designs:

- Impact to the adjacent North Oakville-Milton East Wetland Complex Provincially Significant Wetland
- Impact to Species at Risk habitat
- Impact to Ministry of Transportation structures
- Impact to adjacent properties
- Background information from relevant Halton Region and Town of Oakville planning documents
- Impacts to community features (e.g. schools, churches, community recreation)
- Cultural heritage features
- Stormwater management
- Provision of active transportation
- Traffic operations and safety

5.2. Identification of Alternative Designs

For the development of the design alternatives, Ninth Line was divided into two sections:

- North Section – Ninth Line between the future William Halton Parkway and 407ETR
- South Section – Ninth Line between Dundas Street and the future William Halton Parkway

The intersection of William Halton Parkway and Ninth Line has been designed for a roundabout. This intersection is being designed and constructed as part of a separate Halton Region project. The intersection of Dundas Street at Ninth Line has already been widened and reconstructed.

5.2.1. North Section

Within the north section of the Ninth Line study area, there are four existing Ministry of Transportation structures with limited right-of-way for widening:

- 403/407 underpass
- 403/407 bridge
- 407 underpass
- 403/407 bridge

Given these constraints, it is not considered reasonable to develop alternatives that widen to the east only, west only or equally to the east and west as the impact on the adjacent structures is significant. In order to reduce impacts to the Ministry of Transportation structures and to avoid reconstruction, a mitigated cross-section is required. Given these constraints, one alternative design was carried forward, which follows a best-fit approach. The mitigated design for the north section is illustrated in Appendix J.

5.2.2. South Section

In consideration of the factors discussed above, five (5) alternative designs for the widening of the south section were developed as follows:

Do Nothing

Leave Ninth Line unmodified in an “as is” state.

Alternative 1 – Widen Equally East and West (Widen along Centreline)

Potentially modify the existing property line on both sides and widen equally on the east and west side of Ninth Line.

Alternative 2 – Widen to the East

Maintain the existing property line on the west side of Ninth Line and widen to the east.

Alternative 3 – Widen to the West

Maintain the existing property line on the east side of Ninth Line and widen to the west.

Alternative 4 – Mitigated Design

Modify the existing property line on both sides as required to reduce impact to key features adjacent to Ninth Line.

A sample section of each of the four alternative designs are shown in Figure 19 through Figure 22.

Initially the Ninth Line right-of-way was 20 metres and the roadway was centred within this corridor. As development occurred on the west side of Ninth Line (i.e. Glen Oaks Funeral Home, Fern Hill School, etc.) the Town of Oakville and Region of Halton had additional right-of-way conveyed in anticipation of the future right-of-way widening to 35 metres in accordance with the Regional Official Plan and the Region’s Transportation Master Plan. As a result of these right-of-way widenings, Alternatives 1 and 2 would have similar property impacts as the existing property line on the west side is already set back for some properties.

When Alternatives 1, 2 and 3 were initially reviewed, it was determined that an additional alternative needed to be developed that was a combination of Alternatives 2 and 3 which further reduced impacts on the environment. Alternative 4 was further refined to introduce mitigation including retaining walls through the Provincially Significant Wetland at Joshua’s Creek as minimization of property impacts at Fern High School.

5.3. Design Criteria

Ninth Line is proposed to be widened from two to four lanes between Dundas Street and 407 ETR. The design criteria for the north and south sections are summarized in Table 21 and Table 22, respectively, in Section 7.1 of this report.

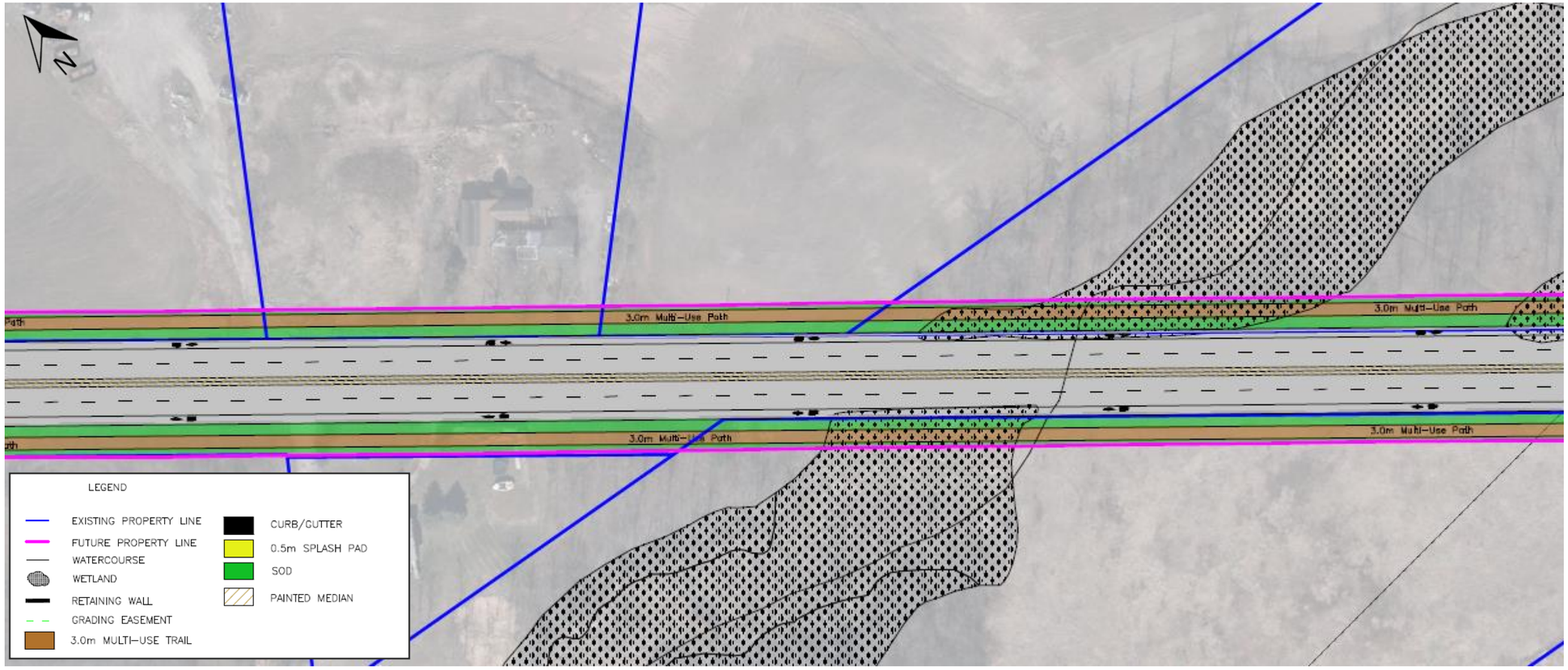

Figure 18: Alternative Design 1 - Widen Equally East and West

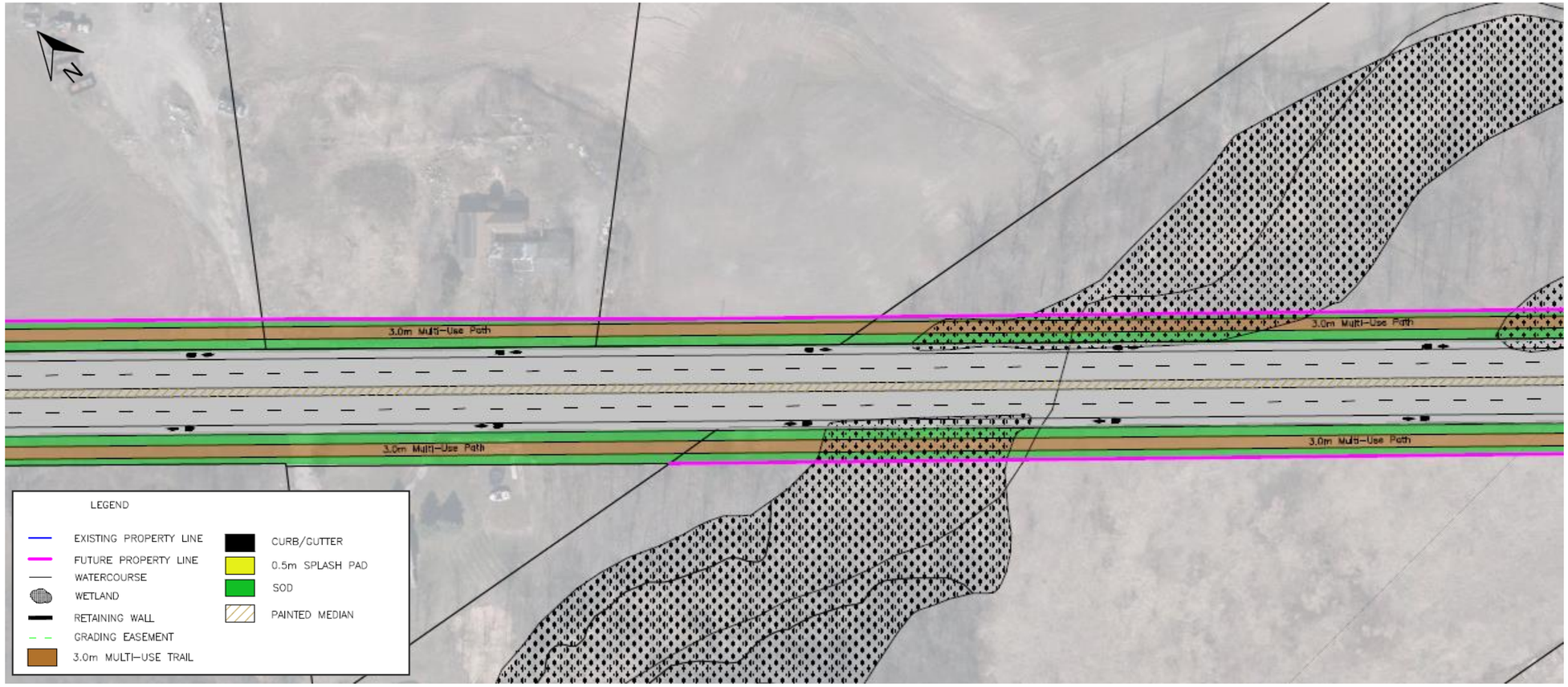

Figure 19: Alternative Design 2 - Widen to the East

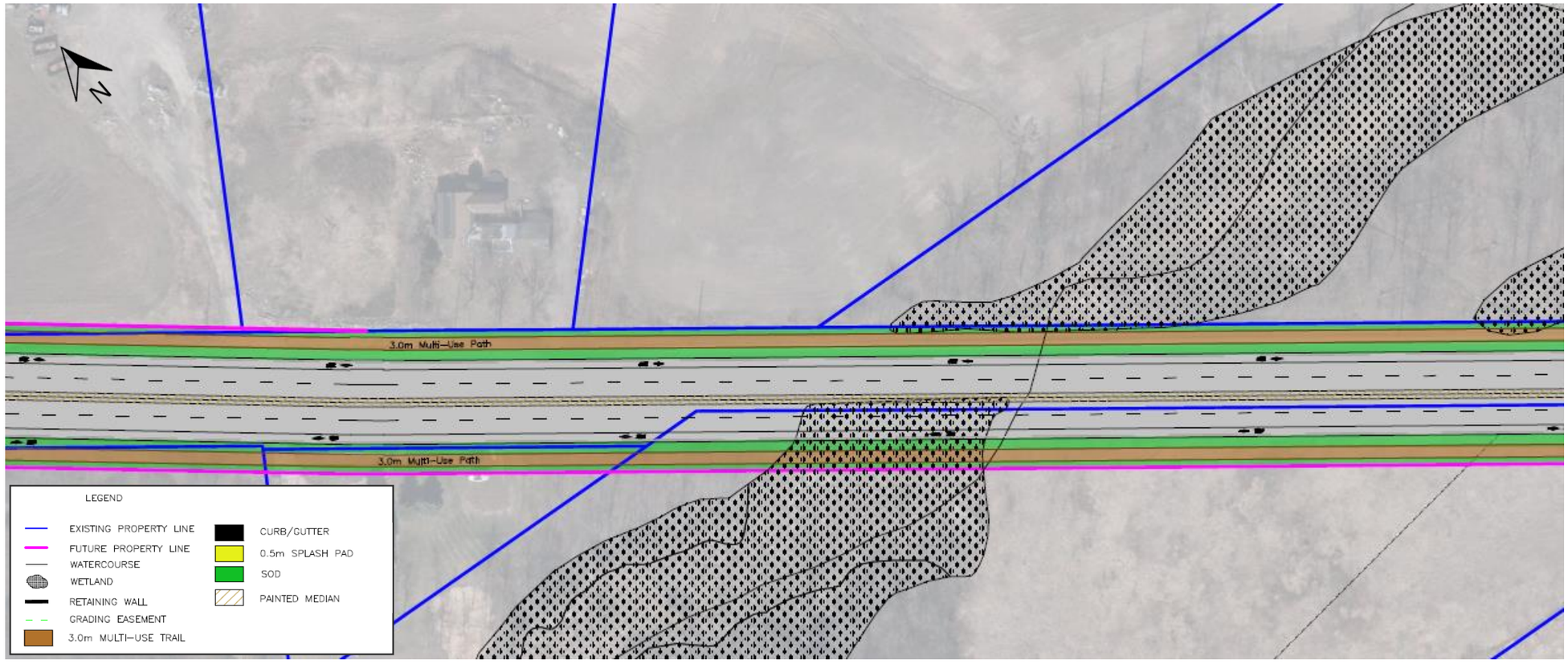

Figure 20: Alternative Design 3 – Widen to the West

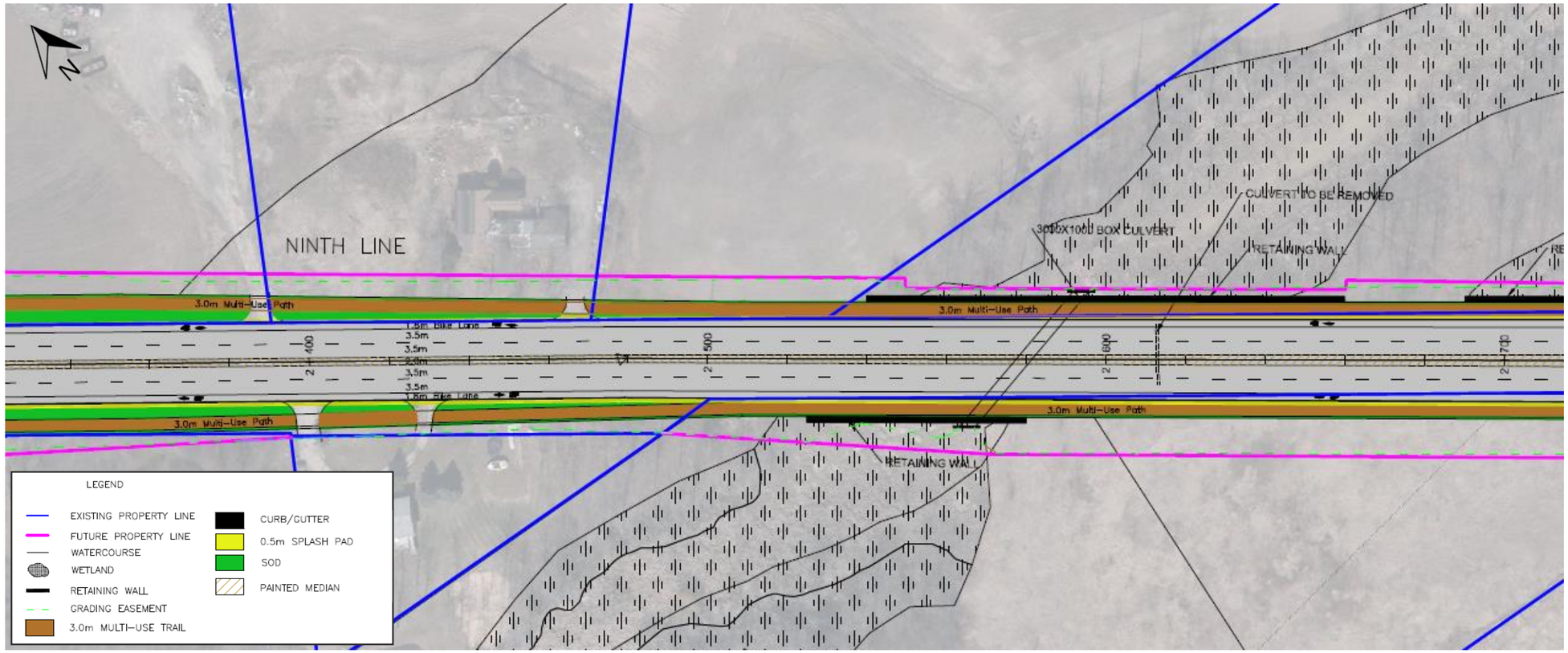

Figure 21: Alternative Design 4 – Mitigated Design

5.4. Impact Assessment and Evaluation

As discussed in Section 5.2.1, the major constraints in the north section are the existing Ministry of Transportation structures. No significant cultural, natural environment, property, or social impacts were anticipated given the existing conditions in the north section.

Alternatively, the potential impact to several features were evaluated for each of the south section alternative designs. Each alternative was assessed against the following technical and environmental factors:

Cultural

- Archaeological Features
- Cultural and Built Heritage

Natural Environment

- Aquatic
- Avian and Wildlife
- Natural Area
- Species at Risk
- Vegetation
- Watercourses
- Climate Change Mitigation
- Climate Change Adaptation

Economic

- Capital Costs
- Construction Staging and Phasing
- Municipal Servicing and Utilities Coordination

Infrastructure Planning

- Active Transportation
- Streetscape
- Level of Service and Network Capacity
- Planning Policy
- Stormwater Management
- Traffic Safety

Social

- Air Quality
- Noise Impacts
- Property Impacts

The alternatives were evaluated against each of the identified factors based on the level of net impact on the corresponding factor. The evaluation is a reasoned argument and detailed in Table 18.

Table 18: Analysis and Evaluation of Alternative Design Concepts

TECHNICAL CRITERIA	DO NOTHING	ALTERNATIVE 1 WIDEN EQUALLY EAST AND WEST	ALTERNATIVE 2 WIDEN TO EAST	ALTERNATIVE 3 WIDEN TO WEST	ALTERNATIVE 4 MITIGATED DESIGN
CULTURAL					
ARCHAEOLOGICAL FEATURES	No Impact.	Land outside of existing right-of-way has archaeological potential. Areas with archaeological potential require Stage 2 Archaeological Assessment and will be carried out during detailed design.			
BUILT HERITAGE RESOURCES AND CULTURAL HERITAGE RESOURCES	No Impact.	Two (2) built heritage resources were found adjacent to Ninth Line. Both resources are set back from the right-of-way. None of the alternatives would have a direct impact on the cultural heritage resources.			
Summary	No Impact.	Minimum impact to the Cultural Environment. Requires a Stage 2 Archaeological Assessment. No direct impact to built or cultural heritage resources.	Minimum impact to the Cultural Environment. Requires a Stage 2 Archaeological Assessment. No direct impact to built or cultural heritage resources.	Minimum impact to the Cultural Environment. Requires a Stage 2 Archaeological Assessment. No direct impact to built or cultural heritage resources.	Minimum impact to the Cultural Environment. Requires a Stage 2 Archaeological Assessment. No direct impact to built or cultural heritage resources.
NATURAL ENVIRONMENT					
AQUATIC	No Impact.	For Alternatives 1, 2, and 3: There is low impact the aquatic environment as there is no potential for serious harm to fish and fish habitat associated with all 3 alternatives. Impacts to tributaries are likewise not expected to result in risk to fish and fish habitat when mitigation measures (as documented in Section 8) are implemented. Joshua's creek is seasonally dry in the year and although it provides direct fish habitat, fish have access to this habitat for only periods when high water conditions are present. Anticipated impacts from the project can be fully mitigated. There is moderate impact due to longer culverts required south of Burnhamthorpe Road to accommodate the road widening. Channel realignment is required at Joshua's Creek for all three alternatives and result in similar impacts. For Alternatives 1, 2, and 3: There is some impact to Joshua Creek and PSW as longer culverts are required. Retaining walls are not provided with these alternatives.			There is low impact the aquatic environment as there is no potential for serious harm to fish and fish habitat associated with all 3 alternatives. Impacts to tributaries are likewise not expected to result in risk to fish and fish habitat when mitigation measures (as documented in Section 8) are implemented. Joshua's creek is seasonally dry in the year and although it provides direct fish habitat, fish have access to this habitat for only periods when high water conditions are present. Anticipated impacts from the project can be fully mitigated. **Alternative 4 includes retaining walls adjacent to the Joshua's Creek culvert and PSW and represents the lowest impact. The proposed retaining walls will mitigate the impact of culvert length and reduce the length of channel realignment at Joshua's Creek.**
AVIAN AND WILDLIFE	No Impact.	All 4 Alternatives represent low impact to woodlands and the associated wildlife habitat as level of intrusion is minimal. Alternative 1 results in moderate impacts to wetlands and associated wildlife habitat. Road widening encroaches substantially into the North Oakville-Milton East Complex Provincially Significant Wetland (PSW is present on both sides of Ninth Line).	All 4 Alternatives represent low impact to woodlands and the associated wildlife habitat as level of intrusion is minimal. Alternative 2 results in moderate impacts to wetlands and associated wildlife habitat. Road widening encroaches substantially into the North Oakville-Milton East Complex Provincially Significant Wetland (PSW is present on both sides of Ninth Line).	All 4 Alternatives represent low impact to woodlands and the associated wildlife habitat as level of intrusion is minimal. Alternative 3 results in moderate impacts to wetlands and associated wildlife habitat. Road widening encroaches moderately into the North Oakville-Milton East Complex Provincially Significant Wetland (PSW is present on both sides of Ninth Line).	All 4 Alternatives represent low impact to woodlands and the associated wildlife habitat as level of intrusion is minimal. Alternative 4 results in lowest impacts to wetlands and associated wildlife habitat. Road widening encroaches the least into the North Oakville-Milton East Complex Provincially Significant Wetland (PSW is present on both sides of Ninth Line).

TECHNICAL CRITERIA	DO NOTHING	ALTERNATIVE 1 WIDEN EQUALLY EAST AND WEST	ALTERNATIVE 2 WIDEN TO EAST	ALTERNATIVE 3 WIDEN TO WEST	ALTERNATIVE 4 MITIGATED DESIGN
SPECIES AT RISK	No Impact.	Two SAR habitats (Barn Swallows and Bobolink) were observed within the study area. Alternative 1 results in a moderate impact to SAR breeding habitat due to greater intrusion into Bobolink habitat located on the west side of Ninth Line. Mitigation of construction activities can be achieved through scheduling works during non-nesting season; safe harbor habitat can be provided during construction.	Two SAR habitats (Barn Swallows and Bobolink) were observed within the study area. Alternative 2 results in a lower impact to SAR breeding habitat when compared with Alternatives 1 and 3. The road alignment would be shifting east, thus reducing intrusion into Bobolink habitat located on the west side of Ninth Line. Mitigation of construction activities can be achieved through scheduling works during non-nesting season; safe harbor habitat can be provided during construction.	Two SAR habitats (Barn Swallows and Bobolink) were observed within the study area. Alternative 3 results in the greatest impact into SAR breeding habitat. The road alignment would be shifting west, thus increasing the intrusion into Bobolink habitat located on the west side of Ninth Line. Mitigation of construction activities can be achieved through scheduling works during non-nesting season; safe harbor habitat can be provided during construction.	Two SAR habitats (Barn Swallows and Bobolink) were observed within the study area. Alternative 4 represents the least impact into SAR breading habitat when compared to Alternatives 1, 2 and 3. The road right-of-way is mitigated with a reduced boulevard width, thus resulting in the least intrusion into Bobolink habitat located on the west side of Ninth Line. Mitigation of construction activities can be achieved through scheduling works during non-nesting season; safe harbor habitat can be provided during construction.
VEGETATION	No Impact.	There is low impact to the vegetation adjacent to a majority of the road corridor. This vegetation is dominated by non-native, disturbance-tolerant plant species. There is a moderate impact to native and wetland plants that are present in the North Oakville-Milton East Complex PSW.	There is low impact to the vegetation adjacent to a majority of the road corridor. This vegetation is dominated by non-native, disturbance-tolerant plant species. The road alignment would be shifting east, resulting in a greater impact to native and wetland plants that are present in the North Oakville-Milton East Complex PSW. A denser population of vegetation is present on the east side of Ninth Line. Vegetation associated with the Joshua Creek crossing on the east side would be removed.	There is low impact to the vegetation adjacent to a majority of the road corridor. This vegetation is dominated by non-native, disturbance-tolerant plant species. The road alignment for Alternative 3 shifts westerly resulting in a moderate impact to native and wetland plants that are present in the North Oakville-Milton East Complex PSW.	There is low impact to the vegetation adjacent to a majority of the road corridor. This vegetation is dominated by non-native, disturbance-tolerant plant species. Alternative 4 includes a road right-of-way that is mitigated through a reduced boulevard width. Alternative 4 represents the least impact to native and wetland plants that are present in the North Oakville-Milton East Complex PSW when compared to Alternatives 1, 2 and 3.
WATERCOURSES	No Impact.	Joshua's Creek meanders south-west of Ninth Line. Alternatives 1, 2, and 3 have the greatest impact as channel realignment is required at Joshua's Creek. All three Alternatives result in similar lengths of channel realignment and require similar mitigation measures such as energy dissipation feature to mitigate downstream erosion.			Joshua's Creek meanders south-west of Ninth Line. Alternative 4 includes a retaining wall resulting in less channel realignment at the downstream end of the Joshua's Creek when compared to Alternatives 1, 2 and 3. An energy dissipation feature to mitigate downstream erosion is required.
NATURAL HAZARDS	No impact.	The lands associated with the PSW and the reach of Joshua's Creek are key features within the Natural Heritage System. Alternatives 1, 2, and 3 have the greatest impact as channel realignment is required at Joshua's Creek and moderate to substantial encroachment into the PSW.			Alternative 4 includes retaining walls to reduce the amount of channel realignment and encroachment into the PSW. Less impact to natural heritage features compared to Alternatives 1, 2, and 3.
CLIMATE CHANGE MITIGATION	No opportunity to contribute to climate change mitigation.	The proposed road widening will help to relieve existing and future traffic congestion on Ninth Line, and thereby reduce idling that is currently experienced in the study area. Thus, the project will not materially contribute towards climate change.			
CLIMATE CHANGE ADAPTATION	No opportunity to include climate change adaptation techniques. Additional vulnerability to changing climatic conditions.	Alternatives 2, 3 and 4 provide the opportunity to consider future flood conditions (Regional and 1:100 year storm event) in the sizing of the proposed stormwater facilities.			

TECHNICAL CRITERIA	DO NOTHING	ALTERNATIVE 1 WIDEN EQUALLY EAST AND WEST	ALTERNATIVE 2 WIDEN TO EAST	ALTERNATIVE 3 WIDEN TO WEST	ALTERNATIVE 4 MITIGATED DESIGN
SUMMARY	No Impact.	Alternative 1 results in low impact to roadside vegetation and moderate impact on the PSW, SAR habitat, vegetation and Joshua's Creek. The proposed road widening will help to relieve existing and future traffic congestion on Ninth Line, and thereby reduce idling that is currently experienced in the study area. Thus, the project will not materially contribute towards climate change.	Alternative 2 results in lower impact on SAR habitat than Alternative 1 or 3 and moderate impact on the PSW, vegetation and Joshua's Creek. The proposed road widening will help to relieve existing and future traffic congestion on Ninth Line, and thereby reduce idling that is currently experienced in the study area. Thus, the project will not materially contribute towards climate change.	Alternative 3 results in moderate impact on the PSW, SAR habitat, vegetation and Joshua's Creek. The proposed road widening will help to relieve existing and future traffic congestion on Ninth Line, and thereby reduce idling that is currently experienced in the study area. Thus, the project will not materially contribute towards climate change.	Alternative 4 results in the least impact on the PSW, SAR habitat, vegetation and Joshua's Creek. The proposed road widening will help to relieve existing and future traffic congestion on Ninth Line, and thereby reduce idling that is currently experienced in the study area. Thus, the project will not materially contribute towards climate change.
ECONOMIC					
CONSTRUCTION STAGING AND PHASING	No staging is required.	Construction staging required (i.e. lane closures and temporary conditions at intersections).			
MUNICIPAL SERVICING AND UTILITIES COORDINATION	No coordination with municipal servicing and utilities required.	Requires relocation of the existing hydro poles to accommodate road widening. Existing utilities require protection during construction.			
SUMMARY	No Impact.	Requires relocation of the existing hydro poles to accommodate road widening. Existing utilities require protection during construction. Construction staging required.			
INFRASTRUCTURE PLANNING					
ACTIVE TRANSPORTATION	No opportunities for alternative transportation infrastructure within existing land uses.	Provides a multi-use trail in boulevard with on-road bicycle lanes on both sides within south section and multi-use trail on one side within north section.			
STREETSCAPE	No opportunities for streetscaping within existing land uses.	Boulevard and street trees are provided in proposed cross-section at select locations. No opportunities for plantings at bridge structures.			Boulevard and street trees are provided in proposed cross-section at select locations. Less streetscaping than alternatives 1, 2 or 3 due to mitigated cross-section. No opportunities for plantings at bridge structures.
LEVEL OF SERVICE AND NETWORK CAPACITY	No opportunities to improve level of service or increase network capacity (LOS F).	Improves level of service and increases network capacity.			
PLANNING POLICY	Not consistent with Halton Region Official Plan, North Oakville East Secondary Plan, Halton Region Active Transportation Master Plan and Halton Region Transportation Master Plan.	Conforms to Halton Region Official Plan, North Oakville East Secondary Plan, Halton Region Active Transportation Master Plan and Halton Region Transportation Master Plan.			
STORMWATER MANAGEMENT	Some culverts continue to have less than 1:100yr design capacity. No quantity/quality controls.	Reconstruction of drainage features including culvert crossings and roadside ditches will be required for all three Alternatives. Culvert extensions required for all three Alternatives Quantity/quality controls provided.			Reconstruction of drainage features including culvert crossings and roadside ditches will be required. Culvert extensions are also required. Quantity/quality controls may be provided; however, where the ROW is narrower, further assessment will be required at detailed design to confirm ability to provide SWM treatments to meet control targets.

TECHNICAL CRITERIA	DO NOTHING	ALTERNATIVE 1 WIDEN EQUALLY EAST AND WEST	ALTERNATIVE 2 WIDEN TO EAST	ALTERNATIVE 3 WIDEN TO WEST	ALTERNATIVE 4 MITIGATED DESIGN
TRAFFIC SAFETY	No opportunities to improve traffic safety.	All four Alternatives conform to geometric requirements including horizontal and vertical alignments satisfying a 60 km/hr posted speed limit			
SUMMARY	No opportunities to improve infrastructure, traffic operations or traffic safety. Not consistent with planning policies and some culverts do not meet design capacity.	Greatest opportunity to improve infrastructure, traffic operations, traffic safety and stormwater management. Conforms to planning policies.	Greatest opportunity to improve infrastructure, traffic operations, traffic safety and stormwater management. Conforms to planning policies.	Greatest opportunity to improve infrastructure, traffic operations, traffic safety and stormwater management. Conforms to planning policies.	Greatest opportunity to improve infrastructure, traffic operations, traffic safety, however, with respect to stormwater management there is less opportunity to provide Low Impact Development systems (less than alternative 1, 2 or 3). Conforms to planning policies.
SOCIAL					
AIR QUALITY	No impact.	The impact on overall air quality in the Region is expected to be negligible.			
PROPERTY REQUIREMENTS	No Impact.	Moderate property impacts to accommodate road widening.	Moderate property impacts to accommodate road widening.	Moderate property impacts to accommodate road widening.	Least property impacts to accommodate road widening compared to other alternatives.
NOISE IMPACTS	No impact.	Noise Sensitive Areas in the study area include private residential houses adjacent to Ninth Line. As a result of the proposed improvements, the Noise Sensitive Areas are not expected to experience an increase in noise level greater than 5 dBA and therefore no mitigation is required.			
SUMMARY	No Impact.	Negligible impact on air quality and noise (no mitigation required). Moderate property impacts.	Negligible impact on air quality and noise (no mitigation required). Moderate property impacts.	Negligible impact on air quality and noise (no mitigation required). Moderate property impacts.	Negligible impact on air quality and noise (no mitigation required). Least property impacts.
OVERALL FINDINGS					
SUMMARY	No impacts to cultural, natural, economic or social environments. No opportunity to contribute to climate change mitigation. No opportunity to include climate change adaptation techniques. Additional vulnerability to changing climatic conditions. No opportunities to improve infrastructure, traffic operations or traffic safety. Not consistent with planning policies	Moderate level of intrusion into wetlands and associated wildlife habitat. No material contribution towards climate change. Opportunity to consider future flood conditions (Regional and 1:100 year storm event) in the sizing of the proposed stormwater facilities. Road widening substantially encroaches into the PSW. Moderate intrusion into SAR breeding habitat. Moderate property impacts.	Moderate level of intrusion into wetlands and associated wildlife habitat. No material contribution towards climate change. Opportunity to consider future flood conditions (Regional and 1:100 year storm event) in the sizing of the proposed stormwater facilities. Road widening substantially encroaches into the PSW. Less of an intrusion into SAR breeding habitat than alternatives 1 and 3 and with similar intrusion as alternative 4. Moderate property impacts.	Moderate level of intrusion into wetlands and associated wildlife habitat. No material contribution towards climate change. Opportunity to consider future flood conditions (Regional and 1:100 year storm event) in the sizing of the proposed stormwater facilities. Road widening moderately encroaches into the PSW. Moderate intrusion into SAR breeding habitat. Moderate property impacts.	**Least amount of intrusion into wetlands and associated wildlife habitat.** **No material contribution towards climate change. Opportunity to consider future flood conditions (Regional and 1:100 year storm event) in the sizing of the proposed stormwater facilities.** **Road widening encroaches the least into the PSW.** **Least intrusion into SAR breeding habitat than other alternatives.** **Least amount of impact to native and wetland vegetation.** **Least property impacts.**
RECOMMENDATION	Not recommended	Not recommended	Not recommended	Not recommended	**RECOMMENDED**

5.5. Preferred Design

Based on the evaluation of alternative designs and public consultation, for the south section, Alternative Design 4 is preferred.

Key factors for Alternative Design 4 being selected as the preferred design include the following:

- Least amount of intrusion into wetlands and associated wildlife habitat.
- No material contribution towards climate change.
- Opportunity to consider future flood conditions in the sizing of the proposed stormwater facilities.
- Road widening encroaches least amount into the North Oakville-Milton East Complex Provincially Significant Wetland.
- Less of an intrusion into SAR breeding habitat.
- Least amount of impact to native and wetland vegetation.
- Least property impacts.

As discussed in Section 5.2.1, it was not considered reasonable to develop alternatives for the north section that widen to the east only, west only or equally to the east and west as the impact on the adjacent structures is significant. Given these constraints, one alternative design was carried forward, which follows a best-fit approach and this alternative is therefore the preferred design for the north section.

6. Consultation Process

6.1. Public Consultation

6.1.1. Study Commencement

A Notice of Study Commencement was prepared to inform agencies of the study and invite a representative to participate as a member of TAC. A reply form was included with the notice to indicate if the agency has background information pertaining to the study area that can be made available to the project team. The notice and invitation to join TAC was sent to 35 agency representatives. Copies of the notice and agency mailing list can be found in Appendix A.

6.1.2. Notice of Study Commencement and Public Information Centre No. 1

A combined Notice of Study Commencement and Public Information Centre No. 1 was prepared to inform the public and agencies of the study and to invite individuals to review and provide input to the study at a Public Information Centre (PIC) on Thursday, June 16, 2016. The notice was placed in the Milton Canadian Champion on June 2 and June 9, 2016 as well as the Oakville Beaver on June 3 and June 10, 2016. The notice was emailed or mailed to 81 agency representatives and mailed to 28 property owners within the study limits on May 31, 2016. The list of agency representatives is included in Appendix A. The comments received are summarized in Table 19.

Table 19: Summary of Notice of Commencement and PIC No. 1 Comments and Responses

Agency/Public	Comment Date	Comment	Response
Credit Valley Conservation	April 26, 2016	The study area does not include any features of interest to Credit Valley Conservation. Sedimentation control during construction must be addressed.	Comment noted. Commitments for sediment and erosion control measures during detailed design are detailed in Section 8.1.1.
Hydro One Network Inc.	April 27, 2016	Hydro One Networks Inc. has assets in parallel to the study area and future developments have been proposed.	Hydro One Networks Inc. was contacted for utility mark-ups to confirm the location of assets. The existing utility plan is provided in Appendix I and utility relocation requirements for the preferred alternative are discussed in Section 7.10.

Ministry of Tourism, Culture and Sport	April 27, 2016	The Ministry of Tourism, Culture and Sport criteria should be used to screen for archaeological potential and built/cultural heritage landscapes.	A Stage 1 Archaeological Assessment and Heritage Impact Assessment were conducted as part of this study. The results of the assessments are summarized in Section 7.8. Both reports were provided to MTCS for review (Appendix A6).
Ministry of Environment, Conservation and Parks	May 6, 2016	Areas of interest raised by the Ministry of Environment, Conservation and Parks include: Ecosystem Protection and Restoration; Surface Water; Groundwater; Air Quality, Dust and Noise; Servicing and Facilities; Contamination and Soils, Mitigation and Monitoring; Planning and Policy; MCEA Process; and Aboriginal Consultation.	The areas of interest which are applicable to this MCEA are discussed in Sections 3 and 7.
Ministry of Natural Resources and Forestry	May 19, 2016	Species at risk identified during field studies must be reported to the Ministry of Natural Resources and Forestry.	A meeting with MNRF was held on March 15, 2017 and the findings of the Natural Environment Assessment were discussed. Meting minutes are available in Appendix A.
Enbridge Pipelines Inc.	June 1, 2016	Enbridge Pipelines Inc. operates facilities within the study area.	Enbridge Pipelines Inc. was contacted for utility mark-ups to confirm the location of assets. The existing utility plan is provided in Appendix I and utility relocation requirements are discussed in Section 7.13.
Infrastructure Ontario	June 1, 2016	Infrastructure Ontario must be notified if Ministry of Economic Development, Employment and	The presence of Infrastructure Ontario land in the study area is discussed in Section 3.10. A proposed work plan to meet IO's

		Infrastructure lands are required.	requirements was provided to IO for review and comment during the study (see Appendix A6).
Canadian Environmental Assessment Agency	June 2, 2016	Request to review the Regulations Designating Physical Activities to determine if Canadian Environmental Assessment Act 2012 may apply to the proposed project.	The Canadian Environmental Assessment Act Regulations Designating Physical Activities are not applicable to the project.
Curve Lake First Nation	June 6, 2016	The study area is situated within the Traditional Territory of Curve Lake First Nation.	The Curve Lake Indigenous Communities was included on all project notifications to remain informed on the progress of the study (see Appendix A8).
Mohawks of the Bay of Quinte	June 14, 2016	The Mohawks of the Bay of Quinte would be concerned if the preliminary archaeological investigations found artifacts or burial remains.	The Mohawks of the Bay of Quint was included on all project notifications to remain informed on the progress of the study. A copy of the Stage 1 Archaeological Assessment Report was also provided for review (see Appendix A8).
Mississaugas of the New Credit First Nation	June 28, 2016	The Mississaugas of the New Credit First Nation request to be on location whenever any fieldwork for environmental and/or archaeological assessments are undertaken.	The Mississaugas of the New Credit First Nation will be notified to attend the Stage 2 Archeological Assessment field work which is to be completed at detailed design (Section 8.1.1).

A summary of the Public Information Centres is included in Section 6.5.

6.1.3. Notice of Public Information Centre No. 2

A Notice of Public Information Centre No. 2 was prepared to notify agencies and the public of Public Information Centre No. 2 on June 22, 2017 at Oakville Town Hall. The notice was advertised in the June 8 and June 15, 2017 in the Milton Canadian Champion as well as the Oakville Beaver. The notice was mailed or emailed on June 7, 2016 to 31 residences, 52 agencies representatives, 54 members of the Technical Advisory Committee and 24 Indigenous

Communities representatives. The list of agency representatives is included in Appendix A. Comments received in response to the Public Information Centre are summarized in Section 6.6.2.

6.1.4. Letters to Affected Property Owners

Letters were sent to six (6) affected property owners on June 6, 2017 advising of Public Information Centre No. 2 and the offer to meeting and discuss the project details. A copy of the letters is provided in Appendix A4.

6.2. Meetings

6.2.1. Conservation Halton

Recognizing the importance of retaining natural features throughout the study area and ensuring planning was carried out to minimize impacts, Conservation Halton (CH) was considered to be a key agency and was provided several opportunities to provide input during the study on the subject section. Five individual meetings with Conservation Halton were held throughout the study. Details of the discussions are documented in the meeting notes in Appendix A.

A meeting was held on April 20, 2016 with Conservation Halton, Halton Region, CIMA+ and Golder in attendance. The main purpose of the meeting was to introduce the MCEA study and receive initial comments or input from Conservation Halton. A summary of the comments raised and discussed are listed below:

- Environmental considerations for Joshua's Creek;
- Culvert sizing;
- Stormwater management criteria; and
- Tree planting.

A follow-up site visit meeting was held on June 2, 2016 for Conservation Halton, Halton Region, CIMA+ and Golder to review site specific issues. Three (3) site locations were reviewed including Joshua Creek Crossing (approximately 745m north of Dundas Street), wetland southwest of Ninth Line and Burnhamthorpe Road and north of 407 ETR interchange at the stormwater management pond. A summary of the comments raised and discussed are listed below:

- Culvert location and drainage; and
- Presence of provincially significant wetland.

A meeting was held on November 24, 2016 for Conservation Halton, Halton Region, CIMA+ and Golder to obtain comments on the Natural Environment Report, environmental constraints drawings, preliminary design options and assessment. Following the meeting, CH submitted formal comments on the meeting materials, which were incorporated into the development of the preliminary preferred design.

A meeting was held on July 26, 2018 for Conservation Halton, Halton Region and CIMA+ to review the draft Stormwater Management Report and Hydraulic analysis. Following the meeting, CH submitted formal comments on the draft reports and meeting materials. The comment/response table can be found in Appendix A.

A meeting has held on October 8, 2019 for Conservation Halton, Halton Region and CIMA+ to review the updated Stormwater Management Report and Hydraulic analysis, as well as review refinements to Alternative 4 resulting from proposed hydro relocations at Joshua Creek tributary and North Oakville-Milton East Wetland Provincially Significant Wetland. Further details regarding the refinement to Alternative 4 due to hydro relocation are provided in Section 7.10.

6.2.2. Conservation Halton and Town of Oakville

Two meetings with the Town of Oakville and Conservation Halton were held on March 1, 2017 and May 16, 2017 to review stormwater management features for the proposed corridor improvements. During the meetings, Conservation Halton and the Town of Oakville provided comments and recommendations regarding the proposed stormwater management system. Details of the discussions are documented in meeting notes included in Appendix A.

Additional consultation with the Town of Oakville took place through the review of the draft ESR in the summer of 2020 to further review on-road active transportation on Ninth Line. A commitment has been added to Section 8.1.1 – Mitigation and Detailed Design Commitments to consider a 0.5m buffer between the travel lane and 1.8m on-road cycling lane. Details of the discussions, as well as the comment/response table are included in Appendix A.

6.2.3. Ministry of Natural Resources and Forestry

One teleconference with the Ministry of Natural Resources and Forestry was held on March 15, 2017 to discuss the presence of Species at Risk within the study area, associated permit requirements and appropriate mitigation measures. Details of the discussion are documented in meeting notes included in Appendix A.

6.2.4. City of Mississauga

Given that east of the Study Area Ninth Line is within the jurisdiction of the City of Mississauga, the City is a key agency participating throughout the MCEA Study to ensure future improvements to the north of the study area can be interconnected with the improvements proposed as part of this study. Staff from the City of Mississauga participated in the two Technical Agency Committee meetings.

One additional agency meeting with the City of Mississauga was held on May 16, 2017 to discuss the City's planned improvements for Ninth Line. Details of the discussions are documented in meeting notes included in Appendix A.

Additional consultation with the City of Mississauga took place through the review of the draft ESR in the summer of 2020 to further review impacts on the City's baseball diamond. Details of the discussions, as well as the comment/response table are included in Appendix A.

6.2.5. Ministry of Transportation and 407 Express Toll Route

Recognizing that the north section of the study area passes through four existing Highway 403 and 407 ETR interchanges, the Ministry of Transportation (MTO) and 407ETR were involved in the development of the mitigated design for the north section.

Two meetings with MTO and 407 ETR were held on January 13, 2017 and May 3, 2017 to review the proposed cross-sections for the north section and associated design criteria. Details of the discussions are documented in meeting notes included in Appendix A.

6.2.6. Oakville Hydro

A meeting was held on September 6, 2019 for Oakville Hydro, Halton Region and CIMA+ to review the preliminary design and property requirements in order to accommodate the proposed hydro relocations. Details of the discussions are documented in meeting notes included in Appendix A.

6.3. Indigenous Communities

All Indigenous Communities listed in Section 1.5.3 were notified of the commencement of this study and also notified of all Public Information Centres. Letters provided to Indigenous Communities and correspondence from Indigenous Communities are included in Appendix A.

6.4. Technical Agencies Committee

6.4.1. Technical Agencies Committee Meeting No.1

A meeting with TAC was held on June 1, 2016. Nineteen (19) individuals attended including 11 agency representatives, 6 technical staff from Halton Region, the Region's Project Manager and 2 representatives from the Consultant Team. Detailed meeting notes are provided in Appendix A. The comments raised and discussed are summarized in Table 20. Responses were provided to comments received following the meeting (Appendix A6).

Table 20: Summary of TAC #1 Meeting Comments and Responses

Agency	Comment	Response
407ETR	Regarding bridge structures north of the corridor, if the structures are to be widened, they will require an encroachment agreement, a tri-party agreement over Highway 403 (MTO, 407 ETR, Halton Region), and discussion regarding maintenance issues and cost sharing between 407 ETR and the Region.	Following the TAC #1 meeting, two joint meetings with MTO and 407 ETR were held on January 13 and May 3, 2017. The meetings were held to discuss issues and options (i.e. previous agreement for widening structure) as well as received confirmation regarding any existing information on the structures (e.g., maintenance, design, etc.). Meeting minutes are provided in Appendix A5.
MTO	The Ministry indicated that a Transportation Environmental Study Report (TESR) for the Highway 403 expansion is approved for projected construction by 2025. MTO provided a copy for review and consideration. With respect to Ninth Line, MTO indicated that permits will be required prior to construction. Halton Region would need to consider covering the cost of bridge widenings.	The commitment to obtain a permit from MTO prior to construction is discussed in Section 8.
Oakville Transit	Requested reference to potential opportunities for transit. Ninth Line was noted as being a transit-supportive corridor.	The cross-sections displayed at PIC#1 noted that buses can be accommodated in the 3.5m travel lanes. Accommodate Other Modes of Travel (including transit) was recommended as part of the preferred solution (Section 4.3).
City of Mississauga	A review of land use and vision for the Ninth Line corridor will be completed by mid-June (2016) (for the east portion of the 407 corridor). An MCEA conducted in 2013 proposed an ultimate 5 lane cross-section with a multi-use trail located on	A meeting with City of Mississauga was held on May 16, 2017 to discuss the preliminary design plans and tie-in locations for the future City of Mississauga Ninth Line MCEA.

	the east side (urban cross-section) from Derry Road north to Highway 401. An MCEA for the section between Eglinton Avenue and Derry Road will be conducted following completion of the Ninth Line Lands Study. The City advised that they will notify the area City Councillors of the Region's study and the upcoming public information centre as they may have an interest in the study.	Meeting minutes are provided in Appendix A5.
Town of Oakville	Advised that development applications for the corridor are conceptual at this stage with no locations specified for new intersections.	This comment was noted. The Town of Oakville participated in two joint meetings with Conservation Halton on March 1 and May 16, 2017. Meeting minutes are provided in Appendix A5.
Enbridge (formerly Union Gas)	High pressure gas line is currently in process north and west of the corridor.	Utility mark-ups were requested on November 8, 2016. Markups were received from Union Gas/Enbridge and the depth and sizing of the gas line has been confirmed. A copy of the letter is provided in Appendix A6. The existing utility plan is provided in Appendix I and utility relocation requirements are discussed in Section 7.13.
Region of Peel	Peel Region will be undertaking a transportation analysis for Ninth Line north of 407 ETR under the City of Mississauga's jurisdiction.	Comment noted. A meeting with City of Mississauga was held on May 16, 2017 to discuss the preliminary design plans and tie-in locations for the future City of Mississauga Ninth Line MCEA. Meeting minutes are provided in Appendix A5.

6.4.2. Technical Agencies Committee Meeting No.2

A second meeting with TAC was held on June 8, 2017. Twenty (20) individuals attended including 16 agency representatives, the Region's Project Manager and Project Director and 2 representatives from the Consultant Team. Detailed meeting notes are provided in Appendix A.

The comments raised and discussed are summarized in Table 21. Responses were provided to comments received following the meeting (Appendix A6).

Table 21: Summary of TAC#2 Meeting Comments and Responses

Agency	Comment	Response
407ETR	The parapet wall adjacent to Structure 4 will be required to be constructed to current standards.	This comment was noted and considered in the development of the preferred alternative (Section 7.3).
MTO and 407ETR	407ETR has authority over the structures and MTO will be responsible for issuing a permit.	This comment was noted. The need for a permit from MTO prior to construction is discussed in Section 8.
City of Mississauga	The baseball diamond parking lot is planned for paving and City of Mississauga requested that the required changes to the parking lot for the widening of Ninth Line occur at the same time as road widening to avoid reconstructing the newly paved parking lot. The City indicated that the parking lot can be redesigned within the proposed right-of-way.	A meeting with City of Mississauga was held on May 16, 2017 to discuss the preliminary design plans. Meeting minutes are provided in Appendix A5. Commitments regarding the reconstruction of the City of Mississauga parking lot are discussed in Section 8.
City of Mississauga	City of Mississauga inquired if the multi-use trail within the north section could be relocated from the west side to the east side to align with the City's proposed cross-section for the Ninth Line MCEA north of this study area.	Halton Region indicated that the multi-use trail will remain on the west side due to constraints on the east side at the MTO structures (Section 3.14).

6.5. Infrastructure Ontario

Infrastructure Ontario (IO) was consulted during the study in order to establish the need to fulfill any provincial requirements or obligations through the MCEA process. IO confirmed that based on the MCEA amendments to General Regulation 334 under the Environmental Assessment Act effective as of July 1, 2019, the sale of government land is exempt from the Ministry of Infrastructure (MOI) Public Works MCEA. Commitments to consult with IO during the detailed design phase are discussed in Section 8.

6.6. Public Information Centres

6.6.1. Public Information Centre No. 1

A PIC was held on June 16, 2016 from 6:30 pm to 8:30 pm. The PIC was held to present the study, including background information, existing conditions, alternative planning solutions and factors for analysis and evaluation. The PIC served as an opportunity for the public to review project information, ask questions or discuss comments with members of the study team. As discussed above, a notice announcing the PIC was advertised in the Milton Canadian Champion on June 2 and June 9, 2016 as well as the Oakville Beaver on June 3 and June 10, 2016. Additionally, the notice was sent to 81 agency representatives and 28 property owners on May 31, 2016.

During the PIC, the public was invited to review presentation boards and ask questions or discuss comments with the project team. The PIC boards displayed the following information:

- Study Area, Purpose, Process and Schedule
- Background
- Halton Region Roads Capital Projects
- Natural Environment
- Social and Economic Environment
- Cultural Environment
- Existing and Future Transportation Conditions
- Problem and Opportunity Statement
- Alternative Planning Solutions
- Proposed Typical Cross-Section
- Ninth Line/William Halton Parkway Roundabout
- Factors for Analysis and Evaluation
- Next Steps

Nine (9) people signed into the PIC including area residents, property owners, a City of Mississauga representative and a Town of Oakville Councillor. Comment sheets were available for the public to fill out and submit at the PIC or mail in by June 30, 2016. The comments received and the corresponding responses are summarized in Table 22.

A copy of correspondence received and responses are provided in Appendix A7.

Table 22: Summary of PIC No.1 Comments and Responses

Comment	Response
The City of Mississauga should be included in consultation as the lands on the east side of Ninth Line are within the City of Mississauga's jurisdiction.	A meeting with City of Mississauga was held on May 16, 2017 to discuss the preliminary design plans. Meeting minutes are provided in Appendix A5.
Concerns regarding widening Ninth Line north of Dundas Street without improving municipal services within the road right-of-way.	Comment will be reviewed in subsequent stages of the study. Utilities for the recommended alternative are discussed in Section 7.10.
Clarification regarding the Existing Conditions Plans and what each line type represents. Concerns with the lines shown at the southwest corner of the intersection of Ninth Line and William Halton Parkway / Burnhamthorpe Road.	On the existing conditions plan, the yellow lines represent the property lines. The black lines are seam lines comprised of triangular segments that form the map and have no significance to the study area. The diagonal yellow lines at the southwest corner of the intersection through the subject property represents an Enbridge easement as there is a 610mm diameter pipeline.
Approval of the roundabout.	The William Halton Parkway roundabout at Ninth Line was approved during the detailed design stage for William Halton Parkway from Neyagawa Boulevard to Ninth Line.
Comments regarding wells and water/wastewater servicing.	Comments will be reviewed in subsequent stages of the study. A hydrogeological assessment was completed as part of this EA study to assess the geology and hydrogeological conditions of the study area and assess the potential impacts of the proposed project on groundwater quality and quantity (Section 3.6). Municipal servicing is discussed in Section 3.8
Access to businesses and residences during construction.	Comment will be reviewed in subsequent stages of the study.

Comment	Response
	The commitment to develop a property access plan during detailed design is discussed in Section A 8.1.1.
Potential property impacts due to road widening.	Comment will be reviewed in subsequent stages of the study. Property impacts associated with the recommended alternative are discussed in Section 7.12.
The status of water, septic and well monitoring to properties.	Comment will be reviewed in subsequent stages of the study. Monitoring and maintenance are recommended to minimize impacts during construction (Section 8.2).
Active transportation facilities.	Comment will be reviewed in subsequent stages of the study. Active transportation facilities are recommended as part of the preferred alternative (Section 7.4).

6.6.2. Public Information Centre No.2

A second PIC was held on June 22, 2017 from 6:30 pm to 8:30 pm at Oakville Town Hall. The PIC was held to present activities since PIC No.1, evaluation of alternative design concepts, identification of the recommended alternative design concept and recommended improvements on Ninth Line corridor to address road safety and travel demand. As with PIC No.1, PIC No.2 served as an opportunity for the public to review project information, ask questions or discuss comments with members of the study team.

During the PIC, the public was invited to review presentation boards and ask questions or discuss comments with the project team. The PIC boards displayed the following information:

- Study Area, Purpose of PIC
- Background and Existing Conditions
- Study Process and Schedule
- Summary of PIC No.1
- Evaluation Criteria
- Alternative Design Concepts and Evaluation: South Section
- Summary of Improvements and Typical Cross-Section: South Section
- Alternative Design Concepts: North Sections
- Summary of Improvements and Typical Cross-Sections: North Section
- Mitigation Measures
- Construction Phasing and Next Steps

Eight (8) people signed into the PIC including area residents, property owners, two (2) City of Mississauga representatives and two (2) Town of Oakville Councillors. Comment sheets were available for the public to fill out and submit at the PIC or mail in by June 30, 2017. The comments received and the corresponding responses are summarized in Table 23. A copy of correspondence received and responses are provided in Appendix A7.

Table 23: Summary of PIC No.2 Comments and Responses

Comment	Response
Municipal services should be included as part of the preferred design, and built together with the road improvements. There may be a need for a SWM faculty somewhere within or adjacent to the right of way to handle the increased runoff from the improved roadway.	Questions regarding municipal servicing for both the west side (Halton) or east side (Peel) are directed to Zahir Najak, Development Engineer at zahir.najak@halton.ca. Stormwater management and drainage, will be managed through swales with bio-retention features implemented as part of the plan to handle drainage, based on the recommended alternative design concept. The property requirements for that facility are included in the PIC roll plan.
Concerns regarding property requirements of private land, culvert relocations, left-turn lane access, and septic bed impacts.	These issues will be addressed during detailed design. Commitments to further work are outlined in Section 8.

6.7. Public Review Period

6.7.1. Comments and Request for Higher Level Study

As discussed in Section 1.3.3, a request may be made to the Ministry of the Environment, Conservation and Parks for an order requiring a higher level of study (i.e. requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g. require further studies), only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other grounds will not be considered. Requests should include the requester contact information and full name for the ministry.

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

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

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

and

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

Requests should also be sent to Halton Region by mail or by email:

Ann Larkin, P.Eng
Supervisor, Transportation Planning
Halton Region
1151 Bronte Road,
Oakville ON L6M 3L1
ann.larkin@halton.ca

7. Project Description

This section identifies the main features of the preferred design for the Ninth Line corridor from Dundas Street to 407ETR. Drawings for the preferred design for Ninth Line are provided in Appendix J.

The recommended undertaking for Ninth Line between Dundas Street and 407ETR includes the following:

North Section – Ninth Line between William Halton Parkway and 407ETR

- 29.5m right-of-way
- 4-lane roadway
- Raised centre median
- 4m multi-use trail (MUT) on the west side of the road

South Section – Ninth Line between Dundas Street and William Halton Parkway

- 39m right-of-way (to accommodate hydro relocation), previously 35m
- 4-lane undivided roadway
- 3m multi-use trail (MUT) on both sides of the road
- On-road cycling lanes on both sides of the road
- Dedicated left-turn lanes

7.1. Design Criteria

Currently, Ninth Line is a rural undivided 2-lane arterial roadway with a posted speed of 60 km/h and partially paved shoulders. Once the improvements have been implemented, Ninth Line will be four-lanes throughout the study area, the posted speed limit will remain 60 km/h. North of William Halton Parkway, Ninth Line passes through four MTO/407ETR structures. Given the right-of-way available through the structures, a mitigated cross-section is required. South of William Halton Parkway, a nominal 39 metre right-of-way is available. The design criteria used in the development of the preferred design for the North Section is provided in Table 24 and the design criteria used for the preferred design for the South Section is provided in Table 25.

Table 24: Design Criteria - North Section

Criteria				Existing Conditions	Design Standards	Proposed Standard
General	Highway classification			RAU80	UAD80 or UAU80	UAD80
	Design speed			80 km/h	80 – 110 km/h	80 km/h
	Posted speed			60 km/h	60 km/h	60 km/h
	Design vehicle				WB-20.5	WB-20
	Stopping sight distance			≥ 135m	135m (GDSOH) 130m (HAMG)	≥ 135m
Horizontal alignment	Crossfall, *e*	Normal crown		-0.02	-0.02	-0.02
		Maximum superelevation		unknown	0.02 – 0.08	0.04
	Minimum radius, R_{min}	For normal crown		unknown	2,130m	n/a
		For e_{max}		330m	280m (with 4% superelevation)	280m (with 4% superelevation)
	Minimum spiral parameter, K			unknown	135m (for rural conditions)	No spirals (typically not used for urban conditions)
Vertical alignment	Grade, G	Maximum		3.2% (estimated)	6 – 8%	2.9%
		Minimum		unknown	0.5% (desirable) 0.3% (absolute)	0.5%
	Curvature, K	Crest curve		35	35	35
		Sag curve	Headlight	unknown	30	30
			Comfort		15	
Sight distance at highway entrance		Utility access		175m (approx.)	230m	existing

		Commercial, etc. *(institutional)*	150m (approx.)	275m	existing
Transition from 2-lane to 4-lane highway		Merging taper length	n/a	130m	130m
		Diverging taper length	n/a	70m	70m
Cross-section	No. of through lanes		2	4	4
	Width of through traffic lane		3.75m	3.75m (desirable) 3.5m (acceptable)	3.5m
	Width of raised median		n/a	1.0m	2.0m
	Two-way shared-use multi-use trail (MTU	Desirable width	n/a	4.0m	4.0m
		Suggested minimum width at constrained locations	n/a	3.0m	
		Minimum width for short distances (constrained)	n/a	2.4m	
		Minimum offset to grading	n/a	1.0m	1.0m
		Minimum clearance to obstruction	n/a	0.3m	0.3m
	ROW width		n/a	20m – 45m (typ)	variable
	Curb and gutter width		n/a	0.5m	0.5m
	Shoulder width		2.5m	n/a	n/a
	Roadside grading	Maximum	unknown	2:1	3:1
		For lower heights	unknown	3:1 – 4:1	3:1
	Boulevard width	Standard	n/a	3.0m	3.0m (adjacent MUT) 2.5m (elsewhere)
		Desirable minimum	n/a	1.5m	
		Absolute minimum	n/a	0.0m	0.3m (at structures)
	Clear zone	Unconstrained	unknown	5.0m	5.0m

		At structures	2.5m (min)	5.0m	Barrier protection provided where required
Cross-section at structures	Side clearance on bridge structures with L > 50m (AUD classification)		1.5m (min)	1.5m	1.5m
	Height of parapet wall on bridge structures adjacent to MUT		n/a	1.37m	1.37m
	Raised median width		n/a	2.0m	2.0m
	Vertical clearance		5.3m (structure 1) 5.4m (structure 3)	4.8m – 5.0m	5.2m (structure 1) 5.3m (structure 3)
	Barrier protection	Offset SBGR face to back of curb	n/a	0.25m	0.25m
		Offset SBGR face to bridge pier	7.5m	1.0m	1.0m
		End-treatments within clear zone	unknown	TL-3	TL-3

Table 25: Design Criteria - South Section

Parameter			Unit	Values
Classifications				UAD 80
Design Speed			km/h	80
Number of Through Lanes				4
Design Vehicle				WB-20
Stopping Sight Distance			m	135
Horizontal Alignment	Min. Radius		m	280
	Min. Radius with Normal Crown		m	2130
Vertical Alignment	Grade	Maximum	%	5
		Minimum	%	0.5
	K Value	Crest Curve		35
		Sag Curve		15
Cross Section	Max. Superelevation		m/m	0.04
	Lane Width	Through Lane	m	3.5
		Turning Lane	m	3.5
		Bicycle Lane	m	1.8
	Median Width		m	N/A
	Sidewalk Width		m	None (MUT)
	Multi-use Trail (MUT)		m	3m
	Boulevard Width		m	3m (can vary)
	Cross Fall		%	2
Intersection Daylight Triangle			m	15
Right of Way	With Median		m	39

7.2. Profile

The proposed vertical alignment of Ninth Line is generally consistent with the existing road profile. A preliminary geotechnical investigation was conducted by Golder. A copy of the report is provided in Appendix K, which includes recommendations and pavement design.

Based on a review of the field information collected during the geotechnical investigation and analysis, the new pavements on the subject section of Ninth Line should consist of the material thicknesses indicated in Table 26. The pavement structures will be constructed on a shaped native silty clay subgrade.

Table 26: Pavement Design

Component	Thickness(mm)	
	South Section	**North Section**
HL1 Surface Asphalt	50	50
HL8 Binder Asphalt	120 (2 @ 60)	120 (2 @ 60)
Granular A Base	250	150
Granular B Type III Subbase	550	450

7.3. Typical Cross Section

Figure 23 illustrates the typical mid-block cross-section proposed for the South Section. Through this section, the boulevard width varies to reduce property impacts to key features such as the Provincially Signiant Wetland. The features included in the cross-section for the South Section include the following:

- 39.0 metre right-of-way
- 4 lanes (2 lanes in each direction)
- 2.0 metre median
- 1.8 metre on-road bicycle lanes on both sides of the road
- 3.0 metre multi-use pathway on both sides of the road
- Left-turn lanes are provided for access to midblock properties including:
    - Storage Facility south-east of William Halton Parkway (currently under construction)
    - Fern Hill School
    - Glen Oaks Funeral Home and Cemetery (2 of the 3 accesses)
    - The Tennis School
    - City of Mississauga Baseball Diamonds

Figure 24 and Figure 25 illustrate the cross-sections for the North Section transition area north and south of interchanges and the cross-section through interchanges between structures, respectively. Figure 26 through Figure 29 illustrate the cross-sections for each of the four MTO structures. The right-of-way varies through structures. The features included in the North Section include the following:

- Variable right-of-way between 22.0 metres and 29.5 metres
- 4 lanes (2 lanes in each direction)
- 2.0 metre raised median between structures
- 4.0 metre multi-use pathway on the west side of the road
- Left-turn lanes are provided for access to midblock properties including:
    - Jehovah's Witness Kingdom Hall

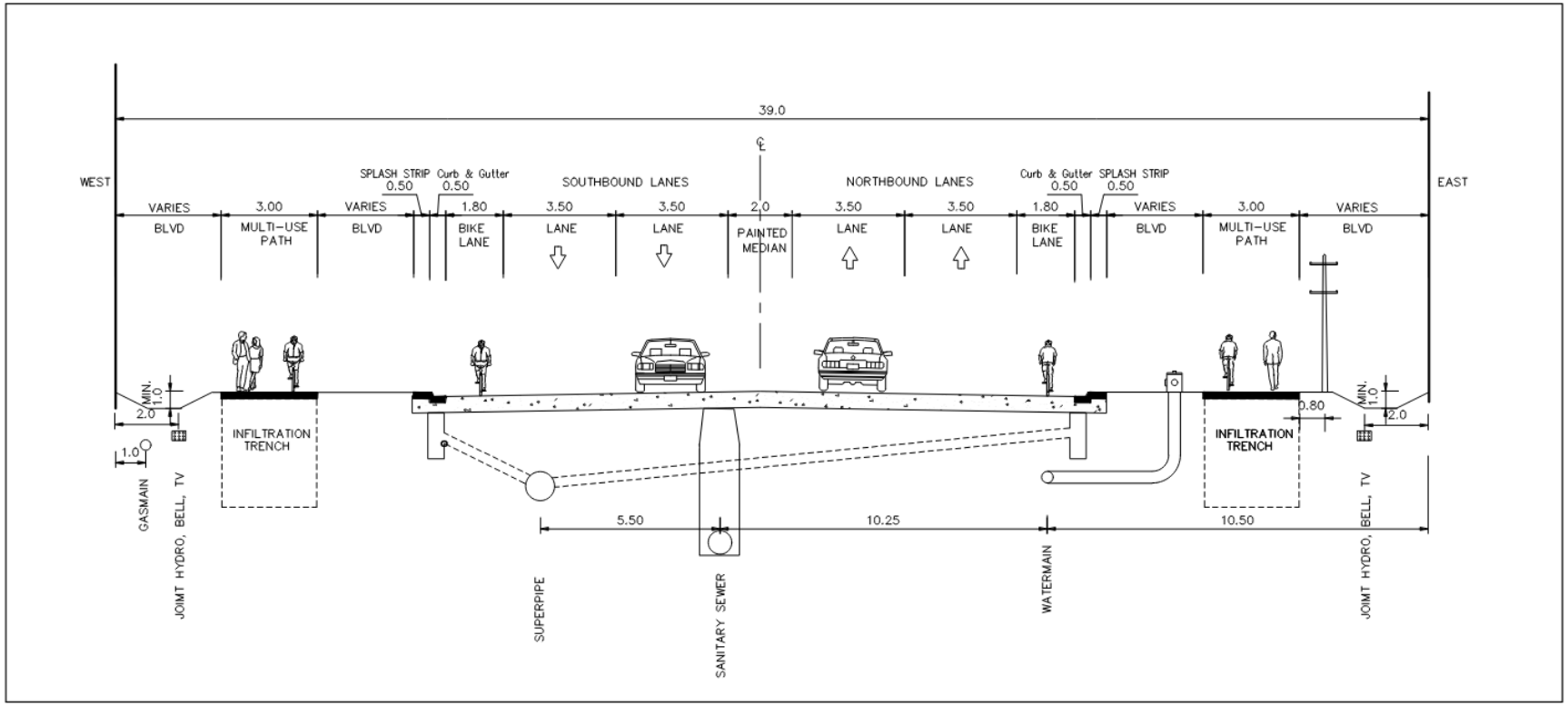

Figure 22: South Section - Typical Mid-Block Cross Section

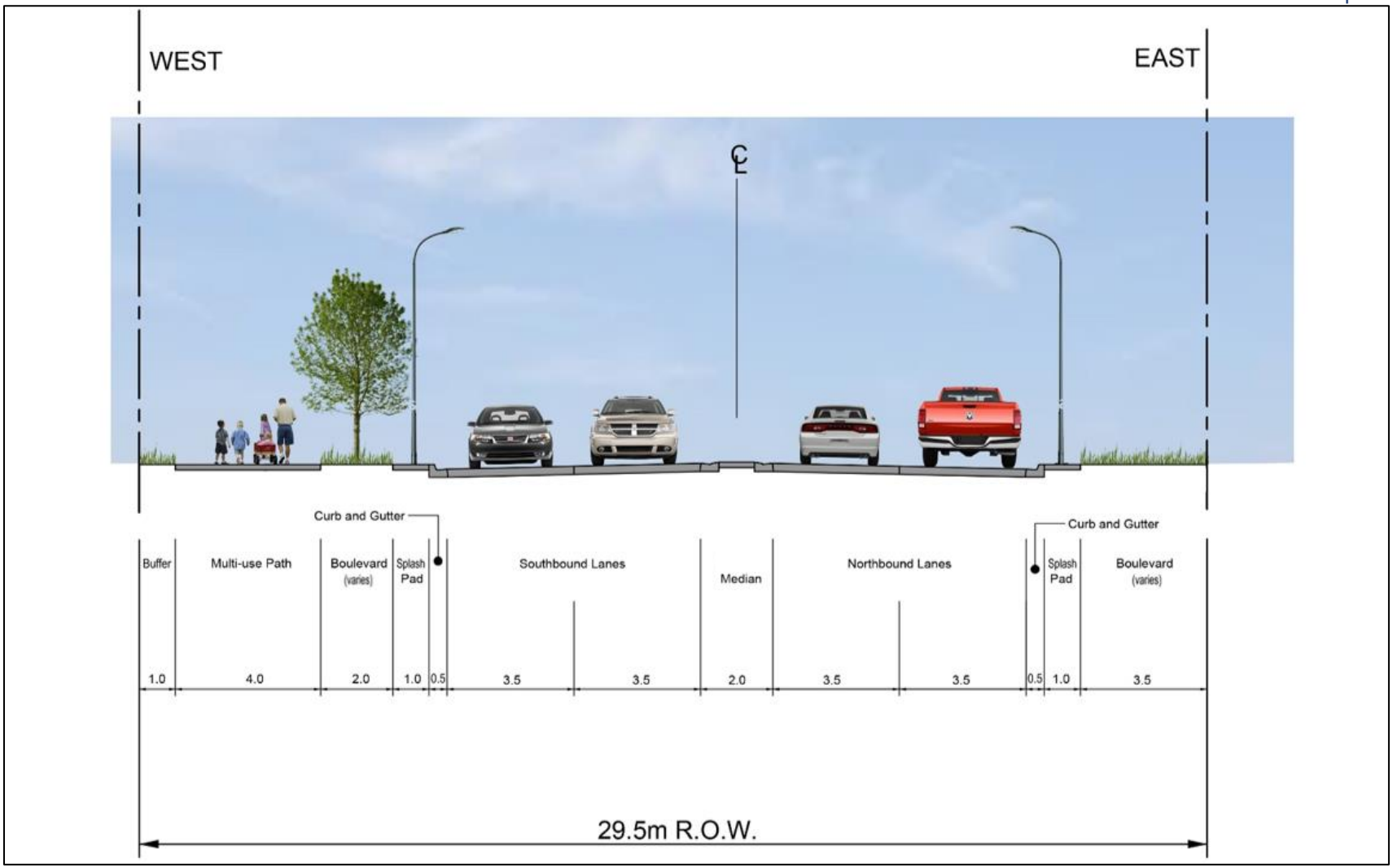

Figure 23: North Section - Cross-Section for Transition Area North and South of Interchanges

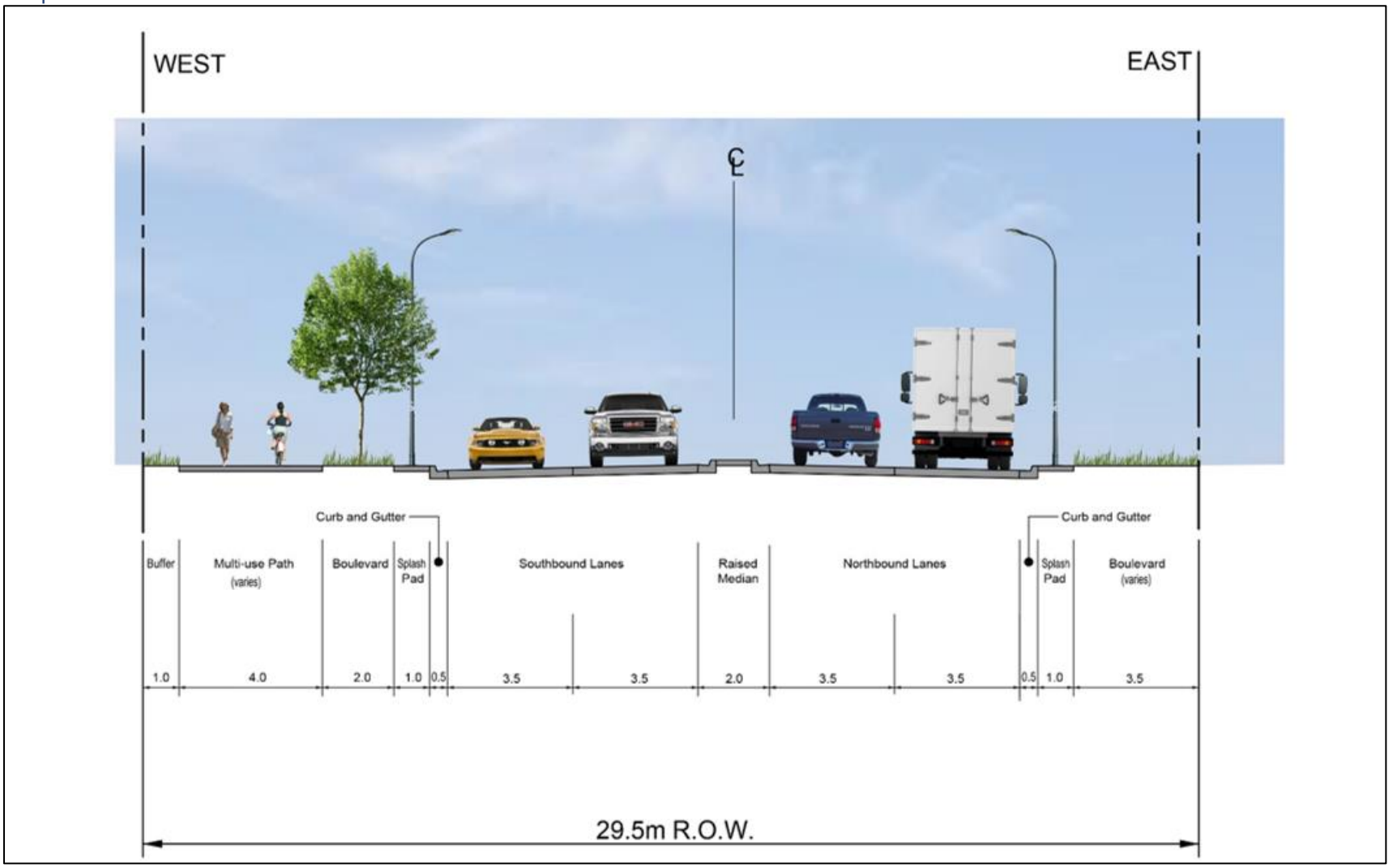

Figure 24: North Section - Cross-Section with Raised Median Through Interchange Between Structures

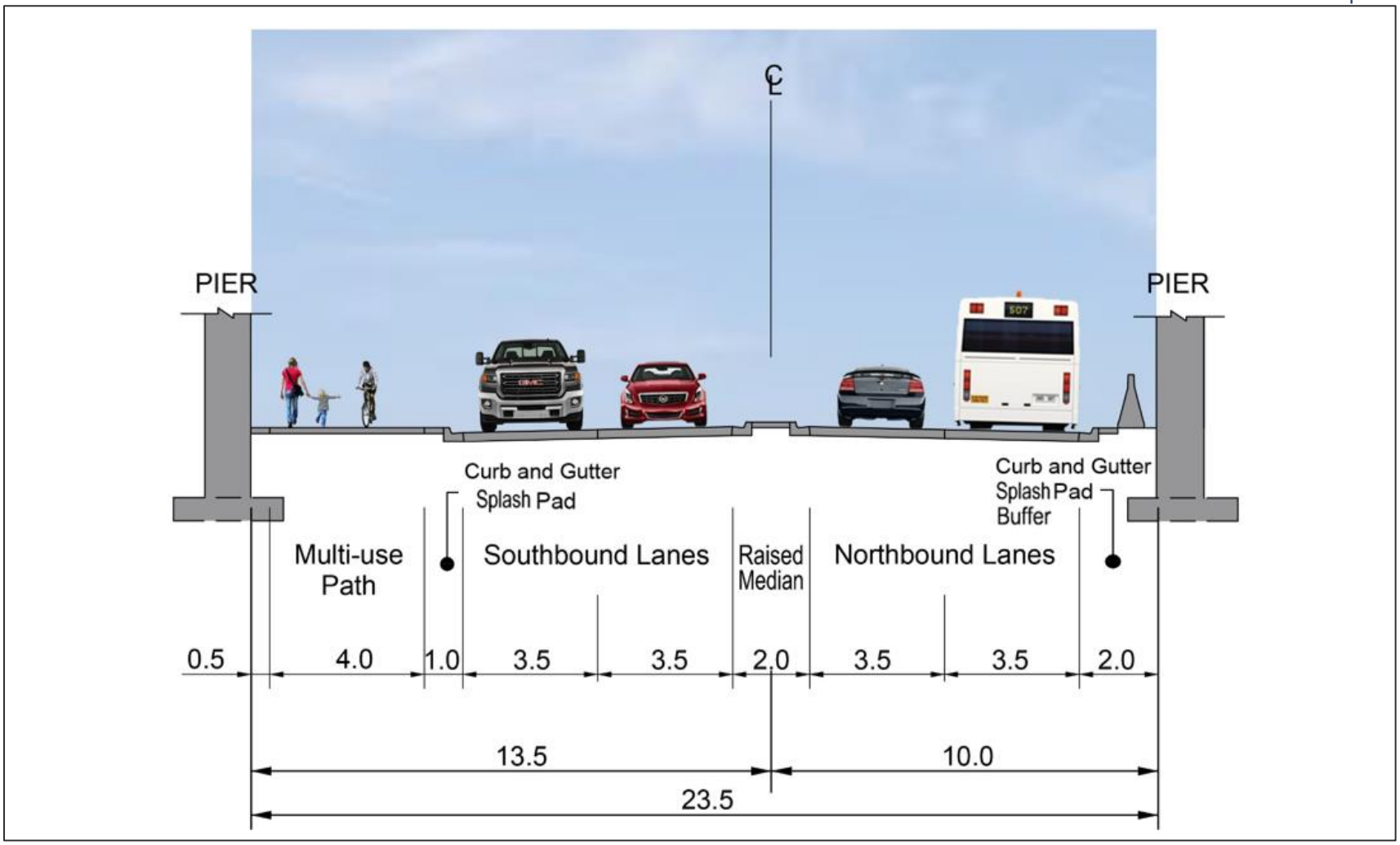

Figure 25: MTO Structure 1 - Ramp W-S underpass (Highway 403/407 interchange) over Ninth Line

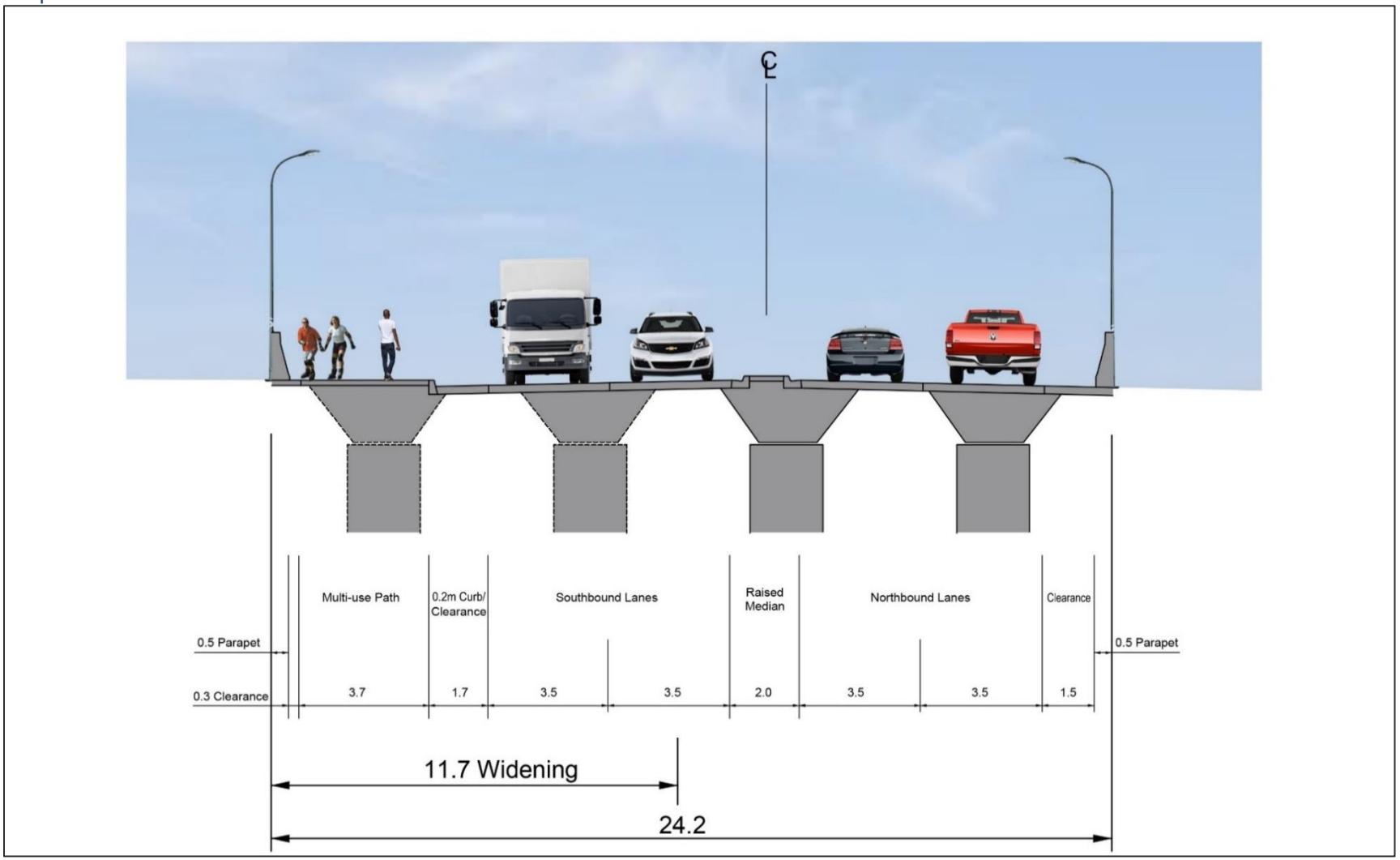

Figure 26: MTO Structure 2 - Ninth Line over Highway 403/407 Interchange

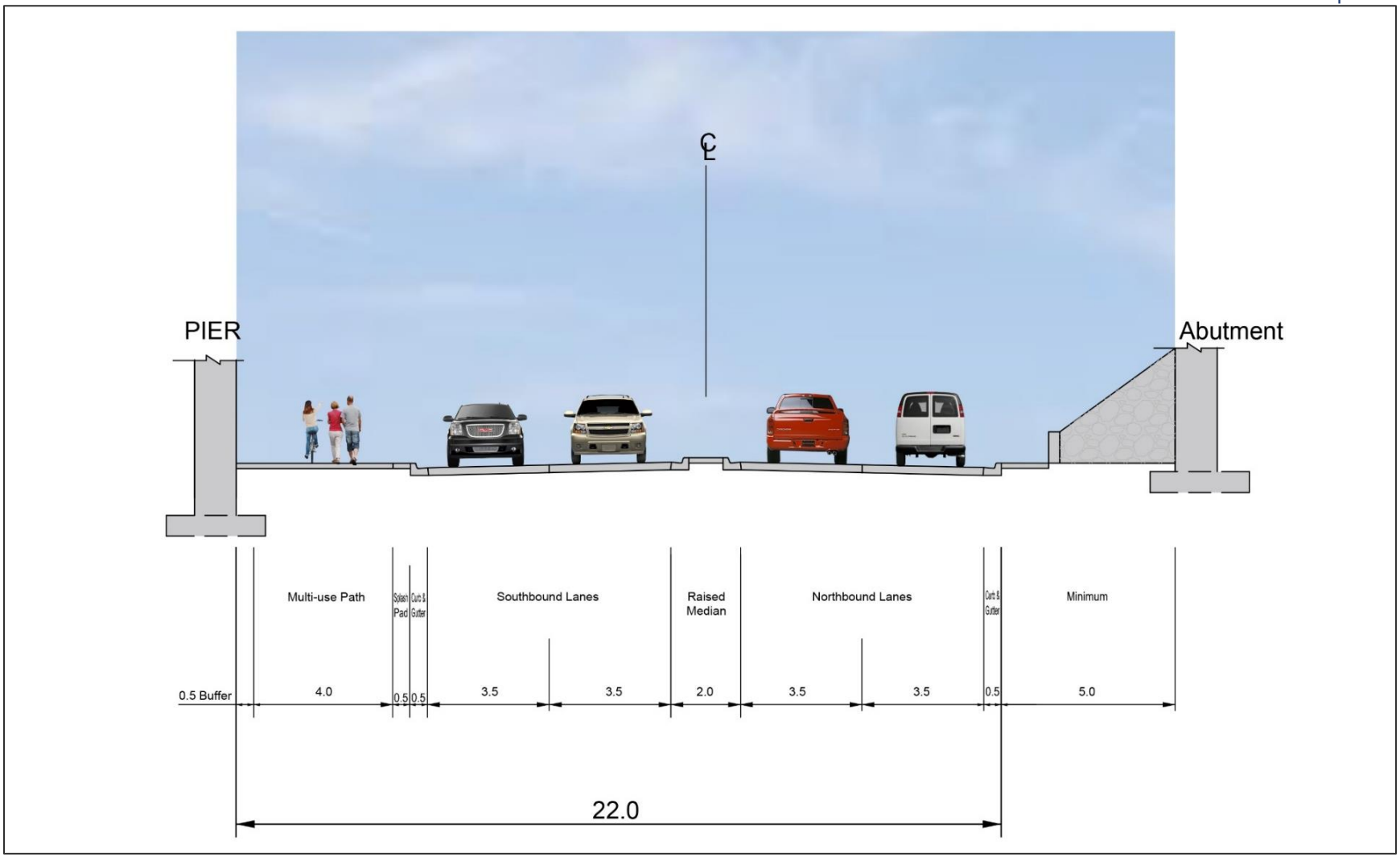

Figure 27: MTO Structure 3 - Ramp 407N-403E, S over Highway 407 and Ninth Line

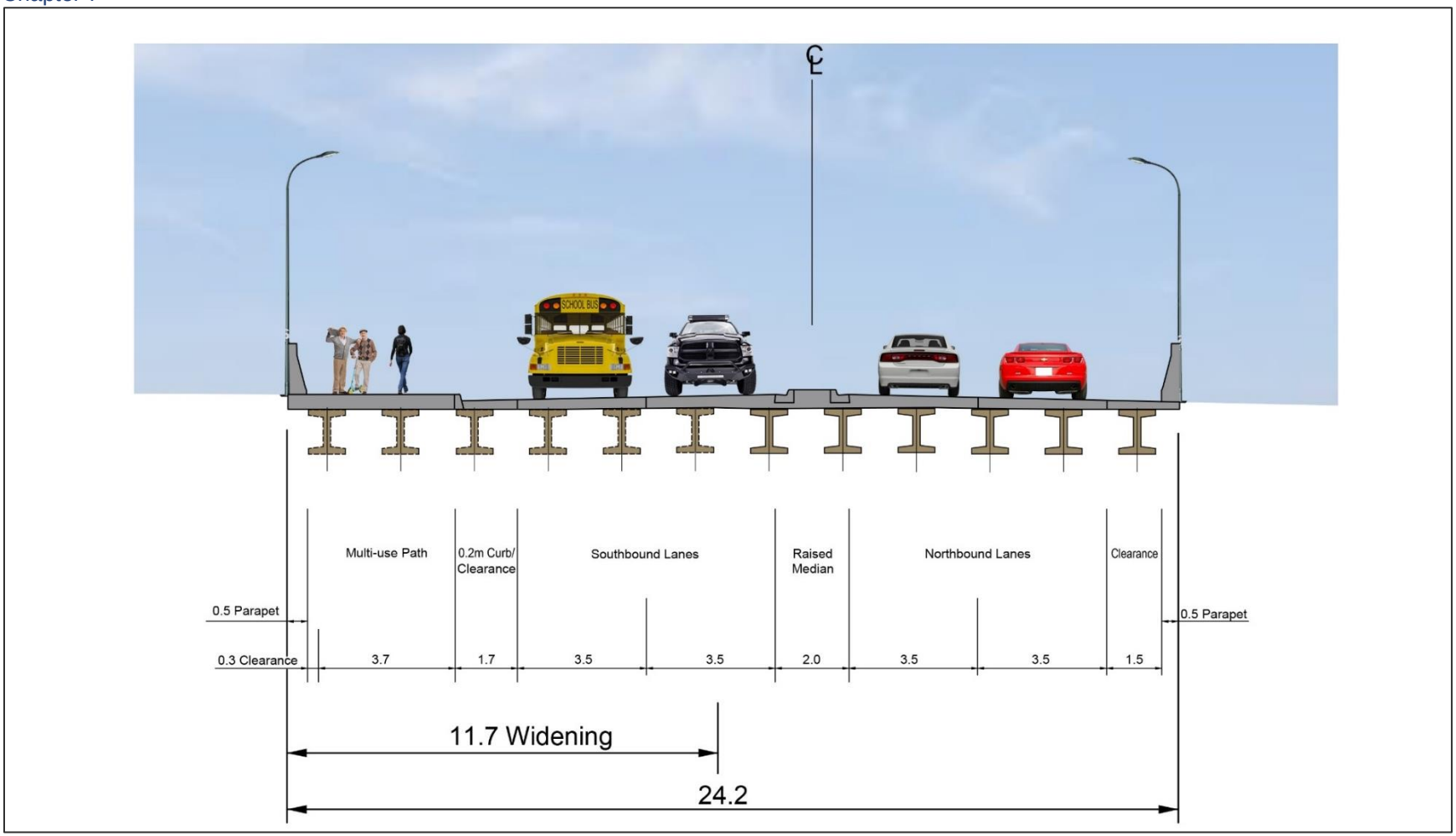

Figure 28: MTO Structure 4 - Ninth Line over Ramp 403S-407N and Ramp 403E-407N

7.4. Active Transportation

Halton Region has developed the Halton Region Active Transportation Master Plan (ATMP) (2015) to outline the required strategy, infrastructure, initiatives, and programs to promote non-motorized travel throughout the Region (as discussed in Section 2.1.3). The ATMP (2015) includes proposed bicycle lanes and a boulevard multi-use trail on Ninth Line. Consistent with the recommendations of the ATMP and the design criteria discussed in Section □, active transportation facilities within the study area include:

North Section:

- 4.0 metre multi-use pathway on the west side of the road (two-way)

South Section:

- 1.8 metre on-road bicycle lanes
- 3.0 metre multi-use trail on both sides

7.5. Drainage and Stormwater Management

7.5.1. Design Overview

The proposed stormwater management design for the Ninth Line corridor is discussed below. This section includes the basis for the design, the proposed stormwater management system for managing flows within the right of way, the proposed road crossing culverts and associated channel work, and the proposed external ditching to capture flows outside the right-of-way. A full discussion of the proposed stormwater management system is provided in the Stormwater Management report in Appendix D.

The proposed stormwater management is designed to satisfy targets set from various stakeholders, including Halton Region, the Town of Oakville (via the North Oakville Creek Subwatershed Study), Conservation Halton, and the Ontario Ministry of Natural Resources and Forestry (MNRF).

North Oakville Creek Subwatershed Study

As discussed in Section 2.1.5, the North Oakville Creek Subwatershed Study (NOCSS) was prepared for the Town of Oakville in August 2006. The goal of the study was to develop a subwatershed plan that allows sustainable development while ensuring the maximum benefits to the natural and human environment on a watershed basis. NOCSS sets target area unit peak flow rates for various catchments and storm events, the targets for the Joshua's Creek catchment within the study area (JC-D2) are outlined in Table 27.

Table 27: NOCSS Unit Peak Flow Targets

	Target Unit Peak Flow Rate ($\frac{m^3}{s}/ha$)						
	2 Year Storm	5 Year Storm	10 Year Storm	25 Year Storm	50 Year Storm	100 Year Storm	Regional Storm
JC-D2	0.004	0.007	0.009	0.012	0.013	0.015	0.043

Halton Region

Halton Region requires that the stormwater management system for Ninth Line be designed to convey runoff from both the 1:100 year and Regional storm events. This includes both the management of stormwater within the road right of way as well as flow in the road crossing culverts.

Conservation Halton

Through the consultation activities discussed in Section 6.2.1 and 6.2.2, Conversation Halton expressed a desire to see infiltration and water quality improvements along Ninth Line in the form of low impact development features such as infiltration trenches and bioretention features. They have also suggested opportunities for increasing the size of wetland culvert CC#7 and the construction of dry benches in the culvert to facilitate wildlife passage. Conservation Halton has also requested that new or replacement culverts be sized at 3 times the bankfull width, in particular the Joshua Creek tributary CC#9.

Ministry of Natural Resources and Forestry

Natural Heritage fieldwork identified Species at Risk habitat within the existing CC#9 culvert. As a result, several different options for CC#9 were evaluated and discussed with respect to maintaining the SAR habitat. The CC#9 options are discussed in Section 7.5.6.

7.5.2. Right-of-Way Stormwater Management

The proposed stormwater management (SWM) system for the Ninth Line right-of-way is designed to meet the design basis described above while leveraging the existing stormwater features and considering physical constraints of property and existing infrastructure.

A hydrologic/hydraulic model of the proposed right-of-way stormwater management system was created in EPA SWMM5. For the model, the proposed right of way was divided into sections between 70 m and 275 m long (based on cross section and right-of-way width), with two catchments for each section (one for each side of the road). Catchment characteristics were defined from the function design drawings for the preferred design.

A hydrologic/hydraulic model of the proposed right-of-way SWM system divides the study area into four sections based on existing features and site topography (Figure 30):

- The section at 407ETR will continue to drain to the existing stormwater features;
- The section between the 407 ETR and the proposed William Halton Parkway roundabout will drain (via LID features and stormwater pipes) to a discharge point at the downstream end of the proposed CC#5;
- The section between the proposed William Halton Parkway roundabout and sports fields north of Dundas Street will drain (via LID features and stormwater pipes) to a discharge point at the downstream end of the proposed CC#9; and,
- The section between the sports fields north of Dundas Street and the Dundas Street intersection will connect (via LID features and stormwater pipes) to the existing SWM infrastructure at the intersection.

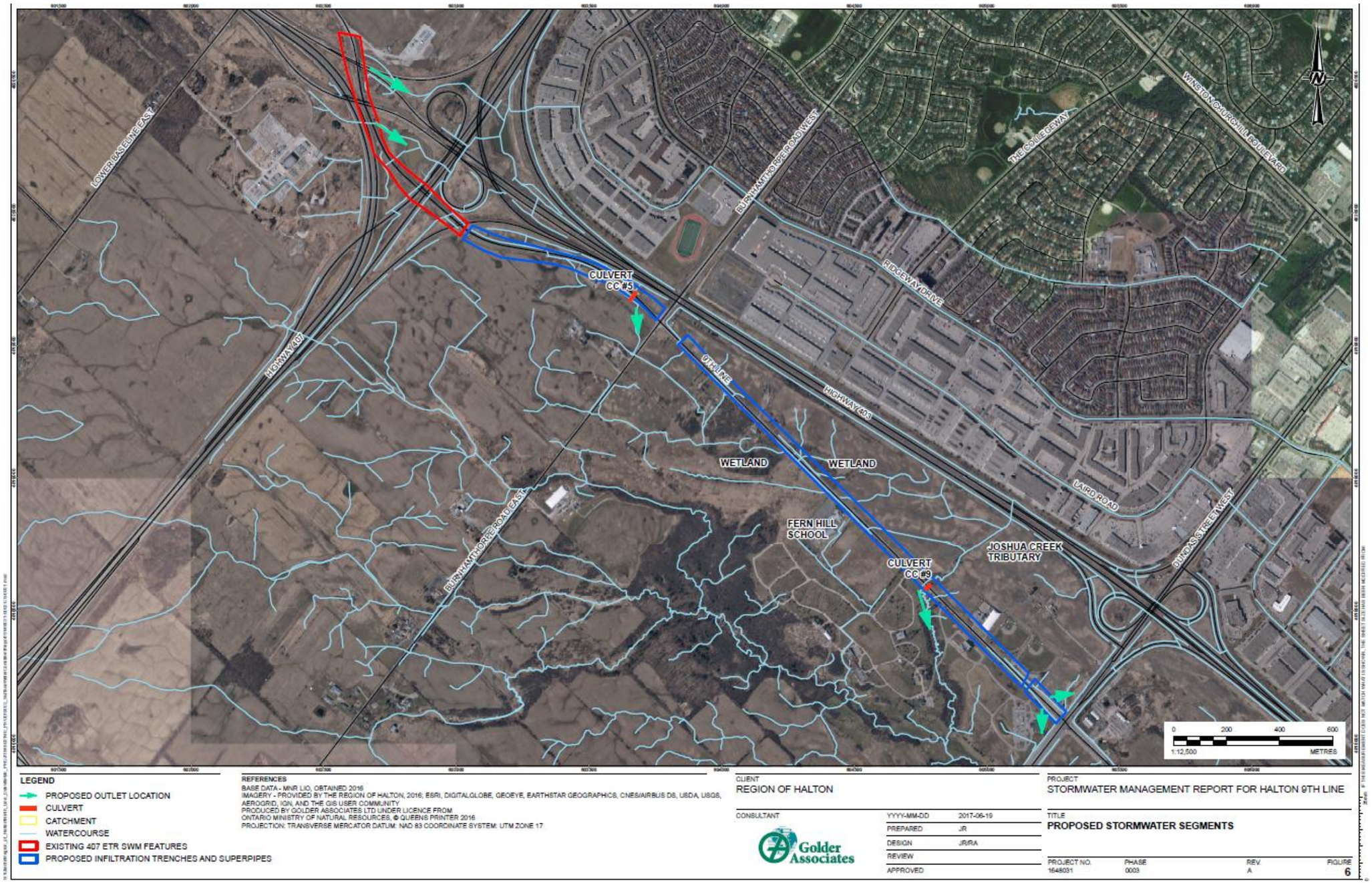

Figure 29: Stormwater Segments

7.5.3. Low Impact Development

Low impact development (LID) refers to systems and practices that use or mimic natural processes that result in the infiltration, evapotranspiration or use of stormwater in order to protect water quality. Both bioretention and infiltration trench systems were considered for the proposed stormwater system south of the 407 ETR. Both systems were discussed and modeled (along with stormwater pipe storage), and the discussion and results are presented below.

Bioretention Systems

The proposed bioretention system design follows the Credit Valley Conservation Authority's "Low Impact Development Stormwater Management Planning and Design Guide" (CVC, 2010). The system would occupy a 2 metre wide landscaped border between the curb and edge of the multi-use path or right-of-way boundary. Flows would enter the bioretention system either via sheet-flow from the outside portions of the right of way or via curb cuts along the road. A 0.3 metre deep surface storage area would be underlain with a 1.0 metre deep filter media containing vegetation plantings. This in turn would be underlain with a storage layer to allow any water passing through the filter layer to slowly seep out of the bioretention system. An overflow pipe with an opening set above the surface storage level would allow excess water to flow into a storm sewer system under the road. Seepage through the filter layer is assumed as 118.5 mm per hour (assuming a fine sand), and seepage from the bottom of the storage layer is assumed as 34 mm per hour, reflecting a conservative estimate of percolation for a silty clay soil (based on initial field results from the geotechnical investigations by Golder in 2017).

Infiltration Trench System

The proposed infiltration trench system design follows the same Credit Valley Guidelines (CVC, 2010). The system would occupy a maximum width of 2.4 metres however a portion or all of that width can lie under the multi-use pathway, allowing for implementation in a constrained right of way. In this system, runoff flow from the right of way would be directed towards catch basins along the curb on either side of the road; the catch basins would include a catch basin inset sediment trap providing pre-treatment of flows (to reduce sediment and clogging of the trench). A low flow would connect the pre-treated catch-basing flows to a perforated distribution pipe within the trench, and a high flow pipe also connected to the catch basin (with an invert below the top of the trench) would route flows into a storm sewer system under the road once the infiltration trench is full. The planned trench is 1.5 metre deep and filled with crushed gravel surrounded by a water-permeable geotextile. As with the bioretention feature, seepage from the bottom of the storage layer is assumed as 34 mm per hour.

LID Selection

The primary constraint for use of this system along Ninth Line is available space. A bioretention system requires 2 metres of landscaped area at the surface, however the preferred road option from the wetland south to Dundas Street was designed to limit property requirements and the disturbed footprint and thus does not allow for 2 metres of landscaped area between the road and the multi-use pathway. Furthermore, initial modelling in SWMM5 suggested that because of the percent of impervious surface in the right of way where there is room for bioretention (roughly 80% in these sections), the 0.3 metre storage depth above the filter layer would likely be unable to store/infiltrate sufficient runoff to achieve the NOCSS targets without significant downstream storage.

Bioretention systems were therefore not included in the proposed conceptual design. With the infiltration trench, the space constraint is lessened in that the system can be built underneath the

multiuse pathway. This allows the system to be built along most of the proposed road alignment south of 407 ETR.

In some areas however, the infiltration trench system could not be implemented, including at road crossing culverts (which cross the right of way and would intersect the trenches) and along the existing gas line west of Ninth Line. High groundwater levels may also affect operations of proposed infiltration trenches. Although preliminary results from geotechnical investigations (Golder, 2017) suggest that the groundwater level is below the proposed infiltration trenches (groundwater was encountered only at a single borehole, in a silty sand layer over 5 metres below ground surface), further testing during detailed design will be needed to confirm groundwater depth and percolation rates from the proposed trenches.

The lifespan of the proposed infiltration trench will be affected by the level pre-treatment of runoff from the ROW. The selection of a catch basin or inlet designs that will maximize the removal of trash and suspended sediment (that would otherwise clog the infiltration trench) will be an important consideration at the detailed design stage of the project. Furthermore, a plan for regular inspection, cleanout and maintenance of the inlets, sumps, and infiltration trenches should be described at the detailed design stage. The final design of the trenches will need to take into account life cycle costing for the system, including replacement of the trenches once they reach their design lifespan.

Superpipes

In addition to the preferred infiltration trench option discussed above, the proposed design would include large diameter storage pipes (‘superpipes’) to provide quantity control. These pipes would be located immediately upstream of the discharge points for the system:

- immediately upstream of the proposed outfall north of William Halton Parkway (CC#5),
- immediately upstream of the proposed outfall at the Joshua Creek Tributary (CC#9); and,
- immediately upstream of the proposed connection to the Dundas Street intersection storm sewer.

These pipes (show on Figure 30 to Figure 32) would be between 1200mm and 1800mm in diameter and include orifice plates at the discharge point to control peak flows. The orifice plates would be sized to limit the flow to the NOCSS targets for both the 1:100 year storm and Regional storm.

Modelling Results

Modelling in SWMM5 (shown in Table 28 below) suggests that the storage provided by infiltration trenches along each side of the road would likely be able to store/infiltrate sufficient runoff to achieve the NOCSS targets for both the 1:100 year and Regional storms with a storage superpipe included in the design. Additional measurements of in-situ infiltration at the proposed infiltration footprints, as well as assessment of the runoff and infiltration trenches with respect to groundwater quality and detailed hydraulic modelling of the inlet, conveyance, superpipe, and orifices will be conducted at the detailed design stage.

Table 28: Stormwater Management System Outfall Control

Outlet Location	Contributing Area (ha)	1:100 year Storm		Regional Storm	
		NOCSS Target Peak Discharge (m^3/s)	Model Result Peak Discharge (m^3/s)	NOCSS Target Peak Discharge (m^3/s)	Model Result Peak Discharge (m^3/s)
North of William Halton Parkway (at CC#5)	2.23	0.03	0.013	0.055	0.025
Joshua Creek Tributary (CC#9)	5.38	0.081	0.015	0.187	0.035
Dundas Street Storm Sewer	0.70	0.008	0.011	0.02	0.029

Conservation Halton requested that the superpipe design consider “storm stacking effect”, or the effect of back-to-back small storms. This was done by confirming the drain time of the superpipes for the 1:2 year storm event is less than 48 hours so that storage volume is available should a second 1:2 year storm occur immediately after the first storm. Results from the modelling suggest that the majority of the storm runoff is captured in the infiltration trenches and that the superpipe drain time is less than 48 hours at all three outlets (see Table 29 below). Additional design and assessment of the superpipe storage, discharge, and drain time will be conducted at the detailed design stage.

Table 29: Drawdown Time for 1:2yr Storm

Outlet Location	Drain Time for 1:2 Year Storm (hours)
North of William Halton Parkway (at CC#5)	30
Joshua Creek Tributary (CC#9)	25
Dundas Street Storm Sewer	24

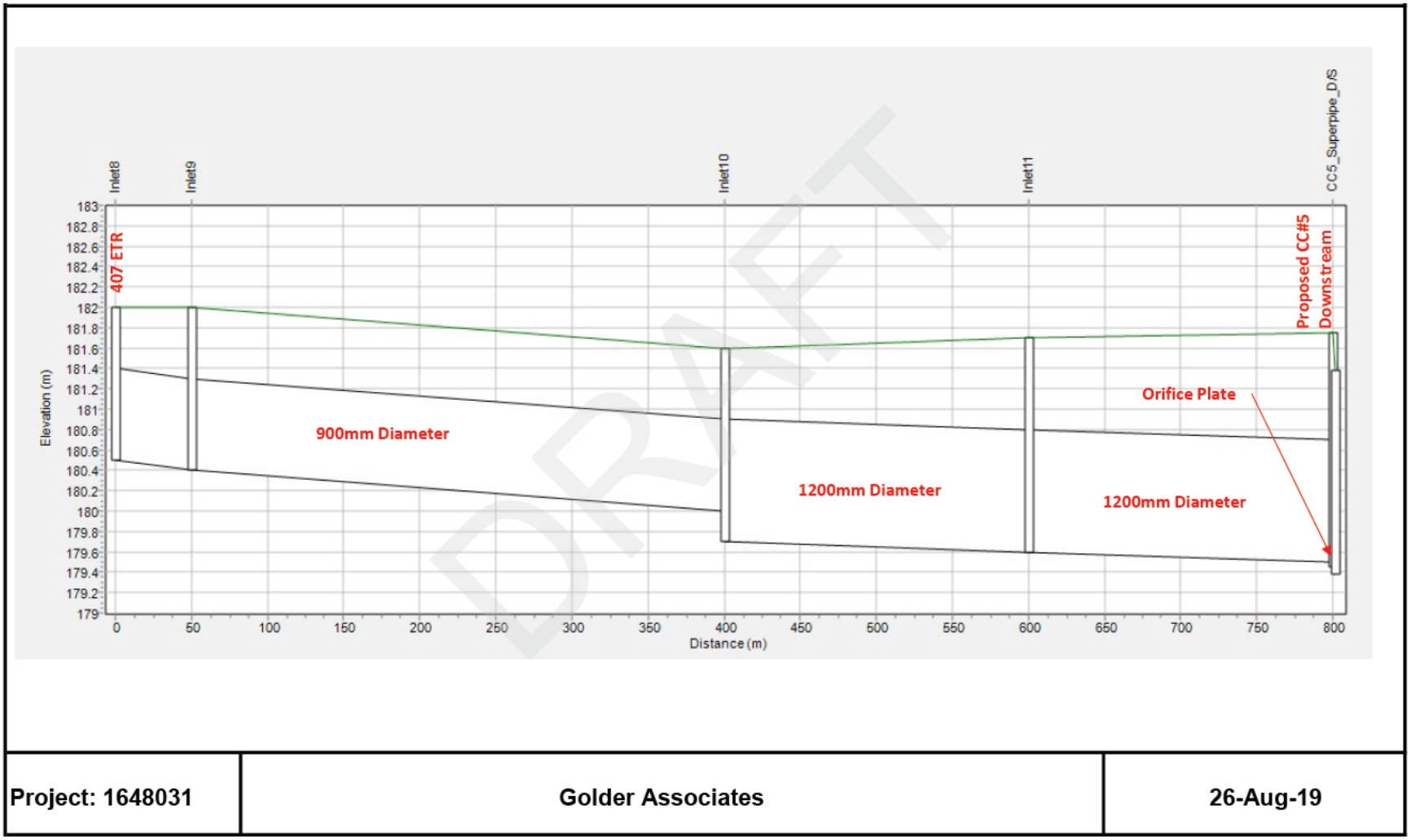

Figure 30: Proposed Storm Sewer Profile (1)

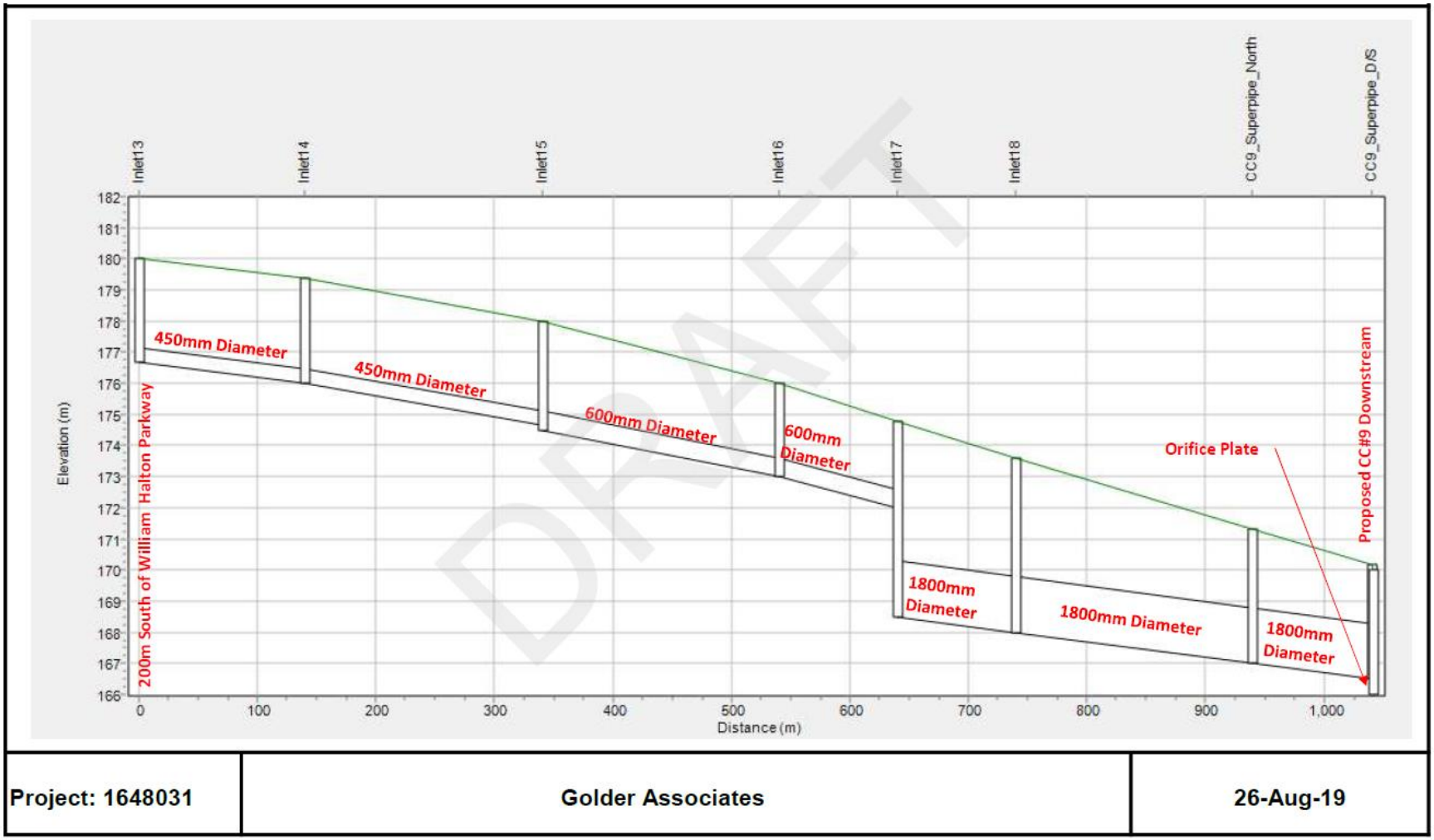

Figure 31: Proposed Storm Sewer Profile (2)

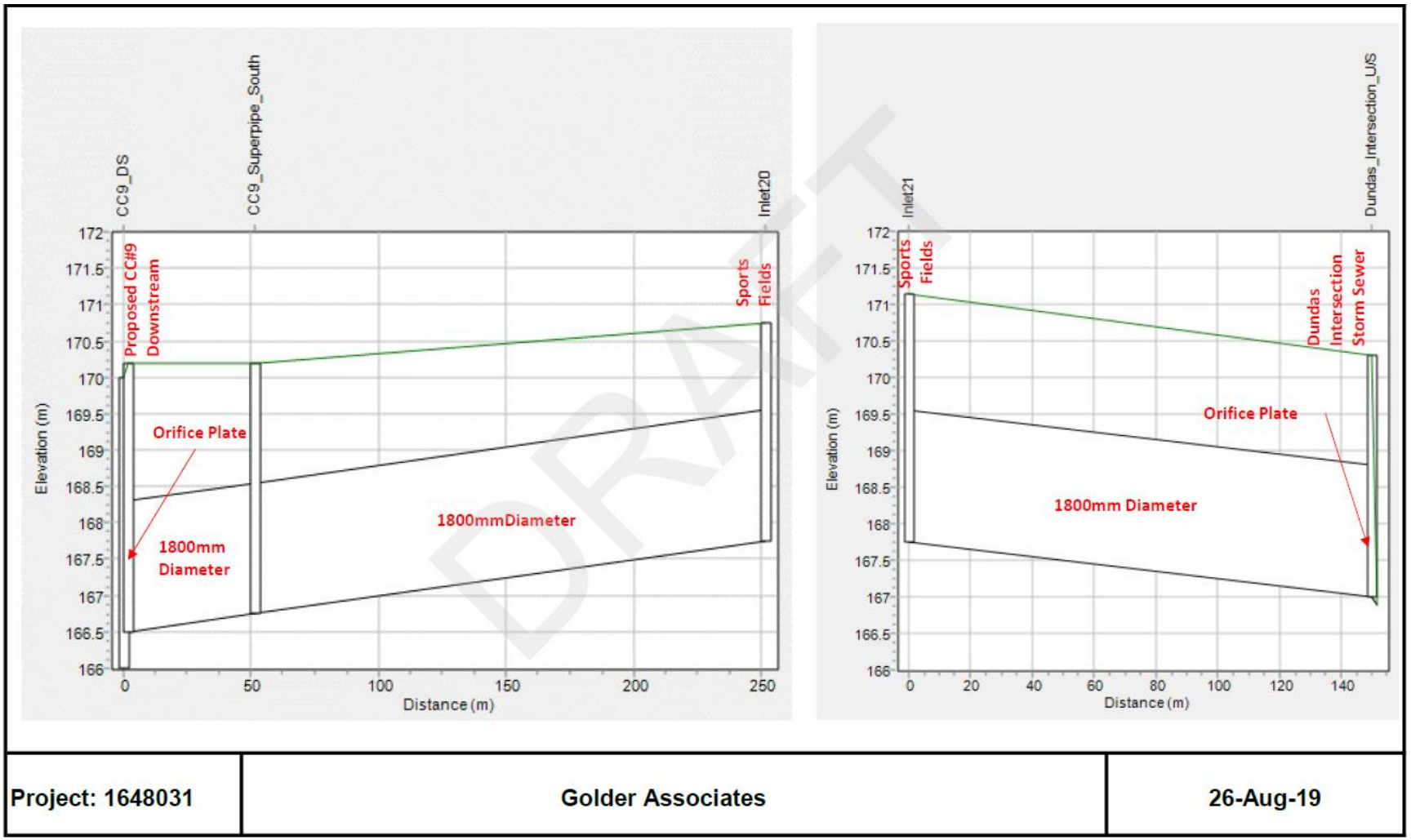

Figure 32: Proposed Storm Sewer Profile (3)

7.5.4. Water Quality

Conservation Halton requested a discussion of how the proposed conceptual design will affect water quality. The comments provided note Total Suspended Solids (TSS), Total Phosphorus (TP), and Temperature as parameters of interest.

A preliminary assessment of the proposed conceptual design suggests the following:

- Total Suspended Solids: There is no removal of TSS from road runoff before it reaches the roadside ditches in the existing condition. In the proposed condition, removal of suspended sediments is expected to occur in both the catch basin inserts (proposed for all catch basins) and the infiltration trenches, with no further removal of TSS expected in the superpipes. The CVC LID Design Guide (CVC, 2010) does not provide guidance for catch basins inserts, however Table 4.4.3 of the Guide suggests a TSS removal of approximately 80% for an infiltration system.
- Total Phosphorus: There is no removal of TP from road runoff before it reaches the roadside ditches in the existing condition. In the proposed condition, removal of TP is expected to occur in the infiltration trenches, with no further removal of TP expected from either the catch basin inserts or the superpipes. Table 4.4.3 of the CVC LID Design Guide (CVC, 2010) suggests a total phosphorus removal of approximately 80% for an infiltration system.
- Temperature: There is no measures to control temperature of road runoff before it reaches the roadside ditches in the existing condition. In the proposed condition, the infiltration trenches and superpipes are expected to result in some reduction of temperature as the soils absorb some heat from the water. The infiltrated water would also not discharge to the surface water

7.5.5. Future Technological Improvements

Construction for the Ninth Line corridor is not scheduled until 2025 and therefore it is possible that ongoing evolution of stormwater management and low impact development may result in new technologies and best management practices becoming available prior to the detailed design phase. These advances may include improved materials, construction methods, and monitoring capabilities, as well as new cost-effective solutions for improving water quality and tailored filtration media. In particular, improvements in water quality treatment at stormwater inlets may serve to extend the life of the system by removing additional sediment before it enters the infiltration trenches. The future detailed design phase of this project is to include a review of currently available stormwater management technologies and, if more appropriate methods are available, update of the approach presented here.

7.5.6. External Drainage

Crossing Culverts

A culvert sizing exercise was undertaken for the overtopping culverts to determine required sizing given the widened roadway. This analysis used the HEC-RAS models previously developed for assessing the existing culverts and required culverts lengths.

Figure 33 illustrates the proposed culverts within the study area. The following culverts require replacement as part of the Ninth Line Corridor improvements:

Crossing Culvert CC#4

Culvert CC#4, located 350 metres south of the Highway 407 interchange, is to be replaced as part of that proposed work. Modelling for the crossing suggests a new culvert should be a minimum 1200 mm diameter concrete pipe with a length of 46 metres to both span the right of way and pass the 1:100 year and Regional storm peak flows without overtopping. As with the existing culvert, the replacement culvert would discharge to a swale on the west side of Ninth Line, leading southwest towards the downstream end of Culvert CC#5.

Crossing Culvert CC#5

Culvert CC#5, located 140 metres north of the William Halton Parkway roundabout, is to be replaced as part of that proposed work. Modelling for the crossing suggests a new culvert should be a minimum 1200 mm diameter concrete pipe with a length of 50.5 metres to both span the right of way and pass the 1:100 year and Regional storm peak flows without overtopping. As with the existing culvert, the replacement culvert would discharge to a swale on the west side of Ninth Line, leading southwest along William Halton Parkway.

Crossing Culvert #6

Culvert CC#6, located 400 metres south of the William Halton Parkway roundabout, is to be replaced as part of that proposed work. Modelling for the crossing suggests a new culvert should be a minimum twin 900 mm diameter concrete pipes with a length of 43 metres to both span the right of way and pass the 1:100 year and Regional storm peak flows without overtopping. As with the existing culvert, the replacement culverts would discharge to an existing swale on the west side of Ninth Line, flowing west towards the wetland feature.

Wetland Culvert CC#7

During a field visit in summer 2016, Conservation Halton staff noted that the culvert at the wetland (CC#7), which was suggested to convey flows between the two wetland segments on either side of the road, was actually 40 metres south of the expected position linking the two wetland sections. Conservation Halton expressed support for constructing the proposed replacement culvert north of the existing location to connect the two wetland sections. Conservation Halton also expressed an interest in seeing the culvert height increased to provide wildlife passage between the wetland segments and suggested the use of a concrete box culvert (as opposed to a CSP pipe at the wetland) with an internal dry bench structure. This would include a 0.5 metre wide area of soil material raised 0.3 metres above the culvert invert adjacent to the wall of the culvert. An appropriate height at this location would be 0.9 metres (0.3 metre bench and 0.6 m clearance) for passage of small mammals such as skunks and raccoons, and amphibians and reptiles such as snakes and frogs. The proposed box culvert height was therefore maintained as 1.0 metre as per the sizing recommendation. This will require raising the road profile through the wetland area, requiring retaining walls along the road through the wetland. Retaining walls are considered preferable in this case to grassed fill slopes falling away to either side of the road, which would result in additional wetland encroachment.

Modelling for the crossing with the proposed bench suggests the new culvert should be a minimum 3.0 metres wide by 1.0 metre tall open-bottom concrete box with a length of 45 metres to both span the right of way and pass the 1:100 year and Regional storm peak flows without overtopping. As noted by Conservation Halton, the proposed culvert would be slightly north of the existing culvert to be more in-line with the wetland location.

Wetland Outflow Culvert CC#8

The topographic survey showed the highpoint of the ditch south of the wetland on the east side to be 174.42 metres above sea level (masl) (20 metres south of existing Culvert CC#7), while the high point of the ditch on the east side is shown as 175.38 masl (75 metres south of existing

Culvert CC#7). This, along with the observed cattails in the ditch to the west of the road and the 900 mm diameter driveway culverts at the Fern Hill School (170 metres south of Culvert CC#7) in an area where the adjacent land generally drains away from the road (i.e., less runoff to the ditch), suggests that the wetland outflow generally follows the west ditch south from the wetland, through the 900 mm.

The preferred road design includes a narrow right-of-way cross-section designed to minimize property impacts at the Fern Hill School, as well as wetland impacts to the east of the road. The preferred design calls for the construction of a new crossing culvert immediately north of the school. This new culvert further reduces the footprint of the road in this area.

- The proposed culvert would be a 3 metre wide by 1.5 metre tall open bottom concrete box culvert, with a length of 45 metres and a 0.6% slope, crossing Ninth Line immediately north of the school. The low height of the culvert is intended to limit changes to the vertical alignment of the road at this location. The culvert itself is designed to pass the 8.17 m^3/s peak flow expected for the existing CC#8 (which includes the flow from the wetland). Both existing and proposed crossing culverts connect roadside ditches; since these are not natural channels, there is no meander belt requirement to be met with the proposed culvert width.
- The upstream end (west side) of the culvert would be linked to the wetland (at approximately the proposed location for Culvert CC#7) by a 200 metre long, 0.5 metre wide trapezoidal swale with 3:1 side slopes and a longitudinal slope between 0.5% and 2%.
- The downstream end of the culvert (east side) would be linked to the existing drainage ditch away from the road at the existing Culvert CC#8 by a 200 metre long, 0.5 metre wide trapezoidal swale with 3:1 side slopes and a 0.5% slope.

With the wetland outflow diverted north of the school, and runoff from the school itself is shown to drain away from the road (based on the Region catchments), a 5 hectare area between the school and the existing CC#8 crossing (largely a portion of the soccer field south of the school) would now drain to the Ninth Line roadside ditch and ultimately south toward the downstream end of the Joshua Creek CC#9 culvert (Figure 33). The proposed catchment to CC#8 without this 5 hectare portion was modelled using the previously-created Regional storm SWMM5 hydrologic model, and the results suggest that there would be an approximate 1.5 m^3/s decrease in peak flow during the Regional storm event (from 8.96 m^3/s to 7.46 m^3/s, or a 17% decrease). Ultimately, the proposed 3 metre by 1.5 metre concrete box culvert was found to pass either of the peak flows without overtopping the road.

Joshua Creek Tributary Culvert CC#9 and CC#10

Natural Heritage field investigations identified the Joshua Creek Tributary crossing Culvert CC#9 as barn swallow habitat based on the presence of barn swallow nests in the culvert. Based on the MNRF “threatened” designation for Barn Swallows, additional alternatives for extending or replacing CC#9 were considered. These included:

- Option 1: Cleanout and Extension: Cleanout of 0.1 metres of sediment from the existing 1.9 metre x 1.1 metre concrete box culvert and extension as required by the road widening.
- Option 2: Extension and Overflow Culvert: Cleanout and extension of the existing 1.9 metre x 1.1 metre concrete box culvert, twinned with an additional 2.4 mete x 1.2 metre open bottom concrete box culvert to provide additional capacity and barn swallow nesting habitat.

- Option 3: Replacement: Replacement of the existing culvert with a 4.0 metre x 1.2 metre open bottom concrete box culvert which would provide replacement capacity and barn swallow nesting habitat.

It was noted that an increase in elevation of the road in that area was being forced by the proposed CC#10, which has a proposed obvert of 169.9 masl (compared to the proposed obvert of CC#9, which is 168.7 masl). It has therefore been proposed to eliminate CC#10, route the additional flow through a roadside ditch to the upstream face of the proposed CC#9, and increase the width of the proposed CC#9 culvert to pass the flows. The previously-created Regional storm SWMM5 model was used to model the effect of both the decrease in catchment to CC#8 (which is upstream and connected to CC#9 in the model) and the diverted flow from CC#10 to the upstream end of CC#9; the result was a peak flow of 12.51 m^3/s at CC#9 (down 0.44 m^3/s or 3% from the existing condition).

Results from the modelling are shown in Table 30 below; they suggest that:

- The Option 1 cleanout and extension of the existing culvert is not sufficient to pass the flow without overtopping the road; and
- The proposed Options 2: Overflow Culvert and Option 3: Replacement provide sufficient capacity to pass the peak flows.

Table 30: Joshua Creek Tributary Culvert Modeling Results

Scenario	Culvert Length (m)	Culvert Opening Size	Estimated Upstream Water Level (m)	Overtopping Road during Regional Flow
Option 1: Culvert Cleanout and Extension	36.5	1.9 m x 1.1 m	170.87	Yes
Option 1: Culvert Cleanout and Extension	36.5	1.9 m x 1.1 m 2.4 m x 1.2 m	169.07	No
Option 3: Culvert Replacement	36.5	4.0 m x 1.2 m	169.08	No

Based on hydraulics and ease of construction, as well as the Conservation Halton request to provide a culvert 3 times the bankfull width (where the bankfull width is shown as between 0.5 metres and 1 metre downstream of the existing culvert in the fluvial geomorphology assessment), Option 3: Culvert Replacement is suggested as the preferred option for Culvert CC#9 in the proposed condition. This option is expected to provide sufficient hydraulic capacity and replacement barn swallow habitat.

The results of the culvert sizing analysis (Table 31) suggest significant increases in culvert size would be required to convey the peak design flow rate.

Table 31: Capacity Assessment of Proposed Culverts

Element ID	Estimated Design Flow Rate ($\frac{m^3}{s}$)	Optimized Culvert Dimensions (mm)	Estimated Upstream Water Level (m)	Overtopping Road
CC#4	2.16	Circular 1,200	181.6	No
CC#5	2.45	Circular 900	181.38	No
CC#6	1.70	2 x Circular 900	179.11	No
CC#7	3.32	Open Bottom Concrete Box 3,000 x 1,000	176.04	No
CC#8	7.46	Open Bottom Concrete Box 3,000 x 1,000	174.51	No
CC#9	12.51	Open Bottom Concrete Box 4,000 x 1,200	169.08	No

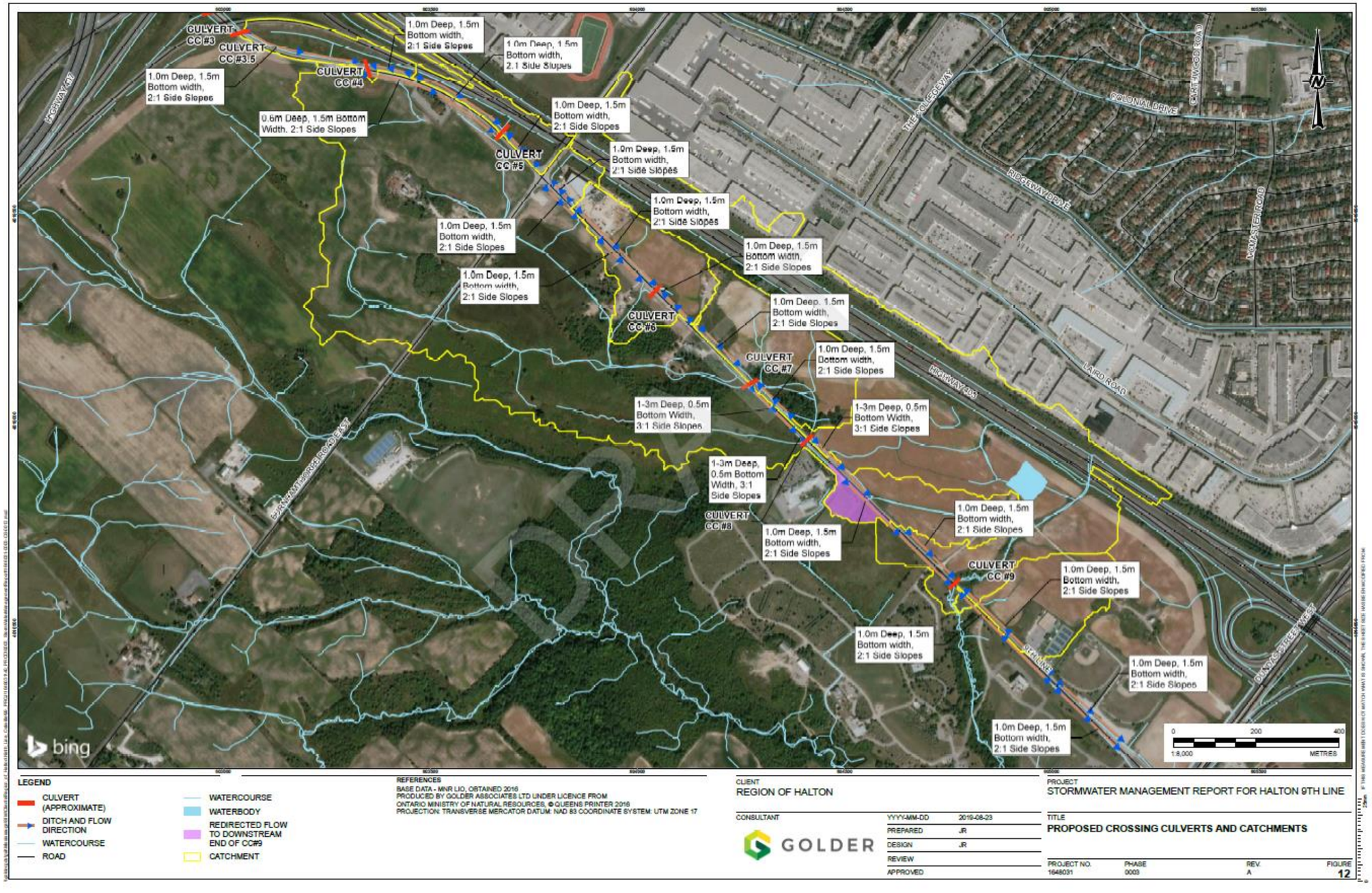

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Figure 33: Proposed Crossing Culverts and Catchments

Upstream Water Levels

In additional comments provided for the project, Conservation Halton has requested a detailed review to assess any increases in flood elevation or velocity on privately owned properties resulting from the new road construction.

In order to address that concern, the differences in the modeled upstream water levels at each of the crossing culverts is shown in Table 32 below.

- With the exception of Culvert CC#8, they show the water level during the peak flow event dropping by between 0.24 metres and 0.9 metres, suggesting the proposed crossing culverts will result in lower water levels and reduced risk of flooding compared to the existing culverts. This is largely the result of the increase in culvert sizes associated with the proposed condition and the fact that the larger culverts no longer result in overtopping of the road during the peak flow.
- Additionally, although Culvert CC#8 shows an increase in water level of 0.14 metres, the location of the culvert has been moved roughly 200 metres north of its current location. Based on the modelling, the peak water level at the proposed culvert location is contained within the proposed ditch running south from the wetland.

Table 32: Upstream Water Levels

Element ID	Estimated Upstream Water Level (m)	
	Existing Condition	Proposed Condition
CC#4	181.32	181.08
CC#5	181.74	181.38
CC#6	179.88	179.11
CC#7	176.45	176.04
CC#8	174.37	174.51
CC#9	**169.98**	**169.08**

Additional detailed hydraulic modelling of the crossing culverts to confirm upstream water levels, velocities, and flooding impacts will be conducted at the detailed design stage.

Ditches to Convey External Drainage

The existing road is generally flanked on either side by ditches, which convey both right-of-way and external drainage. While the proposed 39 metre wide urban cross-section includes a storm sewer system to convey the right-of-way runoff, ditching at the edge of the proposed right-of-way, will be required to convey any areas draining toward the proposed road. These ditches will be located within the right-of-way.

Preliminary sizing of the ditching was conducted to estimate the area contributing surface runoff towards the right-of-way.

- In areas where the ditches are only intercepting sheet flow from adjacent land area, the proposed ditch size would be a 1.0 metre deep trapezoidal ditch with a 0.5 metre bottom width and 2:1 side slopes.
- Between CC#4 and CC#5, the proposed ditch would need to convey the flow discharging from CC#4, and the proposed ditch was increased to 1 metre deep with a

1.5 metre bottom width. A discussion at detailed design will determine where it is possible to convert part of this ditch to a pipe system.

- The proposed ditch connecting the wetland to the proposed CC#8 and beyond, a trapezoidal channel up to 3.0 metre deep was proposed, with a 0.5 metre bottom width and 3:1 side slopes.

The preliminary ditch sizing is shown in Figure 34.

Conservation Halton requested that roadside ditches be converted into enhanced ditches. These are vegetated ditches where the runoff from the 25 mm design storm does not exceed 100 mm deep, or 2/3 the height of the tallest vegetation in the ditch. Preliminary modelling of the 25 mm design storm flows for the conceptual ditches was carried out in SWMM5 for the intercepting ditches upstream of crossing culverts which, as well the ditches between CC#4 and CC#5 and upstream and downstream of CC#8. Other ditches were not modeled as the assumed catchment area for these ditches (where land generally appears to drain away from the road) was assumed to be negligible. Results suggest that;

- The smaller catchments contributing to the intercepting ditches (typically less than 3 hectares per ditch) and correspondingly lower peak flows (maximum of 0.17 m^3/s) allow the intercepting ditches to meet the target of 100 mm maximum flow depth during the 25 mm design storm event.
- The ditch between CC#4 and CC#5 results in a peak flow of 0.048 m^3/s, however the relatively low slope of the ditch (less than 0.1% based on existing topography) results in a peak flow depth of 0.19 metres. This ditch may still meet the criteria for an enhanced swale based on the ultimate height of the vegetation in the ditch.
- The significantly larger contributing catchments to the ditches upstream and downstream of CC#8 (73.2 hectares) results in a correspondingly higher peak flow compared to other ditches (0.4 m^3/s). Consequently, the peak ditch flow depth is higher in this ditch (0.20 metres) compared to other ditches. The larger flow and backwater from the channel downstream of this ditch (which crosses private property east of Ninth Line) is expected to make meeting the 0.1 metres flow depth target difficult for this ditch

It should be noted that in all of these cases, the flow to the ditch is almost entirely from privately-owned land in adjacent catchments (which currently flows via sheet flow towards Ninth Line), and not from the proposed right-of-way (which would drain internally to the stormwater management system and be treated by the infiltration trenches and superpipe systems). Any additional treatment provided by enhanced ditches would therefore apply to runoff from these privately-owned adjacent lands, not the right-of-way runoff (which for the most part does not flow through these 19 ditches). Future development of these adjacent privately-owned lands in the future would likely require on-site quality control for their own runoff, superseding the effect of the enhanced ditches.

The proposed design is expected to meet the requirements of the NOCSS, Halton Region, Conservation Halton, and MNRF. It incorporates the existing SWM features at the 407 ETR interchange, while proposing new features including infiltration trenches, storm sewers for conveyance and storage, a realigned culvert at the wetland designed for animal passage, and a Joshua Creek tributary culvert to provide replacement SAR habitat. Several issues remain to be determined during detailed design, including confirming design of SWM features at the 407 ETR interchange and their ability to receive additional flows from Ninth Line, and delineation of the full extent of infiltration trenches with respect to percolation testing and service locates.

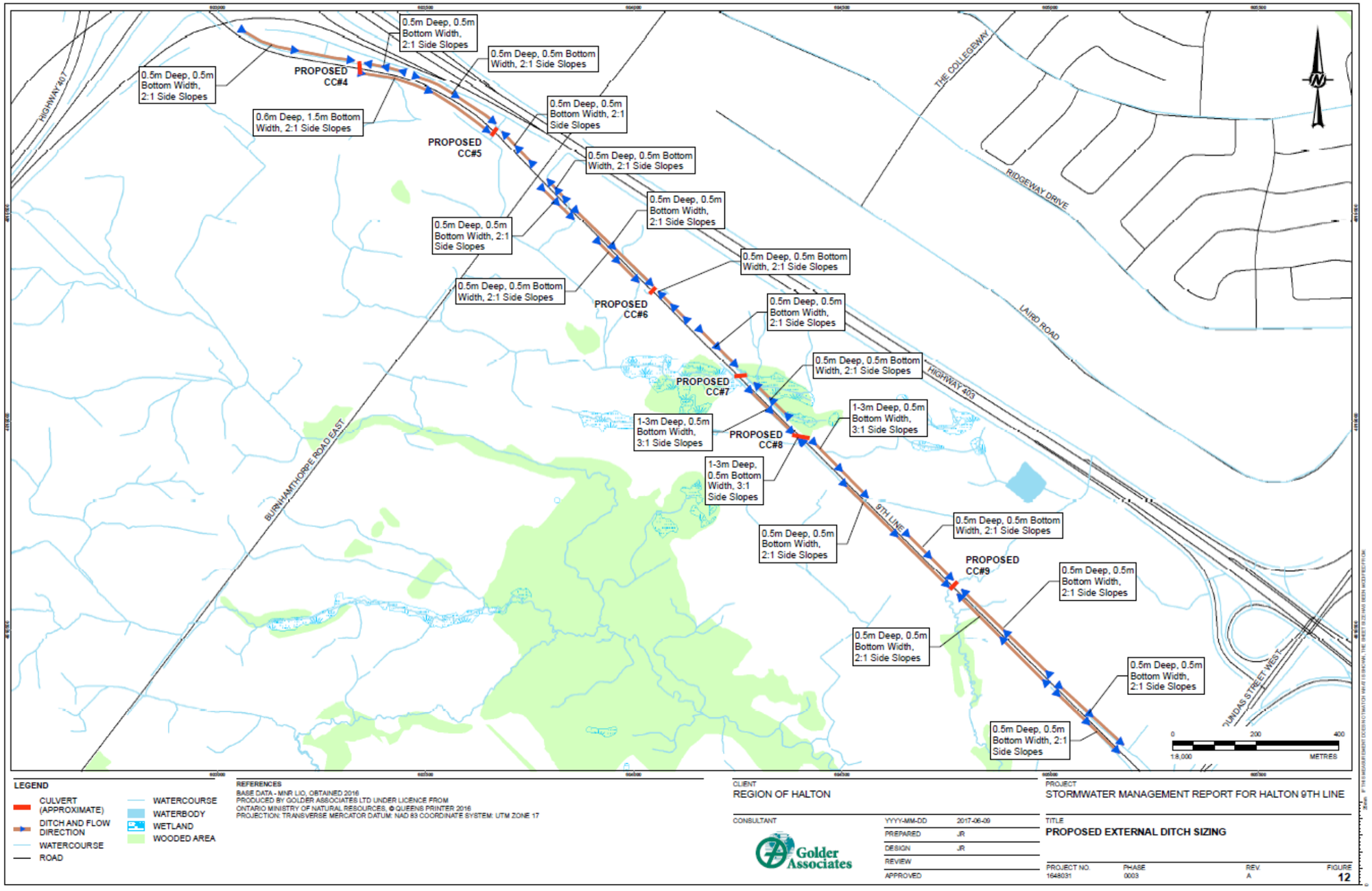

Figure 34: Proposed External Ditching

7.6. Noise Analysis

A noise assessment was carried out as part of the Ninth Line MCEA Study with reference to the Ontario Ministry of Transportation (MTO)/Ministry of the Environment and Climate Change (MECP) Noise Protocol and the Halton Region Noise Abatement Policy. A copy of the Noise Assessment can be found in Appendix L.

The MTO/MECP Noise Protocol requires a comparison of future noise level with and without the proposed road improvement adjacent to a Noise Sensitive Area (NSA). A NSA is a noise sensitive land use within an outdoor living area, which includes single-family houses (typically back yard), townhouses (typically back yard), multiple unit buildings such as apartments with outdoor living areas for use by all occupants, as well as hospitals and nursing homes, with outdoor living areas for the patients. MECP uses the 16-hour period between 7 AM and 11 PM for the assessment of municipal roadway noise. The noise at any one instant may be higher or lower than the 16-hour average.

The provision of noise mitigation is to be investigated if the future noise level with the proposed improvements result in a greater than 5 dBA increase over the future noise level without the proposed improvements. If noise mitigation is provided, the objective is a minimum 5 dBA reduction. Mitigation will attempt to achieve levels as close to, or lower than, the objective level as is technically, economically and administratively feasible. The MECP/MTO Noise Mitigation Criteria is listed in Table 33.

Table 33 : MECP/MTO Noise Mitigation Criteria

Change in Noise Level	Mitigation Effort
0-5 dBA	Consideration of noise mitigation measures not required
>5 dBA	Investigate noise control measures on right-of-way Noise control measures where introduced, should achieve a minimum of 5 dBA attenuation, over first row receivers Mitigation to ambient, as administratively, economically and technically feasible

Halton Region's Noise Guidelines indicate that Existing Noise Sensitive Areas (NSA's) that are exposed to high noise levels due to their proximity to a Regional noise source, such as a Regional Road, should receive consideration for retrofitting of noise attenuation measures. Points of Reception (PORs) are residential noise sensitive areas, situated along a Regional surface transportation corridor, which may be subject to an "unacceptable" sound level. The following land uses, with outdoor living areas (OLAs) associated with them would be considered points of reception under the above criteria:

- Private homes such as single family residences;
- Townhouses
- Multiple unit buildings, such as apartments with OLA's for use by all occupants;

The land uses listed below, by themselves, do not qualify as points of reception:

- Apartment balconies above ground floor

- Educational facilities (except dormitories with OLA's)
- Churches
- Cemeteries
- Public / Private Parks and picnic areas
- Day care centres
- All commercial areas, and
- All industrial areas.

Noise modelling was carried out for four (4) receiver locations (noise sensitive area) identified throughout the Ninth Line corridor between Dundas Street and 407ETR; these are private residential houses located adjacent to Ninth Line.

As illustrated in Table 34, the project will not result in an increase of greater than five (5) dBA, in accordance with the Region's Guidelines; the consideration of mitigation is not further warranted. Further, due to the proximity of the Project corridor, POR04 is the only identified POR with expected future noise levels marginally above 60 dBA.

Table 34: Predicted Noise Levels

Receptor	Daytime Outdoor Noise Level (dBA) for 2017	Predicted Daytime Outdoor Noise Level (dBA) for 2031	Change in Noise Level (dB)	Warrants the Consideration of Mitigation
POR01	46	47	1	No
POR02	56	58	2	No
POR03	53	55	2	No
POR04	59	61	2	No

7.7. Air Quality

An Air Quality Assessment was conducted as part of this study and the Air Quality Report can be found in Appendix M. The primary air quality criteria used for this assessment are the Ministry of Environment, Conservation and Parks guidelines. Where provincial standards are not available, federal standards were used including the Canadian Ambient Air Quality Standards and the National Ambient Air Quality Objectives.

The results of the Air Quality Assessment include the following:

- Levels of particulate matter are shown to be below current standards and guidelines
- The transportation corridor improvements on Ninth Line result in a 33% change in emissions from existing conditions, however contributions to air quality from the project are small compared to emissions from other large roadways that are located close to the study area such as Highway 403 and 407ETR (within 1 kilometer of the study area).
- Highway 403 and 407ETR are the largest sources of road emissions in the immediate surrounding area each with daily traffic approximately 5 times greater than the study area.

The transportation corridor improvements are therefore anticipated to be a relative minor source when compared to other large sources within the area, therefore the impact on overall air quality in the region is expected to be negligible, and no mitigation is required.

7.8. Cultural Environment

7.8.1. Built Heritage Resources

A Heritage Impact Assessment was completed as part of this study and the Heritage Impact Assessment Report can be found in Appendix G. Details regarding the Built Heritage Resources (BHRs) identified within the study area can be found in Section 3.6.

Based on an evaluation of the potential direct and indirect impacts of the proposed improvements to the study corridor, it is concluded that the undertakings will have negligible impacts on these properties given the setback from the right-of-way. Therefore, no conservation or mitigation measures are required.

7.8.2. Archaeological Resources

A Stage 1 Archaeological Assessment was completed as part of this study and the Stage 1 Archaeological Assessment Report can be found in Appendix H. As discussed in Section 3.7.2, the Stage 1 Archaeological Assessment was completed in accordance with Ministry of Tourism, Culture and Sport (MTCS) guidelines. The Assessment found potential for the recovery of pre-contact and post-contact Aboriginal and historical Euro-Canadian archaeological resources within the study area. Based on these findings, it is recommended that portions of the study area that were identified as poorly drained or previously disturbed, do not exhibit archaeological potential and no further archaeological assessment of these areas is required. All remaining portions of the study area with archaeological potential, are recommended for a Stage 2 Archaeological Assessment (test pit survey or pedestrian survey) prior to ground disturbance associated with any future development.

7.9. Natural Environment

7.9.1. Significant Natural Features

As discussed in Section 5.2, the preferred design for the north section of Ninth Line presents a mitigated cross-section in order to reduce impacts to the Ministry of Transportation structures and to avoid reconstruction. The preferred design for the south section is also mitigated at critical locations in order to reduce property impacts and minimize/mitigate impact to the natural environment.

The following are natural environment considerations associated with the recommended plan:

- Mitigate encroachment into the North Oakville-Milton East Wetland Provincially Significant Wetland (PSW) with reduced boulevards widths in this section (1080 m^2).
- Mitigate intrusion into woodlands and wetland associated with wildlife habitat through the mitigated right-of-way.
- Mitigate encroachment into PSW to reduce impact to native and wetland vegetation. A higher density of native and wetland plants are present in the PSW.

- Minimize intrusion into Species at Risk habitat. Construction timing restrictions and safe harbor habitat can further reduce potential for impact.
- Reduce amount of channel realignment though use of retaining walls at Joshua's Creek (to mitigate downstream erosion).

7.9.2. Protecting Existing Vegetation

The following sections of Ninth Line provide an opportunity for boulevard landscaping consisting of shrubs and small trees where space permits:

- The east boulevard between the MTO structures in the north section;
- The east and west boulevards between the wetland and William Halton Parkway; and
- The west boulevards between the wetland and Dundas Street.

Boulevard landscaping will be provided on Ninth Line in conjunction with the road improvements.

A detailed landscaping plan will be developed during the detailed design phase of the study. In the locations noted above, the landscaping plan will improve the overall aesthetics of the road corridor and provide a safe, pedestrian friendly environment. Where feasible, a tree replacement plan for any displaced trees will be provided as part of the landscaping plan.

Mature trees, wetlands, cultural plantations, and woodlots adjacent to and along the length of a corridor contribute to the visual character of an area and add to its cultural landscape value. As discussed in section 3.3.1, there are existing natural features along Ninth Line including several provincially significant wetlands as part of the North Oakville-Milton East Wetland Complex.

The following considerations should be explored to protect the existing vegetation:

- Grading should be minimized near existing trees and vegetation communities where possible, particularly where retaining the existing character of the landscape is most important.
- Using protective fencing to minimize disturbance during construction.
- Establishing dense buffer plantings with groups of native trees and shrubs along the new edge to increase shade and reduce wind.
- Selecting species that will introduce habitat opportunities and enhance landscape connectivity.

7.9.3. Opportunities for Enhancements to Corridor Vegetation

All enhancement plantings should be native or non-invasive, hardy, drought-tolerant species and be restricted to the road right of way. Planting layout should consider:

- denser screenings at locations where residential units abut the roadway;
- filtered views where commercial units are facing the streets; and
- open views to maximize vistas where there is high scenic quality.

7.9.4. Landscape Plantings

Plant selection for enhancement and infill planting should provide seasonal interest. Street trees within the area designated as high density should be planted with regularity along the length of the corridor where context permits. Approaching intersections, ornamental trees can be planted closer together to provide a sense of arrival.

Selection of proposed plantings should reflect changing climate conditions and therefore should consider resistance to drought and winter ice storms. Plant materials currently at the southern limit of their natural range should be avoided.

Boulevards play an important role in defining the streetscape, providing an element of continuity and allowing an area for street trees and other vegetation to grow, further enhancing the street. The boulevard provides an element of continuity to the streetscape and also offers an area for street trees and other vegetation to grow, further enhancing the street. Maintaining street trees and other ornamental plantings within the boulevard is a continuous challenge due to the harsh nature of this environment. An appropriate clearance from street to concrete sidewalk or pathway should be provided for snow storage, and salt resistant plants can be proposed within the road allowance.

Future development should be encouraged to provide additional trees on the private side of the property line to contributing to a more aesthetic streetscape.

Further key considerations for enhancing the boulevard should include:

- Use ornamental tree species under hydro lines; and
- Use a broad selection of urban-resilient species to ensure biodiversity.

7.9.5. Species at Risk

As discussed in Section 7.5.6, three options for CC#9 were considered for extending or replacing the culvert. Based on the evaluation, a replacement of CC#9 is recommended. The recommended culvert will provide replacement barn swallow habitat.

7.10. Utilities

There are a number of existing utilities located in the study area as discussed in Section 3.9 and shown on the Existing Utilities Plan in Appendix I including Enbridge, Oakville Hydro and TransCanada Pipeline.

A relocation of the aerial hydro is proposed to accommodate the preferred alternative and the widening of Ninth Line. Further consultation with Oakville Hydro and Conservation Halton was necessary to review the impacts of the proposed hydro relocations at Joshua Creek tributary and North Oakville-Milton East Wetland Provincially Significant Wetland.

In consultation with Conservation Halton and Oakville Hydro, it was determined that the hydro facility will be relocated on the east side of Ninth Line. At the retaining wall locations, the hydro facility is proposed to be located between the road and retaining wall. As a result, the retaining wall at Joshua Creek tributary will be shifted an additional 2 metres easterly. The relocation of the aerial hydro will be reviewed with Oakville Hydro and Conservation Halton during detailed design.

At locations chainage 2+180 through 2+840 and chainage 3+940, the Enbridge (formerly Union Gas) facilities will be located under the roadway as a result of the proposed widening. A relocation of the facility to the boulevard will be reviewed at detailed design. Where clearance between the facility and the road surface is not sufficient to avoid impacts, the facility will be protected during construction activities.

Additionally, Enbridge and TransCanada Pipeline facilities will be protected during construction activities as no conflicts with the proposed improvements are expected.

Conflicts and the extent of relocation required will be revisited and investigated in further detail during detailed design in consultation with utility agencies.

7.11. Illumination

It is proposed that Ninth Line be illuminated in accordance with Halton Region standards.

7.12. Property Requirements

As discussed in Section 2.1.2, the TMP recommends a 35m right-of-way and an urban cross-section for Ninth Line. The proposed right-of-way for the widened south section of Ninth Line between Dundas Street and William Halton Parkway varies from 35.1 metres to 48.2 metres. The extended right-of-way beyond 35 metres is required in select locations to accommodate drainage features such as swales and hydro relocations.

No property is required within the north section of Ninth Line to accommodate the proposed widening.

Preliminary proposed property impacts are shown in Plates 1 - 22 in Appendix J. The property requirements are subject to further review and confirmation during detailed design. The approximate property requirements for privately and publicly owned property are summarized in Table 35.

Table 35: Preliminary Property Requirements

Location	Preliminary Property Requirement (m^2)
3000 Ninth Line	705
3855 Dundas Street	280
3115 Ninth Line	2355
3164 Ninth Line	1775
3091 Ninth Line	7215
3093 Ninth Line	2315
3300 Ninth Line	330
Hydro One Corridor	6405
4399 Dundas St W	700
3415 Ninth Line	950
3527 Ninth Line	3800
3480 Ninth Line	2570

7.13. Preliminary Cost Estimate

The estimated total project cost associated with the proposed improvements including engineering, construction, utility relocation and other project costs is approximately $13,474,000 for the south section and $16,055,000 for the north section.

It should be noted that this cost estimate does not include property costs. A detailed cost estimate for the south and north sections are provided in Table 36 and Table 37, respectively.

Table 36: South Section Detailed Cost Estimate

Item No.	Description	Unit	Estimated Quantity	Unit Cost	Total Cost
1	Clearing and Grubbing	m^2	65000	$13.50	$877,500
2	Earth Borrow	m^3	27000	$13.00	$351,000
3	Earth Excavation	m^3	14000	$13.50	$189,000
4	Remove Asphalt	m^2	15400	$11.50	$177,100
5	Asphalt HL-1	t	4039	$115.00	$464,508
6	HDBC	t	12566	$100.00	$1,256,640
7	Granular A	m^3	6120	$55.00	$336,600
8	Granular B	m^3	21420	$35.00	$749,700
9	Concrete Splash Pad	m^2	2020	$75.00	$151,500
10	Asphalt Multi-Trail	m	4040	$300.00	$1,212,000
11	Concrete Curb & Gutter	m	4040	$60.00	$242,400
12	Retaining Wall	m^2	500	$1,000.00	$500,000
13	Culvert (Box)	m	185	$2,500.00	$462,500
14	Culvert (CSP)	m	45	$350.00	$15,750
15	Catch Basin	each	102	$2,500.00	$255,000
16	Storm Pipe (Includes Superpipe)	m	2020	$250.00	$505,000
17	Storm Manhole	each	20	$8,000.00	$160,000
18	Infiltration Trenches	m	3670	$280.00	$1,027,600
19	Pavement Marking & Symbols	m	12120	$5.00	$60,600
20	Hydro Pole Relocation	each	37	$10,000.00	$370,000
21	Other Utility Relocations	LS	1	$1,000,000.00	$1,000,000
Sub-Total Construction Cost					**$10,364,398**
Minor Items (20% of Construction Cost)					$2,072,880
Estimated Engineering - Civil, Geo, etc. (10%)					$1,036,440
Total Construction Cost					**$13,473,717**

Table 37: North Section Detailed Cost Estimate

Item No.	Description	Unit	Estimated Quantity	Unit Cost	Total Cost
1	Clearing and Grubbing	m^2	53500	$13.50	$722,250
2	Earth Borrow	m^3	37000	$13.00	$481,000
3	Earth Excavation	m^3	3000	$13.50	$40,500
4	Remove Asphalt	m^2	12750	$11.50	$146,625
5	Asphalt HL-1	t	2861	$115.00	$329,027
6	HDBC	t	8901	$100.00	$890,120
7	Granular A	m^3	4335	$55.00	$238,425
8	Granular B	m^3	15172.5	$35.00	$531,038
9	Concrete Splash Pad	m^2	3520	$75.00	$264,000
10	Asphalt Multi-Trail	m	1760	$300.00	$528,000
11	Concrete Curb & Gutter	m	6500	$60.00	$390,000
12	Concrete Median	m^2	1500	$75.00	$112,500
13	Retaining Wall	m^2	250	$1,000.00	$250,000
14	Bridge Widening	m^2	1652	$3,500.00	$5,782,000
15	Culvert (Box)	m	50	$2,500.00	$125,000
16	Culvert (CSP)	m	50	$350.00	$17,500
17	Catch Basin	each	90	$2,500.00	$225,000
18	Storm Pipe	m	1820	$250.00	$455,000
19	Storm Manhole	each	19	$8,000.00	$152,000
20	Pavement Marking & Symbols	m	4000	$5.00	$20,000
21	Hydro Pole Relocation	each	15	$10,000.00	$150,000
22	Other Utility Relocations	LS	1	$500,000.00	$500,000
				Sub-Total Construction Cost	**$12,349,984**
				Minor Items (20% of Construction Cost)	$2,469,997
				Estimated Engineering - Civil, Geo, etc. (10%)	$1,234,998
				Total Construction Cost	**$16,054,979**

7.14. Construction Staging

The current traffic volumes along Ninth Line between Dundas Street and William Halton Parkway (south section) are lower than the volumes north of William Halton Parkway (north section). The anticipated growth rate for the south section will be higher than that of the north section resulting in higher future traffic volumes along the south section of Ninth Line.

The construction of Ninth Line is planned to the completed in two phases. Based on the high future traffic volumes along the south section, it is recommended that Phase 1 be the construction of the south section, Ninth Line between Dundas Street and William Halton Parkway. Given that the intersection of Dundas Street and Ninth Line has already been reconstructed and Ninth Line has been reconstructed to four lanes south of the intersection, it may improve connectivity to the existing network to complete the reconstruction of the south section prior to the north section. It is recommended that phase 2 be the construction of the north section, Ninth Line between William Halton Parkway and 407ETR.

Phase 1 is planned for start of construction in 2023 and phase 2 is planned for start of construction in 2025. Construction timing is pending available financing.

8. Mitigation Measures and Commitments

In consultation with agencies, the preliminary preferred design has mitigated negative impacts to the environment where possible. Where impacts cannot be entirely avoided, mitigation measures and commitments for detailed design and construction have been developed to minimize or avoid impacts.

8.1.1. Detailed Design Commitments

Table 38 outlines the mitigation measures and commitments to be implemented during detailed design and construction. Through preliminary consultation with various agencies and the public, the recommended design has mitigated environmental impacts where possible. Further consultation with agencies such as Conservation Halton, MNRF, IO and MTO will be required during detailed design.

It is recommended that the commitments noted throughout the ESR be implemented into the contract package to ensure all construction activities comply with the environmental requirements detailed during the MCEA. Halton Region will work with Conservation Halton, MNRF, IO, MTO 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. Environmental monitoring will be combined with construction supervision to include periodic site visits and inspections throughout the course of the work.

Table 38: Detailed Design Commitments

Category	Issue	Action
Natural Environment	Significant Woodlands, Wetlands and Vegetation	• Refinement to impact on the Provincially Significant Wetland (PSW) will be assessed at detailed design and compensation for the PSW will be reviewed with the Ministry of Natural Resources and Forestry (MNRF) and Conservation Halton. • Further consultation and application for a permit with Conservation Halton will occur as it relates to land alteration within regulated areas. • Development at the North Oakville-Milton East Wetland Complex and the Joshua Valley Park North will require permits from Conservation Halton. • The North Oakville Creeks Subwatershed Study (NOCSS) recommends retention of existing woodland and wetland features in the Joshua's Creek Core Area #11. Ninth Line is a partial barrier to the movement of water within this Core Area and between pockets of the North Oakville-Milton East Wetland Complex. Improvements to water flow under Ninth Line, including potential

Category	Issue	Action
		for wildlife passage will be considered during detailed design to improve the connectivity in the wetland. • Potential impacts are approximated using preliminary conceptual design details. As construction is expected in 2025, impacts to natural heritage features and functions should be revisited at detailed design (e.g. vegetation removals). • Tree Preservation Plan will be required at detailed design. • A detailed landscaping plan will be developed during detailed design to establish dense buffer plantings with groups of native trees and shrubs along the new edge to increase shade and reduce wind (i.e. long PSW, woodlands). • Halton Region's Tree-Canopy Replacement Policy on Regionally Owned Lands (LPS31-08) will be considered as part of the compensational requirements. • The impact to the PSW resulting from the hydro relocation will be confirmed at detailed design. • The Department of Fisheries and Oceans Canada should be consulted during detailed design to provide guidance under the new *Fisheries Act.*
	Wildlife and Species at Risk (SAR)	• Refinement to impact on the Provincially Significant Wetland (PSW) will be assessed at detailed design and include further impact analysis to bobolink habitat. • During detailed design, current SAR regulations will be reviewed in addition to any updates to the SAR in Ontario list. • SAR habitat assessment will be updated at detailed design. The study area will be assessed for any changes to available SAR habitat during the growing season (i.e., May to September). • Compensation measures for impacts to SAR habitat will be reviewed and confirmed at detailed design. Depending on the impact to SAR habitat, compensation may be required

Category	Issue	Action
		and construction timing windows may have to be respected. • Compliance with the Migratory Birds Convention Act (1994) can be ensured by scheduling all vegetation clearing, including the cutting of trees on private property, outside of the breeding bird season (April 1st to August 15th for the Study Area). If vegetation clearing between these dates is required, nesting surveys should be conducted by a qualified biologist immediately prior to the commencement of vegetation clearing. • Further wildlife surveys (i.e. turtle, bird, amphibian) will be completed during detailed design. • Permanent wildlife exclusion fencing will be considered at the detailed design stage in consultation with Conservation Halton. • Review design details and permitting process with the Ministry of Natural Resources and Forestry at detailed design. • Joshua's Creek could provide intermittent warmwater fish habitat. No in-water work should be conducted during the timing window restriction for warmwater fish (April 1 to June 30th). • The provision of fish passage through the new proposed culverts will be further assessed at the detailed design stage. • Wildlife passage opportunities to be revisited at detailed design and should use most recent designs and methods. • The Ministry of Environment, Conservation and Parks will be contacted during detailed design as part of the development of Species at Risk mitigation and compensation measures of impacted habitat (i.e. Bobolink habitat) • The project will be registered with the Ministry of Environment, Conservation and Parks when the final design is confirmed with a submission of a Notice of Activity. Habitat management plans

Category	Issue	Action
		and compensation habitat may be required for work within SAR habitat.
	Source Water Protection	• A portion of the study corridor surrounding the Joshua's Creek Tributary is identified as being located within a vulnerable area of the Halton Source Protection Area regulated under the Clean Water Act. This area is categorized as an Intake Protection Zone 3 Event Based Area with a pipeline that is close to rivers, streams or other water bodies. No Source Water Protection Plan Policies apply to this project and therefore no mitigation is required.
	Hydrogeology	• If construction dewatering of excavations is required at a rate greater than 50,000 litres per day, a Permit to Take Water (PTTW) or Environmental Activity and Sector Registry (EASR) will be required from MECP. • If it is determined that a PTTW is required, a search of potentially contaminated sites will be conducted to determine if any other type of contaminates are present within the potential radius of influence of dewatering activities. • If soil contamination (salt or other contaminants) are encountered during construction, these areas of soil contamination may contribute to groundwater contamination if disturbed during construction. Soil and groundwater containment and disposal measures will be implemented, where required.
Socio-Economic Environment	Property Requirement	• The cross-section of the proposed road widening was modified, and a retaining wall is proposed at the Joshua Creek tributary. • A relocation of the watercourse in the vicinity of the school is proposed to minimize impact along that property frontage. • Reconstruction of the City of Mississauga parking lot adjacent to the baseball diamonds will be provided to accommodate road widening. Trees within the reconstruction limits will require relocation.

Category	Issue	Action
		• Property is required. Halton Region will negotiate property purchases with private owners.
	Private Driveway Access	• The road design will include left turn lanes into private properties to improve site access.
	Property Access	• A property access plan will be developed during detailed design, and alternative access points will be considered, if required.
	Active Transportation	• The Halton Region Active Transportation Master Plan (ATMP) (2015) outlines the required strategy, infrastructure, initiatives and programs to promote non-motorized travel throughout the Region. The ATMP includes proposed cycling lanes and a boulevard multi-use trail on Ninth Line. Both on and off-road facilities will be included in design, where feasible. • The MTO design for the north section (William Halton Parkway to 407ETR) was developed over 30 years ago and did not account for active transportation. The design for Ninth Line will include active transportation in the proposed widening cross sections. • In consultation with the Town of Oakville, the detailed design will assess the feasibility of implementing a 0.5m buffer between the travel lane and 1.8m on-road cycling lane.
Cultural Environment	Archaeology	• A Stage 2 Archaeological Assessment will be completed prior to final design and construction. If archaeological resources or human remains are discovered during construction, work will stop immediately and appropriate authorities will be called. Indigenous Communities will also be notified. • Coordination with Infrastructure Ontario (IO) is required for Stage 2 Archaeological Assessment on IO lands (hydro corridor). • The Mississaugas of the New Credit First Nation will be notified to attend the Stage 2 Archeological Assessment field work.

Category	Issue	Action

Stormwater Management	Fluvial Geomorphology	• Proposed modifications to the existing concrete box culvert will be designed to maintain or enhance flow and sediment conveyance between RL-01 and RL-02 (Joshua's Creek tributary).
		• The incorporation of bank and/or bed treatments will be considered at the inlet and outlet of the Joshua's Creek culvert (CC#9) to mitigate any increased opportunity for scour and erosion in the local area of further downstream.
		• Natural channel design techniques will be used at RL-01 and RL-02 in the event that channel re-alignment is required to accommodate the new road embankment.
		• A detailed assessment of the advantages and disadvantages of leaving the diverted hydrologic feature (WC3/RL-03) in its proposed location will be conducted at detailed design.
		• A qualified Fluvial Geomorphologist will be retained during detailed design to:
		  ○ Update fluvial geomorphic assessment to refine bankfull width estimate and channel stability.
		  ○ Provide guidance on channel design for three times bankfull sizing for culverts in addition to providing guidance for treatment of creek through culvert structure and substrate sizing, mixing details, etc.

	Stormwater Quantity and Quality Control	• Design of the SWM features at 407 ETR will be confirmed at detailed design. • Additional information will be required to design infiltration trenches and avoid groundwater quality impacts at the detailed design stage. • In-situ infiltration rate measurements will be required to size stormwater management facilities (infiltration trench system) at the detailed design stage. • Details and a summary table of the proposed super-pipes, orifices and stage-storage-

Category	Issue	Action
		discharge tables will be required at the detailed design stage. • Inlet capacity analysis to confirm that the Regional Storm event will be captured by the superpipes will be required at the detailed design. • During detailed design, the feasibility of intercepting and conveying the 100-year and/or the Regional storm flows to the superpipes will be confirmed • Additional detailed hydraulic modelling of the inlet, conveyance, superpipe, and orifices will be conducted at the detailed design stage. • Additional detailed estimates of the impact to water quality will be conducted at the detailed design stage. • Confirmation on the ditch capacities will be required at the detailed design stage. • The Conservation Halton HEC-RAS modelling and floodplain expectation and standards will be reviewed at the detailed design stage and the model will be refined. • An underdrain will be considered for the Low Impact Development (LID) measures at detailed design. • To meet NOCSS guidelines, a mix of existing stormwater management measures and LIDs will be included in detailed design. • A review of the current available SWM technologies will be conducted at detailed design and the SWM approach will be updated if more appropriate methods are available. • Further geotechnical testing (i.e. test pits) will be conducted during detailed design to confirm groundwater depth, percolation rates and modeled infiltration capacity from the proposed infiltration trenches. • The selection of a catch basin or inlet designs that will maximize the removal of trash and suspended sediment (that would otherwise clog

Category	Issue	Action
		the infiltration trench) will be considered at detailed design. • A plan for regular inspection, cleanout and maintenance of the inlets, sumps, and infiltration trenches will be developed at detailed design. • Additional detailed hydraulic modelling of the crossing culverts to confirm upstream water levels, velocities, and flooding impacts will be conducted at detailed design. • Potential negative impacts to water quality will be analyzed and mitigation will be developed during detailed design.
Agency Approvals	Permit Requirements	• Further consultation with MTO, IO, MNRF and CH will be required to determine what permits are required prior to construction.
	Contract Documents	• All construction-related mitigation measures will be incorporated into contract documents and communicated to contractors to ensure that all environmental standards are met.
	Infrastructure Ontario	• A Stage 2 Archaeological Assessment will be completed during detailed design. Further consultation with IO will occur at that time and IO will be provided with a copy of the Stage 1 and 2 Archaeological Assessment Reports for review. • Hydro One will be consulted during detailed design to confirm the land requirements and initiate Hydro One's technical review. IO will be consulted following the technical review.
	Utilities	• Continued consultation will occur with Enbridge Gas Distribution Inc. and Hydro One Networks Inc. as it relates to relocation of existing plant. • Enbridge will be notified prior to all excavations within 30m of the Enbridge right-of-way. • Approval in the form of a standard crossing agreement between Enbridge and the facility owner will be established prior to work on any facilities crossing the Enbridge right-of-way.

Category	Issue	Action
		• A relocation of the Enbridge (formerly Union Gas) facility to the boulevard will be reviewed at detailed design. • Further consultation will occur with Enbridge (formerly Union Gas) during detailed design to establish a Franchise Agreement and cost sharing. • The relocation of the hydro poles will be confirmed in consultation with Oakville Hydro during detailed design.
	Provincial Highways	• All designs will comply with Accessibility for Ontarians with Disabilities (AODA) • Fence relocation adjacent to Ninth Line at the highway interchanges will be reviewed at detailed design. • Glare mitigation at road curvature between Ninth Line bridge structure 2 (Highways 403/407 interchange) and structure 3 (ramp 407N-403E, S underpass: passage under the 407N-403E, S ramp) will be investigated further in detailed design. • A tall wall barrier is required between structure 2 and 3 for protection between Ninth Line and the 407ETR. The exact limits will be determined in detailed design phase. • An illumination review will be completed at the detailed design phase. Avoidance of glare for highway traffic will be an issue.

8.2. Monitoring and Maintenance

During construction, Halton Region will ensure that monitoring of all mitigation measures will occur regularly throughout construction. The Region will also ensure that recommendations of the ESR and agency approval conditions are fulfilled as required.

8.2.1. Potential Impacts During Construction

The mitigation measures and commitments to be implemented during construction are outlined in Table 39.

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 his 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.

Table 39: Mitigation Measures to be Implemented during Construction

Issue	Action
Archaeology	• If archaeological resources or human remains are discovered during construction, work will stop immediately, and appropriate authorities will be called. Indigenous Communities will also be notified.
Wildlife	• All vegetation clearing, including the cutting of trees on private property, will occur outside of the breeding bird season (April 1 to August 15) to comply with the Migratory Birds Convention Act. If vegetation clearing between these dates is required, nesting surveys will be conducted by a qualified biologist immediately prior to the commencement of vegetation clearing. • Wildlife exclusion fencing shall be installed around the perimeter of the construction area within 50 metres of the PSW and Joshua Creek to mitigate the risk of herptile mortality.
Aquatic	• Joshua's Creek provides seasonal warm water fish habitat during high water periods such as freshet or after rainfall events. No in-water work will be conducted during the timing window restriction for warmwater fish (April 1 to June 30).
Noise Control	• Construction will adhere to Halton noise by-laws as it relates to working hours. Machinery will be kept in a state of good repair and have noise mitigation devices where required. Construction staging will be planned to limit the total time of disruption.
Traffic Management	• Notice will be provided to residents of traffic management plans before construction commences.
Mud and Dust Control	• The Contractor shall take steps as required to prevent dust resulting from construction activities. • The Contractor shall be responsible for all dirt and mud that is tracked onto roadways from vehicles entering and exiting the job site. • Upon request from the Contract Administrator (CA), the Contractor shall immediately proceed with cleanup operations. If in the opinion of the CA, the Contractor has not or cannot

Issue	Action
	sufficiently remove the mud from the road, the CA will proceed with the necessary cleanup.
Sediment and Erosion Control	• Sediment and erosion controls will be implemented as per the contract drawings, and monitored regularly during construction. Excess sediment will be removed as required to ensure that controls remain functioning.
Disposal of Excess Materials and Spills Management	• For any soils that are to be moved off-site, testing will be conducted to determine contaminant levels and appropriate disposal options, consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04. • A spills management plan will be developed, which will include measures for spill control, spill reporting, and spill containment. Direction will be provided in the contract documents for stockpiling of materials, monitoring of leaks, location of refueling areas, and best management practices for pollution prevention.
Waste	• All waste generated during construction will be disposed of in accordance with MECP guidelines.

Monitoring	• During construction, the on-site Halton Region 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 MCEA commitments).
	• 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 and further developed during detailed design are carried out. In an event that problems arise, appropriate agencies will be contacted to provide further input.

Issue	Action
	• 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. • 2-years of post-implementation monitoring of the project should be conducted.
Utilities	• Where clearance between the relocated Enbridge (formerly Union Gas) facility and the road surface is not sufficient to avoid impacts, the facility will be protected during construction activities.
Tree Removal and Preservation of Plan Communities	• A Tree Protection Plan will be developed during detailed design. The plan will provide guidelines for tree protection during construction and recommendations for maintenance during and post-construction.

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