Class Environmental Assessment Study
Guelph Line (Regional Road 1) Transportation Corridor Improvements from 1 Kilometre North of Derry Road (Regional Road 7) to Conservation Road
Town of Milton – PR-2596A

Environmental Study Report
November 2010

IR ASSOCIATES

Prepared for:

The Regional Municipality of Halton
Public Works & Engineering Services
1151 Bronte Road
Oakville, Ontario L6M 3L1

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Prepared by:

Richard Hein, P.Eng., PTOE, AVS
Richard Goertz, P.Eng.

R and R Associates Inc.
600 Ontario Street, P.O. Box 28058
St. Catharines, Ontario L2N 7P8

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EXECUTIVE SUMMARY

Environmental Assessment Study

In August 2009, Halton Region commenced a Schedule 'C' Class Environmental Assessment (Class EA) Study to identify roadway improvements required for the Guelph Line (Regional Road 1) corridor from one kilometre north of Derry Road (Regional Road 7) to Conservation Road in the Town of Milton, pursuant to the Municipal Class EA process (October 2000, as amended in 2007). The Environmental Assessment study addresses the operational deficiencies and the needs for the Guelph Line transportation corridor to 2021, while taking into account the potential impacts on the natural, socio-economic, and cultural environments.

The Environmental Study Report

The *Environmental Study Report* (ESR) documents the planning process followed in accordance with the procedures set out under the Municipal Class Environmental Assessment (MEA October 2000, as amended in 2007) for Schedule 'C' projects. In general, the ESR documents the planning and decision-making process, including public consultation, which has been followed to arrive at the preferred design. The ESR also sets out the mitigating measures proposed to avoid or minimize environmental impacts.

Specifically, this ESR report documents:

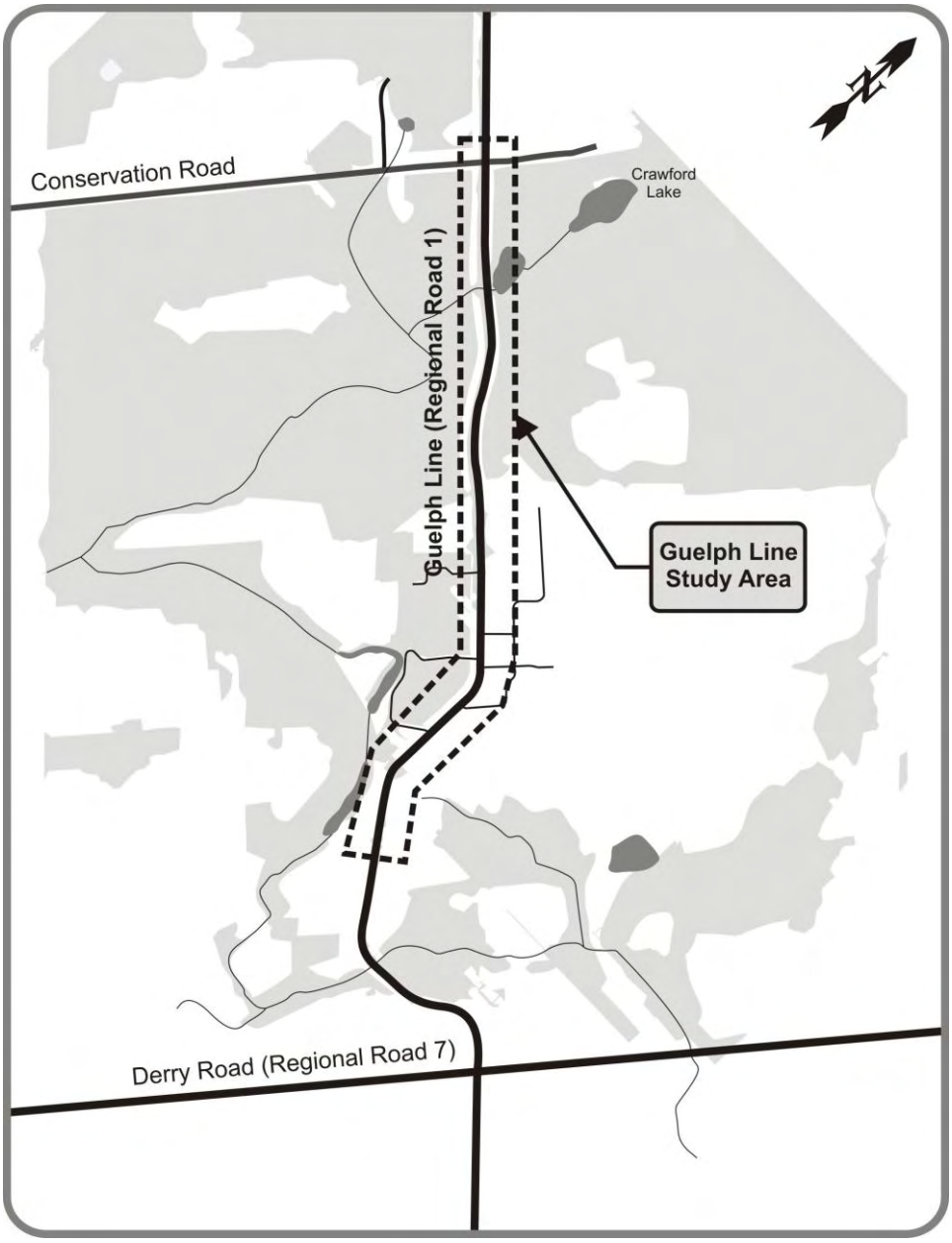
- The background to the study;
- The need and justification for the study;
- A description of the problem;
- The studies and measures undertaken to resolve the problem;
- The planning, preliminary design, and public consultation processes followed to arrive at the preferred design;
- The principal environmental impacts of the study;
- The mitigating measures to be employed to offset the anticipated impacts; and
- The next steps required in moving forward with the detailed design of the project.

Study Background

The section of Guelph Line under study extends from approximately one kilometre north of Derry Road (Regional Road 7) to Conservation Road, a distance of about 2.4 kilometres in length. Guelph Line is under the jurisdiction of the Regional Municipality of Halton and is designated as a Major Arterial roadway with a designated roadway right-of-way width of 35 metres. Within the study limits of the Class Environmental Assessment, Guelph Line is a two lane rural roadway with variable width partially paved/granular shoulders and roadside drainage

ditches. The posted speed limit is 60 km/hr throughout the study corridor with a two-way stop controlled intersection at Conservation Road. The existing right-of-way limits vary from about 20 to 26 metres.

The predominant land uses within the study area include Escarpment Protection Area and Escarpment Natural Area, Natural Heritage System, and Prime Agricultural Area in accordance with the Halton Region Official Plan. North of Derry Road, the Town of Milton Official Plan classifies the predominant land uses as Escarpment Protection Area and Escarpment Natural Area.



Description of the Problem

The study is being undertaken in response to the problem and deficiencies identified within the Guelph Line (Regional Road 1) transportation corridor. In order to address immediate roadway structural concerns, Guelph Line was resurfaced in 2008 to deal with the poor condition of the roadway at that time. The resurfacing provided a degree of improvement until such time that the Class EA process could be initiated to review the Guelph Line transportation corridor. Subsequent to improving the pavement conditions, a number of opportunities currently exist for improvement which will increase the overall safety of the corridor including the potential reduction in the number and severity of collisions.

Planning Alternatives

A range of Planning Alternatives were considered to address operational deficiencies along the Guelph Line transportation corridor, including the following:

1. **Do Nothing** – Do not undertake any improvements or changes within the Guelph Line corridor;
2. **Improve Other Roadways** – This alternative involved improving other roadways that travel parallel or perpendicular to Guelph Line such as Twiss Road, Appleby Line, Derry Road or Conservation Road to accommodate future traffic volumes;
3. **Limit Future Development** (within the vicinity of the study area) – This alternative would limit or restrict future development in the area to limit traffic growth along Guelph Line;
4. **Use of Travel Demand Management Measures** – This alternative is aimed at shifting travel behaviour to reduce peak hour vehicle travel demands (i.e. car-pooling, HOV lanes, flexible work hours);
5. **Implement Localized Intersection and/or Traffic Control Improvements** – This alternative involved localized intersection improvements that may include the provision of auxiliary lanes, improvements to traffic control such as the installation of traffic control signals and/or the optimization of traffic controls along the study corridor to increase efficiency of operation;
6. **Implement Geometric Roadway Improvements to Improve Safety** – This alternative included modifications to the existing roadway geometrics (i.e. horizontal and vertical roadway alignments) and roadway cross-section elements (e.g., travel lane width, median width, shoulder width, side slopes, ditches, etc.) to provide a safer roadway;
7. **Roadway Reconstruction** – This alternative would involve full depth reconstruction of the roadway (i.e. removal and replacement of the roadway base and subbase structures);

8. **Improvements to Existing Drainage Culverts and Ditches** – This alternative would include modifications or replacement of existing culverts with larger, higher capacity culverts or augmentation of existing culverts (i.e. providing additional culvert drainage capacity through installation of new culverts in the area of existing culverts) and the improvement or construction of new roadside ditches where necessary to improve overall roadside drainage; and
9. **Combination of Roadway Improvement Alternatives and Other Supporting Measures** – This alternative entailed a combination of the various planning alternatives toward the goal of providing the best overall solution to the problem through addressing a range of issues within the study area.

The recommended planning solution was determined to be represented by **Alternative 9**, which includes the following general components:

- Provides geometric roadway improvements, where feasible, including adjustments to the horizontal and vertical roadway alignment to meet prevailing standards;
- Provides improvements to the roadway rural cross-section through adjustments to the travel lane widths, shoulder widths, and side slopes;
- Improves the pavement structure of the roadway as required;
- Improves roadway and roadside drainage through enhancements to the road grades and profiles, replacement and/or addition of drainage culverts, and provision of proper roadside ditches; and
- Provides improvements or modifications to intersection traffic control where necessary to meet future traffic operational demands.

Preferred Roadway Alternative

Roadway improvement design concepts included various alternatives for the improvement of the existing two lane rural road cross-section to meet Regional road standards. In each case, a two lane rural roadway cross-section was maintained for each of the improvement alternatives. The alternatives were then assessed and evaluated considering: Technical, Socio-Economical, Natural and Cultural Environment criteria. The alternatives considered the following general concepts:

- **"Do Nothing" Alternative** – No improvements or changes would be made to solve the identified problem or opportunity—existing roadway remains in current state.

- **Alternative 1** – Maintain the current horizontal roadway alignment with a horizontal curve radius of 250 metres with a rural 2-lane road cross-section including 3.65 metre lanes and 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular).

- **Alternative 2** – Centre the roadway alignment within the existing right-of-way limits with a horizontal curve radius of 250 metres with a rural 2-lane road cross-section including 3.65 metre lanes and 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular).

- **Alternative 3** – Centre the roadway alignment within the existing right-of-way limits with a horizontal curve radius of 400 metres (larger radius curve is consistent with existing horizontal curves within the Guelph Line corridor study area) with a rural 2-lane road cross-section including 3.65 metre lanes and 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular).

Separate roadway improvement design concepts were also considered within the northern section of Guelph Line (south of Conservation Road) to improve the existing two lane road cross-section to meet Regional standards while minimizing potential impacts to existing Conservation Halton lands, rock outcrops, pond areas and utilities. The following two alternatives were considered as part of the Environmental Assessment process for this study:

- **Alternative 1-A** – A rural 2-lane road cross-section with 3.65 metre lanes and 2.5 metres partially paved shoulders (1.0 metre paved; 1.5 metres granular). Guiderail protection would be installed as required to provide additional roadside protection for motorists.

- **Alternative 1-B** – An urban 2-lane road cross-section with 3.65 metre lanes and 1.0 metre paved shoulders with concrete curb and gutter. Guiderail protection and retaining walls would be installed as required to provide additional roadside protection for motorists.

The identification of the preferred alternative and its refinement was assisted by public consultation activities throughout this Environmental Assessment, including two Public Information Centres, two Technical Agency Committee (TAC) meetings, as well as a separate meeting with Conservation Halton, whereby public comments and input were received. Based on the evaluation criteria and public, stakeholder and TAC input received, the preferred alternative was identified as a combination of 2-lane rural and urban (north section of Guelph Line) cross-section with 3.65 metre travel lanes throughout the length of the Study Area.

Public 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 planners and the public, allowing an exchange of ideas and the broadening of the information base, leading to better decision-making.

As part of this study, a Technical Agencies Committee (TAC) was established to provide external technical agencies with an opportunity to provide input into the Class EA process. Two meetings with the TAC group and one meeting with Conservation Halton were held during the course of the study. In addition to the TAC meetings, two Public Information Centres (PICs) were held to provide a forum and an opportunity for public input into the study. An additional Derry Road Resident Meeting was held subsequent to the second PIC to address a number of issues brought forward by the public. As a result of the input from the Technical Agencies Committee and the general public at the PICs, the following issues and concerns have been addressed as part of the study:

- Traffic Capacity, Safety and Operational Issues within the corridor;
- Roadway Geometrics;
- Drainage;
- Roadway Pavement Structure;
- Structures (retaining walls);
- Pedestrian and Cycling Facilities;
- Access to Properties;
- Property Impacts to adjacent Property Owners;
- Natural Features;
- Noise Impacts;
- Archaeological and Cultural Impacts;
- Utility Impacts; and
- Timing of Project.

Description of Preferred Roadway Improvement Design

The main features of the Preliminary Preferred Roadway Improvement Design for Guelph Line from one kilometre north of Derry Road (Regional Road 7) to Conservation Road include the following:

- Slight modifications to the horizontal centreline alignment of Guelph Line to accommodate larger 250 metre radius curves;
- Widening symmetrically about the existing centreline (except where the horizontal alignment is shifted slightly to accommodate the larger 250 metre radius curves) as follows:
    - A rural 2-lane road cross-section including 3.65 metre lanes and 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular) from approximately one kilometre north of Derry Road (Regional Road 7) to about 1.2 kilometres south of Conservation Road; and
    - An urban 2-lane road cross-section with 3.65 metre lanes and 1.0 metre paved shoulders with concrete curb and gutter for the remainder of the study area.

- Installation of guiderail protection and retaining walls as required;
- Accommodation of active transportation modes (cyclists and pedestrians) though provision of 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular);
- Stormwater management provisions via new drainage ditches along both sides of the roadway within the rural section and the provision of a storm sewer system within the urban section;
- Replacement of existing roadway cross culverts with higher capacity culverts;

Construction Schedule and Cost

Roadway improvements for Guelph Line (Regional Road 1) from one kilometre north of Derry Road (Regional Road 7) to Conservation Road are anticipated to begin in 2015 as identified in the current 10-year Regional Capital Budget. The total estimated cost of the Preliminary Preferred Roadway Improvement Design is **$4,500,000**.

Environmental Impacts and Mitigating Measures

The preferred design has the least impact on adjacent properties, utilities and the surrounding natural, cultural, and socio-economic environments. As a result of the impact assessment conducted by the study team, as well as input received from review agencies, the following highlights the environmental impacts and mitigating measures:

Fisheries and Aquatic Ecosystems

- The unnamed tributary of Limestone Creek provides indirect fish habitat and is considered to be Type 2 coolwater habitat. Culvert improvements on the unnamed tributary may improve overall water flow through this area. The extent to which the drainage is currently flowing within the ditches along Guelph Line will be maintained after construction.

- Installation of an earthen slope on the north and south sides of Guelph Line abutting the Crawford Lake/Calcium Pits Provincially Significant Wetland (PSW) Complex in combination with the minor widening will incur a small unsubstantial loss of wetland as the newly constructed slope will be functionally equivalent and likely more stable than the existing granular slope.

- Curb and gutter will minimize erosion and runoff directly into the PSW, redirecting the runoff into the downstream watercourse crossing Guelph Line. Potential impacts and habitat loss in the PSW associated with the slope can be addressed through additional plantings and habitat edge creation along the base of the slope.

Stormwater Management and Erosion and Sedimentation Control

- The preferred design incorporates the installation of a storm sewer and curb and gutter collection system in the northern section and drainage ditches throughout the remaining study area. A combination of engineered works and natural drainage attenuation on the downstream outlet portion of the watercourse may be effective in treating the excess storm water and will further be examined during the detailed design phase of the project.

- Increased erosion due to the exposure of soil is common through the construction phase, resulting in increased suspended sediments, which can have detrimental effects on the watercourse(s) if conveyed by surface water runoff. A number of temporary erosion and sedimentation control measures are detailed in the ESR document to deal with potential erosion.

Terrestrial Ecosystems and Wildlife Habitat

- There are no significant ecological changes anticipated as a result of the proposed road widening and improvements, and no rare, threatened or endangered plant species were identified directly within the proposed road improvements along Guelph Line.

- The Jefferson Salamander (Ambystoma jeffersonianum) listed nationally and provincially as threatened, has been identified within the Crawford Lake PSW and ephemeral pool breeding habitat within ten metres of Guelph Line. Installation of a retaining wall at the wetland will incur minimal loss of habitat for local flora and fauna and no impact on the breeding pool. Construction of a double perched culvert at the existing Guelph Line crossing may provide a secure corridor crossing for the salamander.

Noise Impacts

- The roadway improvements for Guelph Line will produce insignificant noise impacts with noise levels falling within established Ministry of Environment and Ministry of Transportation Guidelines. Since the resultant daytime sound exposures in the rear yard amenity areas will be below 60 dBA, noise mitigation is not required.

Cultural Environment

- The existing Guelph Line right-of-way does not retain archaeological site potential due to previous ground disturbances.

- Impacts to the cultural environment may include minor impacts to existing cultural heritage landscapes (i.e. mature tree lines) directly adjacent to the existing roadway and within the existing roadway right-of-way limits.

Socio-Economic Environment

- There are no impacts anticipated for local area uses (community/public/ institutional/facility land uses), official or other planning initiatives. During construction, it is anticipated that there will be some temporary impacts from construction activities and existing driveway throats will be redefined to match into the new roadway alignment.

Monitoring and Mitigation

The Region will ensure that the environmental protection recommendations described in the ESR document and other subsequent agency approval conditions are complied with during the construction stage. During detail design, Halton Region will work with appropriate utilities and agencies to confirm potential effects and mitigation measures and to obtain necessary approvals and permits. Additional details related to monitoring and mitigation measures are detailed in Section 7.0 of the ESR document.

1. INTRODUCTION

The need to undertake a Class Environmental Assessment Study for Guelph Line from 1 kilometre north of Derry Road (Regional Road 7) to Conservation Road was identified as part of a Comprehensive Road Safety Action Plan (CROSAP) which identified the need for improvements to the roadway cross-section and geometric design within the corridor.

The Halton *Regional Official Plan* (2006) outlines a long-term vision for Halton's physical form and community character. Commonly referred to as The Regional Plan, the Official Plan (OP) sets forth stated goals and objectives, describes an urban structure for accommodating growth, states the policies to be followed, and outlines the means for implementing the policies within its property tax base and other financial resources. Part IV of the Regional Plan describes *Healthy Communities Policies*, setting out the following goal for Transportation, as amended by Regional Official Plan Amendment 38 (ROPA 38):

> *"The goal for transportation is to provide a safe, convenient, accessible, affordable and efficient transportation system in Halton, while minimizing the impact on the environment and promoting energy efficiency."*

The Regional Plan further clarifies a number of Regional objectives for meeting this goal, including the following policy for transportation:

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

ROPA 38 incorporates the results of the *Sustainable Halton* process and a comprehensive review of the current Regional Official Plan. To that end, the planning horizon year was amended to 2031. In addition, 173(5.1) of ROPA 38 notes: *"173(5.1) Amend Maps 3 and 4 and Table 3 to reflect the requirements of the transportation system to meet travel demands for year 2031, upon completion of the Region's Transportation Master Plan and consistent with the appropriate recommendations of the Metrolinx Regional Transportation Plan."*

The Regional Municipality of Halton retained ***R and R Associates Inc.*** to assist the Region with the Class Environmental Assessment and Preliminary Design for Guelph Line from 1 kilometre north of Derry Road (Regional Road 7) to Conservation Road in the Town of Milton, Ontario.

1.1 Purpose of the Class Environmental Assessment

It is a requirement under the Regional Municipality of Halton that a Class EA study be undertaken in accordance with the Municipal Class Environmental Assessment planning and design process. The Regional Plan [OP - 173(17)] requires the environmental assessment of any Arterial Road project, to address whether there are other transportation alternatives and how the project would implement the transportation goals, objectives and policies of [The Regional Plan] and to consider, where appropriate, alternative design standards to mitigate environmental and social impact.

The Environmental Study Report (ESR) documents the planning and design process followed in accordance with the procedures set out under the Municipal Class Environmental Assessment process (MEA October 2000, as amended in 2007) for Schedule 'C' projects.

The purpose of this Class EA study is to provide an assessment of the need for transportation corridor improvements for Guelph Line (Regional Road 1), within the limits of the study area, to meet the requirements of Halton Region to the year 2021. The study will identify a preferred solution that will address these needs, while providing a comprehensive, environmentally sound planning process that will facilitate dialogue between stakeholders with a number of competing interests. The primary range of key consideration and issues that were addressed through the public process within the context of the study are listed below.

Transportation

- Integration with Overall Transportation Network
- Existing Operational Issues
- Future Corridor Travel Demands
- Existing and Proposed Access and associated Access Management
- Roadway Cross-section Considerations
- Alternate/Active Transportation Modes
- Safety

Structural

- Pavement Conditions
- Watercourse Culverts

Natural Environment

- Provincially Significant Wetlands
- Woodlands
- Creek Crossings

- Drainage and Stormwater Management
- Provincial Greenbelt Plan
- Environmentally Sensitive Areas (ESAs)
- Species at Risk (SAR)

Adjacent and Existing/Future Land Uses

- Residential, Commercial, and Rural
- Escarpment Rural Area
- Greenlands Area
- Future Land Use Considerations (including property requirements/restrictions)

Cultural and Social Environment

- Built Heritage Features
- Archaeology Features
- Noise Impacts
- Aesthetics

Other Features

- Existing and Future Utilities

1.2 Study Area

The study area for the Class Environmental Assessment (Class EA) Study for Guelph Line (Regional Road 1) Transportation Corridor Improvements is shown in **Figure 1-1**. The section of Guelph Line under study extends from approximately one kilometre north of Derry Road (Regional Road 7) to Conservation Road, a distance of about 2.4 km in length. Currently, Guelph Line is under the jurisdiction of the Regional Municipality of Halton and is designated as a Major Arterial roadway in accordance with the Halton Region Official Plan and Halton Region Transportation Master Plan. Guelph Line (Regional Road 1) is a major north-south arterial road beginning in the north at 32 Side Road (Regional Road 32) in the Town of Milton, traveling southerly to terminate at Lakeshore Road in the City of Burlington. The Region's Official Plan indicates a designated roadway right-of-way width of 35 metres.

Figure 1-1: Study Area Limits

Within the study area limits, Guelph Line maintains a two lane rural road cross-section with a posted speed limit of 60 km/hr. The intersection at Conservation Road to the north is a STOP controlled intersection for Conservation Road. The Guelph Line intersection at Derry Road (Regional Road 7) is currently controlled via signalized control. The existing right-of-way limits

vary from about 20 to 26 metres with varying partially paved/granular roadside shoulders and ditches throughout the study area.

The predominant land uses within the study area include *Escarpment Protection Area* and *Escarpment Natural Area*[1] and *Prime Agricultural Area*[2] in accordance with the Halton Region Official Plan. North of Derry Road, the Town of Milton Official Plan classifies the predominant land uses as *Escarpment Protection Area* and *Escarpment Natural Area*.

1.3 Related Studies

A number of related studies have been completed which have significance to the Guelph Line (Regional Road 1) Transportation Corridor Improvements. These studies include:

- The Regional Plan, Regional Municipality of Halton, 2006;
- Amendment No. 38 to The Regional Plan (2006) Official Plan for the Halton Planning Area, Regional Municipality of Halton, December 16, 2009;
- Town of Milton Official Plan, Town of Milton, August 2008;
- Region of Halton Regional Transportation Master Plan, Regional Municipality of Halton, June 2004;
- PPW36-08 - Halton Region Transportation Master Plan Update (2007), Regional Municipality of Halton, March 2008;
- 2007 State of the Regional Road System Report, Regional Municipality of Halton, August 2008;
- Road Needs Study 2008 Update, Regional Municipality of Halton, August 2008;
- Halton Region Environmentally Sensitive Area Consolidation Report, Regional Municipality of Halton, 2005;
- Pavement Design Report - Guelph Line (Derry Road to Steeles Avenue), Regional Municipality of Halton, August 2007; and
- Comprehensive Road Safety Action Plan (CROSAP) - Phase 2 – Operations and Safety Assessment, Guelph Line (Regional Road 1), Halton Region, June 2002.

[1] Map 1A – Provincial Plan Areas & Land Use Designation, Halton Region Official Plan, December 16, 2009
[2] Map 1E – Prime Agricultural Areas, Halton Region Official Plan, December 16, 2009

2. STUDY PROCESS

2.1 The Class Environmental Assessment Process

2.1.1 The Municipal Class EA

The Municipal Class EA process provides a decision-making framework that enables the requirements of the EA Act to be met in an effective and traceable manner. An approved Class EA document describes the process that a proponent must follow for a class or group of undertakings in order to meet the requirements of the EA Act. Once approved, the Class EA establishes the process whereby the municipal projects, as defined in the Municipal Class EA and any subsequent modifications, can be planned designed, constructed, operated, maintained, rehabilitated and retired without having to obtain project-specific approval under the EA Act, provided the approved environmental assessment planning process is followed.

The term “Environment” is applied in a broad sense and includes the natural, social, cultural, built and economic environments. The key principles of environmental assessment planning include:

- Consultation with affected parties early into and throughout the process, such that the planning process is cooperative in nature;
- Consideration of a reasonable range of alternatives for implementing the solution;
- Identification and consideration of the effects of each alternative on affected aspects of the environment;
- Systematic evaluation of alternatives in terms of their advantages and disadvantages, to determine their net environmental affects; and
- Provision of clear and complete documentation of the planning process followed, to allow “traceability” of decision-making with respect to the project.

Currently, the Municipal Class EA facilitates municipal road, water and wastewater, and transit projects through the Class EA Planning and Design process. In order to address the variability of environmental impacts for specific projects, the Municipal Class EA classifies individual projects in terms of schedules as follows:

Class EA Schedule Designation	Schedule Description	Typical Projects
A	Projects are limited in scale, have minimal adverse environmental effects and include a number of municipal maintenance and operational activities. These projects are pre-approved and may proceed to implementation without following the full class EA planning process.	Normal emergency operational and maintenance activities
A+	Projects are pre-approved; however, the public is to be advised prior to project implementation.	Normal emergency operational and maintenance activities
B	Projects have the potential for some adverse environmental effects. These projects require mandatory contact with directly affected public and relevant agencies, to ensure that they are aware of the project and that their concerns are addressed.	Improvements and minor expansions to existing facilities
C	Projects have the potential for significant environmental effects and must proceed under the full planning and documentation procedures specified in the Class EA document. An Environmental Study Report (ESR) is prepared and filed for review by the public and review agencies.	Construction of new facilities and major expansions to existing facilities

2.1.2 The Class EA Planning and Design Process

The *Class EA Planning and Design Process* is a five-phase planning process approved under the EA Act by which proponents may plan municipal infrastructure projects. The process follows the five basic phases which are conducted within a framework of environmental protection, effective consultation with stakeholders including review agencies, the public, property owners, interest groups, and traceable decision-making. The five phases of the Class EA planning and design process are summarized as follows:

Phase 1 – Identify the problem (deficiency) or opportunity.

Phase 2 – Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment, and establish the preferred solution taking into account public and review agency input.

Phase 3 – Examine alternative methods of implementing the preferred solution, based on the existing environment, public and review agency input, anticipated environmental effects and methods of minimizing negative effects and maximizing positive effects.

Phase 4 – Document, in an Environmental Study Report (ESR), a summary of the rationale and the planning, design and consultation process of the project established through Phases 1 to 3. The ESR is made available for public and agency review and comment.

Phase 5 – Complete contract drawings and documents and proceed to construction and operation along with the monitoring of construction activities and operations to ensure adherence to environmental provisions and mitigation.[3]

Based on the Region's assessment of the types of improvements that are required within the Guelph Line corridor from 1 Kilometre North of Derry Road (Regional Road 7) to Conservation Road, the Guelph Line (Regional Road 1) Transportation Corridor Improvements study was identified by the Regional Municipality of Halton as a Schedule 'C' undertaking under the Municipal Class Environmental Assessment. The work program for this study was structured to follow the first four phases of the Class EA planning and design process.

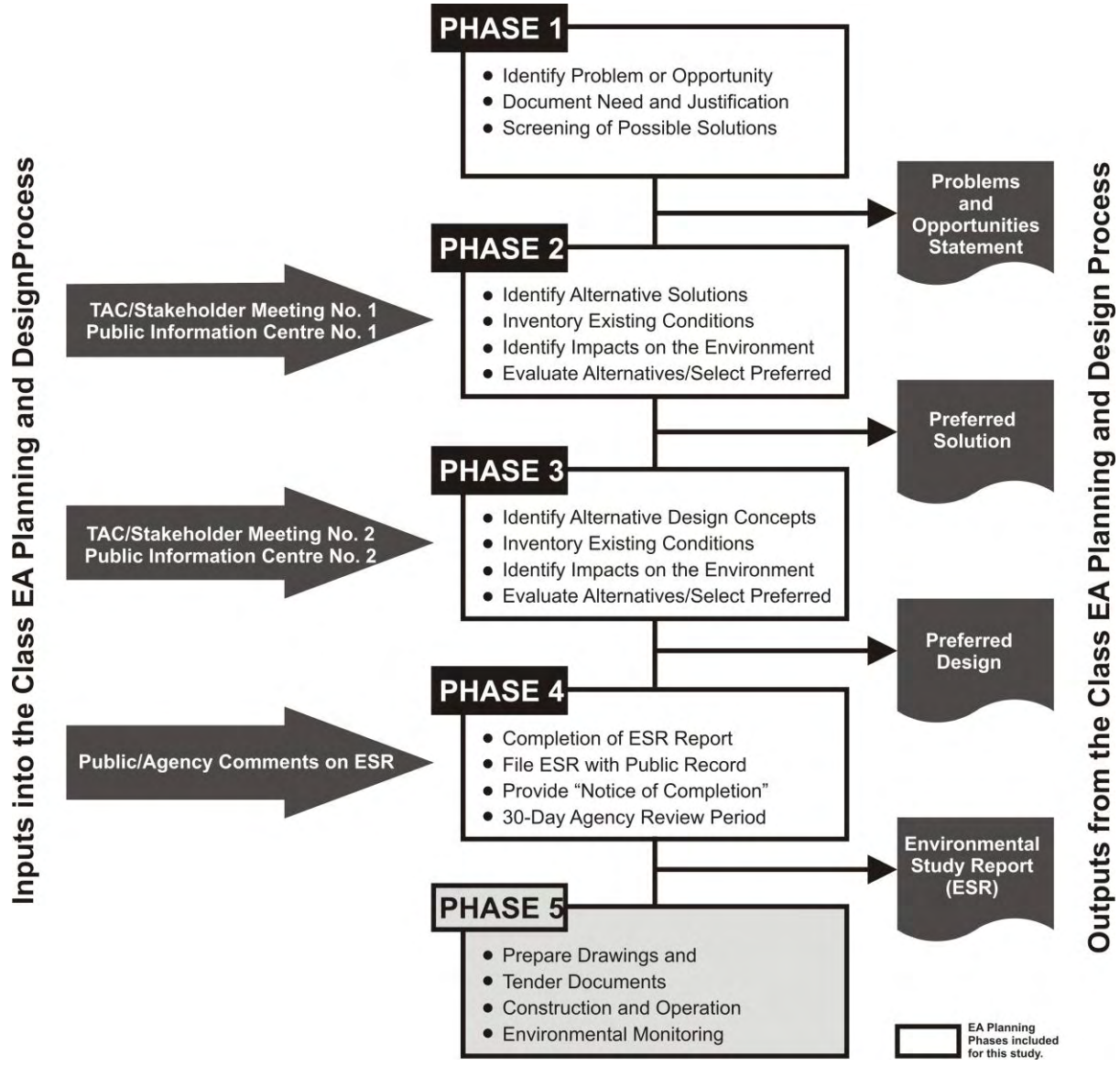
Figure 2-1 encapsulates the basic structure of the Class EA planning and design process, highlighting the phases that will be followed to complete this study. Figure 2-1 also summarizes various points in the EA process where public, technical agency and stakeholder input is mandatory as well as the various outputs expected at the end of each phase.

Consistent with the Municipal Class EA, the study approach has been designed to meet the following objectives:

1. Protection of the environment (natural, social, economic and cultural environments);
2. Minimal disruption during construction to the existing residents and business owners who rely on this roadway;
3. Participation of a broad range of stakeholders in the study process to allow for sharing of ideas, education, testing of creative solutions and developing alternatives; and
4. Documentation of the study process in compliance with all phases of the Municipal Class Environmental Assessment process.

[3] Phase 5 is not included as part of this study.

Figure 2-1: Five Phase Class EA Planning and Design Process
Guelph Line (Regional Road 1) Transportation Corridor Improvements



2.2 Part II Order Requests

The filing of this ESR completes the planning and preliminary design stage of the project. The ESR is placed on the public record and made available for review for a forty-five (45) calendar day period. A public notice is published at the time of filing. Copies of the report are available for review and comment during normal business hours at the following locations:

Halton Region

Clerk's Department
Regional Municipality of Halton
1151 Bronte Road
Oakville, Ontario
L6M 3L1
(905) 825-6000
Monday – Friday: 8:30 a.m. - 4:30 p.m.

Town of Milton

Clerk's Department
Town of Milton
150 Mary Street
Milton, Ontario
L9T 6Z5
(905) 878-7252
Monday – Friday: 8:30 a.m. – 4:30 p.m.

Milton Public Library - Beaty Branch
945 Fourth Line
Milton, Ontario
L9T 6P8
(905) 875-2665
Tuesday – Thursday: 10:00 a.m. – 8:00 p.m.
Friday – Saturday: 10:00 a.m. – 5:00 p.m.

Milton Public Library – Main Branch
45 Bruce Street
Milton Ontario
L9T 2L5
(905) 875-2665
Tuesday – Thursday: 10:00 a.m. – 9:00 p.m.
Friday – Saturday: 10:00 a.m. – 5:00 p.m.
Sunday: 1:00 p.m. – 5:00 p.m.

Class Environmental Assessments place emphasis on both project assessment and on public and agency involvement and consultation. The process places importance on and encourages stakeholder participation throughout the process to resolve all project-related issues and concerns with the proponent. However, if concerns are raised during the public review period that cannot be resolved through discussions with the Regional Municipality of Halton, a "Part II Order" request may be submitted to the Minister of the Environment.

The Minister of the Environment determines whether or not this is necessary and the decision in this regard is final. If the Part II Order is granted, the project cannot proceed unless an Individual Environmental Assessment is prepared. The Class Environmental Assessment is subject to a formal government review and approval process and may result in a formal public

hearing. Anyone wishing to request a 'Part II Order; of this Derry Road ESR must submit a written request by the end of the forty-five (45) calendar day review period to the Minster of the Environment at the following address with a copy sent to Halton Region:

Ministry of the Environment

Attention: Minister of the Environment
12th Floor 135 St. Clair Avenue West
Toronto, Ontario
M4V 1P5

Regional Municipality of Halton
Attention: Mr. Jeffrey Reid, C.E.T.
Senior Transportation Planner, Transportation Services
1151 Bronte Road
Oakville, Ontario
L6M 3L1

2.3 The Environmental Study Report (ESR)

This Environmental Study Report (ESR) documents the planning and design process followed to determine the recommended undertaking and the environmentally significant aspects for the Guelph Line Transportation Corridor Improvements in accordance with the procedures for Schedule 'C' projects, setting out the planning and decision making process, including consultation with technical agencies and the public, which has been followed to arrive at the preferred solution. The ESR also sets out the mitigating measures proposed to avoid or minimize environmental impacts.

The ESR embodies Phase 4 of the Environmental Assessment process, documenting in a report all the activities undertaken to date through Phases 1, 2 and 3. The ESR is intended to be a traceable and easily understood record of the proponent's decision making process. The ESR generally describes the following:

- A description of the problem or opportunity and other background information;
- The rationale employed in selecting the preferred solution to the problem;
- The rationale employed in selecting the preferred design;
- A description of the environmental considerations and impacts;
- The mitigating measures which will be undertaken to minimize environmental effects;
- A description of the consultation process and an explanation of how concerns raised by the public and review agencies have been addressed in developing the project; and
- A description of the monitoring program which will be carried out during construction.

2.4 Study Schedule

The study was initiated in October 2009 through the advertised *Notice of Study Commencement*. The study scope, as defined by the Region's Terms of Reference, followed the requirements as set out in the Municipal Class Environmental Assessment process including the following timetable:

Schedule Item		Date
Notice of Study Commencement	–	October 29, 2009[4]
Technical Agencies Meeting No. 1	–	November 10, 2009
Public Information Centre No. 1	–	November 10, 2009
Technical Agencies Group Meeting No. 2	–	April 13, 2010
Public Information Centre No. 2	–	April 20, 2010
File Environmental Study Report (ESR)	–	Fall 2010

2.5 Study Organization

The Regional Municipality of Halton retained R and R Associates Inc. to assist the Region with the Class Environmental Assessment study. The project team consisted of members from the Regional Municipality of Halton, R and R Associates, and specialized sub-consultants needed to address specific requirements for projects of this type under the Ontario Environmental Assessment Act.

The Project Team consisted of staff from:

Role	Organization and Team Member
Proponent:	**Regional Municipality of Halton** **Public Works & Engineering Services**
	Ms. Alicia Jakaitis – Project Manager **Bob Wickland, A.Sc.T., CMM III** – Design Services
Prime Consultant:	**R and R Associates Inc.**

[4] Date of initial newspaper advertisement.

Role	Organization and Team Member
	Rick Hein, P.Eng., PTOE, AVS – Project and Transportation Manager **Rick Goertz, P.Eng.** – Design Manager/Preliminary Design **Darrell Smith, P.Eng.** – EA Process and Quality Control/Assurance
Sub-Consultants:	**Lisa Campbell, M.Sc., CCEP –** LCA Environmental (Natural Environment) **Brian Ellis, P.Eng.** – Ellis Engineering (Structures) **John Emeljanow, P.Eng.** – Valcoustics (Noise Assessment) **John Lamarre, P.Eng.** – Lamarre Consulting Group (Drainage and Stormwater Management) **Caitlin Lacy, B.A., Anthropology** – Archaeological Services Inc. (Archaeology) **Rebecca Sciarra, Hons. B.A., M.A., CAHP** – Archaeological Services Inc. (Built Heritage) **Mark Popik, P.Eng.** – Applied Research Associates Inc. (Geotechnical & Pavement Design)

2.6 Public and Agency Consultation

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

2.6.1 Notification of Study Commencement and Initial TAC/PIC Meetings

The Notice of Study Commencement for the Guelph Line (Regional Road 1) Transportation Corridor Improvements Class EA was published in local newspapers on the following dates:

- October 29, 2009 and November 5, 2009 – Halton Compass; and
- October 30, 2009 and November 6, 2009 – Burlington Post and Milton Champion.

Property owners (local area residents) and external technical agencies were notified of the project by mail on October 16, 2009. Letters mailed to the residents and technical agencies included the Notice of Study Commencement and the date and location of the first Public Information Centre (PIC) and Technical Agencies Committee (TAC) meetings, respectively for each group. First Nations were also notified. Copies of the newspaper advertisement, letters

sent to the residents and agencies, and a list of the agencies that were notified are contained in **Appendix A**.

The Notice of Study Commencement and the initial contact letters described the study, outlined the Municipal Class Environmental Assessment process (October 2000, amended 2007), announced the first PIC date (the first TAC meeting was announced in the letter sent to the technical agencies), requested involvement in the planning and design process, and provided contact persons for the Region and the Consultant.

Technical Agencies Committee Meeting No. 1

Technical agency representatives were requested to notify the Project Team of their interest in participating in the first "Technical Agency Committee" (TAC) meeting held on November 10, 2009 via a Fax Back Form included with the letter mailings. Responses were received from ten (10) technical agencies prior to and following the initial mailing. Copies of the Fax Back Forms, e-mail and letter responses received from the technical agencies are contained in **Appendix B**. A copy of the database that was maintained with respect to the external agency contacts is also provided in **Appendix B**.

2.6.2 Technical and Agency Committee (TAC) Meeting No. 1

Technical Agency Committee Meeting No. 1 was held on November 10, 2009 at Hugh Foster Hall located in the Town of Milton at 141 King Street, Milton, Ontario. The meeting was scheduled from 3:00 p.m. to 4:30 p.m. There was one representative from Conservation Halton in attendance.

The purpose of the meeting was to review the study approach, process and organization; need for improvements, study area, and background information; study timetable; key considerations and issues, key findings to date, the problem/opportunity being addressed, alternative planning solutions and the preferred solution; evaluation factors; and the next steps in the process. The meeting also provided a forum for the technical agency representative to provide study input and note any potential concerns related to the study.

The primary issues and concerns raised at the meeting included:

- The potential need for traffic turning lanes at Conservation Road during the weekend periods;
- Conservation Halton expressed concerns related to any potential impacts to adjacent properties or habitat; and
- The determination of the presence of Coyote species as part of the wildlife inventory and the potential presence of Redside Dace in the aquatic inventory.

A copy of the presentation and the meeting minutes for the first TAC meeting are included in **Appendix C**.

2.6.3 Pubic Information Centre No. 1

The first of two scheduled public information centres (Public Information Centre No. 1) was conducted on Wednesday, November 10, 2009 from 6:30 to 8:00 p.m. at Kilbride Public School located at 6611 Panton Street in the City of Burlington, Ontario.

The Public Information Centre (PIC) notice was advertised in local newspapers on the following dates:

- October 29, 2009 and November 5, 2009 – Halton Compass; and
- October 30, 2009 and November 6, 2009 – Burlington Post and Milton Champion.

The PIC notice was also posted on the Region's web site on October 29, 2009. A copy of the original advertised Notice of Public Information Centre No. 1 is contained in **Appendix D**.

The information centre was organized as an informal drop-in style format with panels and background materials on display. A formal presentation was provided at 7:00 p.m. followed by a question and answer session. A copy of the meeting presentation is provided in **Appendix D**. Public participants were asked to sign an attendance register and were encouraged to review the materials on display, ask questions of the Study Team, and provide their remarks on comment sheets provided at the information centre.

The purpose of the meeting was to:

- Introduce the Study to the public and outline the purpose for undertaking this Class EA;
- Present the existing conditions within the Study Area;
- Outline the need and justification (i.e. Problem Statement) for considering geometric design improvements;
- Obtain public comments and feedback on the assessment of the alternative solutions; and
- Identify future activities to be undertaken as part of the Class EA Study.

Sign-in sheets, comment sheets and presentation materials were available at the PIC. A handout booklet containing a small format version of the larger displays was made available to the public. Once the participants at the PIC had a chance to view the display panels and ask questions of the Study Team, they were encouraged to either fill out a comment sheet during the course of the information centre or take a comment sheet with them to fill out at a later date and return to the Regional Municipality of Halton or R and R Associates Inc. Information was gathered to assist the Regional Municipality of Halton in implementing proposed improvements

to the Guelph Line corridor within the study limits. With the exception of personal information, all comments were included in the Environmental Study Report (ESR) and were included as part of the public record for this project. Copies of the handout booklet and comment sheet are provided in **Appendix D**.

An attendance register was maintained at the PIC and participants were requested to sign the attendance register as they arrived. A total of three (3) individuals signed the attendance register during the 6:30 to 8:00 p.m. drop-in session. No comment sheets were received at the conclusion of the Public Information Centre. One comment was received by e-mail subsequent to the Public Information Centre. A copy of the attendance register, the one comment received and the subsequent Region response to the comment are provided in **Appendix D**.

The first PIC was generally well received by those who attended. Comments and concerns that were provided to the Study Team by the public during the informal presentation phase of the PIC, along with the Study Team's responses, are provided in **Appendix D**. Relevant concerns were reviewed for consideration in the evaluation and assessment of alternative solutions.

The majority of attendees were either local area residents or individuals who had a general interest in the study. The majority of discussion during the PIC centred on the following issues:

- Potential snow drift hazards along the tangent section of Guelph Line, adjacent to the open field areas north of the S-bend (approximately two kilometres south of Conservation Road);
- The collection of water at low spots along the east side of Guelph Line (approximately 350 metres south of Conservation Road) surprising drivers during the summer months as unexpected ponding and as black ice during the winter months; and
- Safety issues related to run-off-the road collisions and potential roadside hazards.

2.6.4 Conservation Halton Meeting

A meeting with Conservation Halton was held on April 1, 2010 at Conservation Halton Offices located at 2596 Britannia Road West in the City of Burlington. The meeting was held to:

- Provide Conservation Halton with an overview of the study;
- Discuss Conservation Halton concerns as summarized in a letter from Conservation Halton dated December 22, 2009; and
- Discuss a subsequent response letter from the study team dated March 6, 2010 addressing those concerns.

A copy of the Conservation Halton letter and subsequent study team response letter is provided in **Appendix C**.

The overview presentation provided a summary of the project study area, study timetable, study Problem Statement, the key considerations and issues, alternative design concepts, evaluation factors, the preferred design alternative, and roadway cross-sections. A copy of the presentation is provided in **Appendix C**. During the course of the meeting, three alternative design concepts and the preferred design were discussed in detail, highlighting the various components of each design.

Conservation Halton noted that there may be "Jefferson Salamander" within the project limits. In order for the salamanders to cross Guelph Line it was suggested that roadway cross culverts be installed to allow the salamanders access under the roadway. In order to meet this need, it was proposed that a smaller separate diameter culvert could be installed at a slightly higher elevation than the future drainage culverts (i.e. those designed for the 25-year storm event). This smaller culvert would then provide the main access for the salamanders under drier conditions. During the construction phase, there will be a need to ensure that the salamanders are not adversely affected, particularly during breeding season.

Conservation Halton enquired as to Guelph Line's designation as an Emergency Detour Route (EDR). Subsequent to the meeting it was confirmed by the Region's Transportation Services Operations Group that Guelph Line is not part of the current EDR.

Conservation Halton indicated at the meeting that the issues noted in their December 22, 2010 Letter (CH File: MPR 527) were addressed by the information provided in the Halton Region Response Letter (March 6, 2010).

A copy of the meeting minutes is provided in **Appendix C**.

2.6.5 Notification of Second TAC/PIC Meetings

Technical Agencies Committee Meeting No. 2

External technical agencies were notified of the second Technical Agencies Committee Meeting by mail on March 19, 2010. Letters mailed to the technical agencies included the date and location of the second Technical Agencies Committee (TAC) meeting. A list of the technical agencies that were notified and a copy of the letters sent to the agencies are contained in **Appendix A**.

Technical agency representatives were requested to notify the Project Team of their interest in participating in the second "Technical Agency Committee" (TAC) meeting held on April 13, 2010 via a Fax Back Form included with the letter mailings.

Responses were received from six (6) technical agencies prior to and following the initial mailing. Copies of the Fax Back Forms and e-mail responses received from the technical agencies are contained in **Appendix B**.

Public Information Centre No. 2

The Notice for the second Public Information Centre for the Guelph Line (Regional Road 1) Transportation Corridor Improvements Class EA was published in local newspapers as follows:

- April 8, 2010 and April 15, 2010 – Halton Compass
- April 9, 2010 and April 16, 2010 – Burlington Post
- April 8, 2010 and April 15, 2010 – Milton Champion

The First Nations were also included on the PIC mailing list. A copy of the newspaper advertisement is provided in **Appendix A**.

As part of the public and agency consultation for the study, Public Information Centre and Technical Agency Committee meetings were held during Phase 2 and Phase 3 of the EA process in compliance with a Schedule 'C' undertaking.

2.6.6 Technical and Agency Committee (TAC) Meeting No. 2

Technical Agency Committee Meeting No. 2 was held on April 13, 2010 at Hugh Foster Hall located in the Town of Milton at 141 King Street, Milton, Ontario. The meeting was scheduled from 1:30 p.m. to 2:30 p.m. There was one representative from the Town of Milton in attendance.

The purpose of the meeting was to review the study process, background and timetable; the problem/opportunity being addressed; key study considerations and issues; the Recommended Planning Solution; the development and evaluation of Alternative Design Concepts; the preliminary plan for the Preferred Alternative Design; and the next steps in the study process. The meeting also provided a forum for the technical agency representative to provide study input and note any potential concerns related to the study.

There were no significant concerns raised by the meeting attendants. A copy of the TAC No. 2 meeting minutes and presentation are included in **Appendix C**.

2.6.7 Public Information Centre No. 2

The second of two scheduled public information centres (Public Information Centre No. 2) for the Guelph Line (Regional Road 1) Transportation Corridor Improvements Class Environmental

Assessment study was conducted on Tuesday, April 20, 2010 from 6:30 to 9:00 p.m. at Kilbride Public School located at 6611 Panton Street in the City of Burlington, Ontario.

The information centre was organized as an informal drop-in style format with panels and background materials on display. A formal presentation was provided to the PIC attendees beginning at 7:00 p.m. followed by a question and answer session. A copy of the formal meeting presentation is provided in **Appendix E**. Public participants were asked to sign an attendance register and encouraged to review the materials on display, ask questions of the Study Team, and provide their remarks on comment sheets provided at the information centre.

The purpose of the meeting was to:

- Present and obtain feedback on the:
- Alternate design concepts considered for the preferred solution;
- Environmental conditions fieldwork;
- Assessment of the alternative design concepts;
- Preferred design concept; and
- Identify future activities to be undertaken as part of the Class EA Study.

Sign-in sheets, comment sheets and presentation material were available at the PIC.

The public was encouraged to provide any relevant information pertaining to the study issues and to the evaluation of the alternative design concepts and the selection of the Preferred Design Alternative.

Participants at the PIC were encouraged to take with them an information handout booklet. The handout booklet contained a small format version of the larger displays. Once the participants at the PIC had a chance to view the display panels and ask questions of the Study Team, they were encouraged to either fill out a comment sheet during the course of the information centre or take a comment sheet with them to fill out at a later date and return to the Regional Municipality of Halton or R and R Associates Inc. by May 7, 2010. Information was gathered to assist the Regional Municipality of Halton in implementing proposed improvements to the Guelph Line corridor within the study limits. With the exception of personal information, all comments were included in the Environmental Study Report (ESR) and were included as part of the public record for this project. Copies of the handout booklet and comment sheet are provided in **Appendix E**.

An attendance register was maintained at the PIC and participants were requested to sign the attendance register as they arrived. A total of fifteen (15) individuals signed the attendance register during the 6:30 to 9:00 p.m. drop-in session. Four (4) comment sheets were received at the conclusion of the Public Information Centre. A copy of the attendance register, comment sheets, and subsequent public correspondence is provided in **Appendix E**.

The second PIC was generally well received by those who attended. Comments and concerns that were provided to the Study Team by the public during the formal presentation phase of the PIC, along with the Study Team's responses, are provided in **Appendix E**. Relevant concerns were reviewed for consideration in the evaluation and assessment of alternative solutions.

2.6.8 First Nations

As part of the EA public consultation process First Nations were contacted directly by Halton Region via a letter on October 7, 2009 to inform them of the Guelph Line (Regional Road 1) Transportation Corridor Class Environmental Assessment study and to provide them with notice of the first PIC. The letter encouraged the First Nations to provide relevant comments related to the study and pertaining to any areas of potential Aboriginal uses and/or activities. The letter also enquired as to any outstanding First Nation land claims within or in proximity to the study area, or any additional First Nations that should be contacted as part of the EA process.

The following affiliate First Nations were contacted as part of the EA public consultation process:

Mississaugas Nation

- Alderville First Nation
- Curve Lake First Nation
- Hiawatha First Nation
- Mississaugas of Scugog Island First Nation
- Mississaugas of the New Credit First Nation

Iroquois

- Mohawks of Akwesashe First Nation
- Oneida Nation of the Thames
- Six Nations Haudenosaunee Confederacy Council
- Six Nations of the Grand River
- The Mohawks of the Bay of Quinte First Nation
- Wahta Mohawks First Nation

A second letter from Halton Region was sent to First Nations on March 15, 2010 as part of the public consultation process for the Guelph Line Class EA study. The letter included a copy of the Stage 1 Archaeological Assessment of the entire study corridor (Refer to **Appendix F**). A Stage 2 archaeological field assessment is recommended prior to construction activities. The letter further noted that the archaeological assessment study indicated that no previously registered archaeological sites were identified within the limits of the study area.

The First Nations were informed that a Cultural and Built Heritage investigation was completed, confirming that construction would not be expected to impact any heritage built features or cultural landscape units. Finally, the letter provided the place, date and time for the second Public Information Centre (6:30 p.m. on Tuesday, April 20, 2010 at Kilbride Public School, 6611 Panton Street, Burlington, Ontario), outlining the purpose of the PIC and encouraging the First Nations to attend the PIC or provide comments on the study. The First Nations were also informed that they would be notified when the Environmental Study Report was filed for the 45-day public review period. A copy of the correspondence letters to the First Nations is provided in **Appendix F**.

3. EXISTING CONDITIONS

3.1 Natural Environment

The Class EA process requires that the existing natural environment be evaluated to determine potential negative impacts on the existing and future features and functions of the natural environment. The natural environment components include the existing vegetation, wildlife habitat, existing drainage features, aquatic habitat, sedimentation and erosion control and special consideration for environmentally sensitive areas. The evaluation process also requires that mitigation measures are explored to minimize the impacts on the natural environment and surrounding landscape and maximize the benefits to the community.

The predominant land uses within the study area are a mix of agricultural, rural residential, commercial, and natural lands. The study area is located within the upper portion of the Limestone Creek subwatershed within the Bronte Creek Watershed. In the northern portion of the study area, Guelph Line is traversed by one tributary of the west branch of Limestone Creek. Further downstream, the west branch travels near the southwest limit of the study area.

The *Natural Sciences Report* component of the EA is required in order to determine if the proposed improvements will have any impact on the natural environment. From this perspective, the study area was reviewed in general with specific criteria evaluated for the recommended alternative including the following:

- Aquatic Habitat and Fisheries (including significant species);
- Terrestrial Features (valleylands, wetlands, significant woodlots, ANSIs, ESAs & greenlands, and significant species);
- Wildlife (birds, herpetofauna, mammals); and
- Natural Heritage System (Greenbelt Plan Area, core areas, natural corridors, potential linkages, secondary linkages, other woodlots/wetlands and potential (unevaluated) wetlands.

Supporting documents that have been consulted for relevant natural heritage data include:

- Bronte Creek Hydrology and Stream Morphology Study (BCHMS, PEIL, 2003);
- Bronte Creek Watershed Study (BCWS, Conservation Halton, 2002); and
- Halton Natural Areas Inventory (NAI) Volumes 1 and 2 (Dwyer, 2006).

The Ministry of Natural Resources and the Halton Region Conservation Authority were also contacted for existing natural heritage information which has been incorporated into this report.

The complete *Natural Sciences Report* is provided in **Appendix G**.

3.1.1 Physiography and Soils

An assessment of the physiography in the study area was conducted by reviewing the relevant background documents noted above. The documents reviewed for each section of the following discussion are referenced at the end of each paragraph.

The physiography of the Bronte Creek Watershed is dominated by the Niagara Escarpment which runs on a north–south axis through Halton Region and divides many of the watercourses in the area into lower and upper reaches. In terms of bedrock geology, three formations make up the watershed. The Queenston Formation, comprised of red shale, underlies the lower portion of the watershed below the escarpment and forms the scarp's lower slopes. The Cataract Group, comprised of sandstone, dolostone, and shale, overlies the Queenston Formation and is exposed on the escarpment face. The Amabel Formation, comprised of erosion resistant dolostone, overlies the other formations, forms the upper scarp face, and underlies the upper portion of the watershed above the escarpment. (Conservation Halton, 2002; Dwyer, 2006; PEIL, 2003)

The northern portion of the study area is located within the Flamborough Limestone Plain physiographic region which occupies the majority of the Bronte Creek Watershed above the escarpment. Shallow Wentworth Till consisting of boulder till, sand, and gravel generally overlies the plain leading to the formation of stony, shallow soils. As these soils are unfavourable for agriculture, widespread forest cover exists across the plain associated with numerous wetlands and adjacent upland areas. Together, the shallow permeable soils and wetlands as well as bedrock fractures allow significant groundwater recharge and discharge across the plain. The southern portion of the study area is located within a Spillway physiographic region. This feature contains deep sand and gravel accumulations deposited along glacial spillways which allow groundwater discharge into Bronte Creek and the midstream reaches of Limestone Creek. (Conservation Halton, 2002)

An assessment of the soils and drainage in the study area was conducted by reviewing the relevant soils map for the area (Canada Department of Agriculture; 1971). According to the mapping, six different soil types are present in the subject lands. The northern portion of the study area near Conservation Road is comprised of very to exceedingly stony, well drained loam on complex topography with 5 to 9 percent slopes. Loams are also present further south in the area where the tributaries of Limestone Creek converge and traverse Guelph Line; however, these loams are variably to poorly drained, less stony, and are present on flatter topography (0 to 5 percent slopes). The southern portion of the study area is comprised of moderately stony, well drained sandy loam on complex topography with 5 to 9 percent slopes. Additionally, a very poorly drained organic mesisol is located at the southwest limit of the study area that corresponds to the downstream reach of the west branch of Limestone Creek.

3.1.2 Aquatic Habitat and Fisheries

As noted above, various unnamed tributaries of the west branch of Limestone Creek converge and traverse Guelph Line in the upper portion of the study area. Mapping contained in both the Bronte Creek Watershed Study (Conservation Halton, 2002) and the Halton NAI (Dwyer, 2006) displays various headwater tributaries on the east side of Guelph Line; however, their number and alignments are not consistent. Additionally, although both sources display widening of a channel into a small waterbody just upstream of the road, they differ in terms of the location of the waterbody relative to the tributaries. Both sources indicated that Crawford Lake is part of the system (either online or origin) and show confluences and/or interconnections of the tributaries into two that cross the road. Site visits confirmed the southern crossing via a small culvert, however, there is no indication based on historical records and current field searches that a northern culvert exists at the pond location (*Appendix C – Natural Sciences Report – Site Photographs*). Further, the engineering drawings corresponding to the design alternatives for the project do not indicate a northern culvert crossing. As such, it appears that only one crossing exists. Based on the mapping, the location of the putative additional crossing would link the wetland with an open water zone that is present on the east side of Guelph Line (upstream) to wetland (without open water) that is present on the road's west side (downstream). Given these observations, it is possible that a historical linkage has been severed by the road leading to the current local hydrology.

In addition to the northern tributaries, a downstream reach of the west branch of Limestone Creek is present near the southwestern limit of the study area. However, as it is located outside of the study area approximately 80 metres west of Guelph Line and was not evaluated for this report.

3.1.2.1 Historical Data

The Bronte Creek Watershed, which includes the Limestone Creek subwatershed, has been evaluated in several studies dating back to 1960. The Bronte Creek Watershed Study (BCWS) prepared by Conservation Halton in 2002 provided a comprehensive evaluation of the watershed and its aquatic habitat through the incorporation of historical findings, as well as, new data gathered from 1998 to 2001 in support of the study. In 2003, *Planning & Engineering Initiatives Ltd. (PEIL)* completed the Bronte Creek Hydrology and Stream Morphology Study (BCHMS) on behalf of Conservation Halton. The following, is a discussion of the aquatic conditions present in Limestone Creek based on a review of the 2002 and 2003 reports.

The west branch of Limestone Creek begins northwest of the study area in the Guelph Junction Woods Environmentally Sensitive Area (ESA). The watercourse flows southeast and enters a glacial outwash valley associated with the Calcium Pits ESA/ANSI located west of Guelph Line. The ESA also encompasses portions of the Crawford Lake/Calcium Pits Provincially Significant Wetland (PSW) Complex. Within the ESA, the creek bends northeast then back southeast

circumventing a till moraine and then travels near the southwest limit of the study area. Just south of the study area, the watercourse bends northeast again and flows over the Niagara Escarpment (a natural fish barrier) at Guelph Line before its confluence with the east branch of the creek upstream of Derry Road. The tributary of the west branch that traverses the study area originates east of Guelph Line in a portion of the Crawford Lake/Rattlesnake Point Escarpment Woods ESA/ANSI that encompasses a portion of the Crawford Lake/Calcium Pits PSW Complex. The tributary flows south under Guelph Line, merges with another tributary that extends south from the wetland present on the west side of the road and then joins the west branch of the creek just east of Twiss Road. In general, the west branch exhibits extensive forest cover with some adjacent agricultural land use. Although flows in the west branch are augmented by groundwater discharge, more significant groundwater contributions into the creek occur in the reach of the main branch located between the confluence of the east and west branches and Derry Road. Downstream of Derry Road, the main branch of the creek travels through predominantly agricultural lands with limited forest cover before discharging into Bronte Creek upstream of 4 Side Road (Conservation Halton, 2002; PEIL, 2003).

Mapping contained in the BCWS and the Halton NAI (Dwyer, 2006) indicates that the tributaries flow through wetland present on the east and west side of Guelph Line. A review of the Halton NAI, BCWS and recent correspondence from Conservation Halton (*January 4, 2010; Appendix A – Natural Sciences Report*) identifies the wetland as part of the Crawford Lake/Calcium Pits PSW Complex. The NAI classified the wetland as Shallow Marsh (MAS) and Open Aquatic (OAO) under the Ecological Land Classification for Southern Ontario (ELC) protocols (Lee et. al., 1998). The roadside surveys conducted for this report confirmed this classification and noted white cedar (Thuja occidentalis) as the dominate tree species in the wetland area in association with cattails (Typha latifolia), Sugar Maple (Acer saccharum var. saccharum) and Green Ash (Fraxinus pennsylvanica).

As discussed above, mapping contained in various sources display multiple tributaries connected/disconnected at Guelph Line on different alignments. Although the lands could not be accessed, it appears on the 2009 aerial imagery recently received GIS data from Conservation Halton that the alignment contained in the NAI mapping is not accurate. The Conservation Halton GIS data indicates multiple channels that converge into one branch approximately 150 metres southeast of the PSW and cross Guelph Line as one channel via a (~500 mm) corrugated steel culvert at Guelph Line.

An instream temperature survey conducted for the BCWS at nine stations in Limestone Creek indicated that the west branch, due to groundwater inputs at its headwaters and in its downstream reaches below the escarpment, provides coolwater habitat along its length. A coolwater temperature regime was also found in the east branch due to groundwater inputs. Downstream of the confluence of the two branches, warmer temperatures that approach the coolwater/warmwater margin near the creek's outlet into Bronte Creek were recorded due to the limited forest cover along the main branch. It was noted in the study that "the [measured]

coolwater habitat conditions upstream of Derry Road do not correspond with the healthy Brook Trout populations (coldwater habitat indicator) [found] through these reaches" (Conservation Halton, 2002).

Fish community sampling was conducted at three stations in Limestone Creek (two in the west branch and one in the main branch) for the BCWS in order to *"…qualitatively assess changes in fish community composition from the headwaters of [the creek] to [its] confluence with the main branch of Bronte Creek"* (Conservation Halton, 2002). Additionally, the data was used to evaluate changes in the fish community over time through comparison with historical studies. According to the report, the creek *"supports a diverse coldwater fish community highlighted by the presence of salmonids from its headwaters downstream to its confluence with Bronte Creek"*.

In the west branch, Brook Trout were common and migrating Rainbow Trout and Chinook Salmon were found as far upstream as the escarpment. Similar communities were found in the east branch below the east branch dam. In the main branch, in addition to the migrating species noted above, Brook Trout were common upstream of Walkers Line and Brown Trout were found downstream of Derry Road. Numerous forage fish species such as Rainbow Darter, Fantail Darter, Stonecat, Common Shiner, Northern Hog Sucker, White Sucker, and Creek Chub were found throughout the watercourse. Notably, the study indicates that Limestone Creek is a significant spawning ground and nursery for the Rainbow Trout population in Lake Ontario. As well, the study points to historical Coho Salmon reproduction in the creek. The full fish community data presented in the BCWS has been included in *Appendix B – Natural Sciences Report* for reference purposes.

According to correspondence from Conservation Halton to R and R Associates Inc. dated December 22, 2009 (*Appendix A – Natural Sciences Report*), the Ontario Ministry of Natural Resources may have concerns regarding Redside Dace (Clinostomus elongatus; S2, END), Atlantic Salmon (Salmo salar; SX, EXP), and American Eel (Anguilla rostrata; S1, END) populations in Limestone Creek. According to the BCWS, Redside Dace was relatively common in the upper portions of the Bronte Creek Watershed until the early 1970s; however, the resident population appears to have declined and contracted since then as only three records of the species have been recorded since 1990 despite sampling at former known sites. The report indicated that, presently, Redside Dace appears to be limited to a reach of Bronte Creek and one of its tributary systems south and west of Limestone Creek. Atlantic Salmon, which used to be abundant in the Bronte Creek Watershed, has been extirpated from Lake Ontario and its tributaries since the late 1800s (BCWS, 2002). According to the BCWS, Atlantic Salmon fry were stocked in Bronte Creek and Willoughby Creek from 1997 to 2000 in an effort to re-establish the species in the watershed. However, no indication was given as to the success of the program. The status of American Eel in the watershed is unclear as there is no discussion of the species in the BCWS. No records of Redside Dace or Atlantic Salmon are included in the BCWS fisheries data for Limestone Creek; however American Eel has been

found in the creek below the escarpment (*Appendix B – Natural Sciences Report*). Correspondence from OMNR dated June 7, 2010 (*Appendix A – Natural Sciences Report*) indicated that there are no fish species of concern within the study area. Species and their respective habitat that receive protection under the Endangered Species Act 2007 may require a permit should the proposed alternative cause harm to these species or their habitat.

Benthic invertebrate sampling conducted for the BCWS according to the BioMAP protocols (Griffiths, 1999) at three stations in Limestone Creek indicated that the water quality in the watercourse was non-impaired to slightly impaired. However, it was noted that the benthic indices used in the evaluation may not be entirely appropriate for the upstream station (downstream of the study area) given the characteristics of that reach of the creek (low gradient, non-gravel bottom) and a reference condition approach was recommended for future monitoring. Nevertheless, the benthic study results in Limestone Creek appeared to correlate well with the instream temperature and fish community studies as healthy, diverse fish communities such as that found in Limestone Creek were generally found in reaches with non-impaired or slightly impaired water quality throughout the watershed (BCWS, 2002).

Overall aquatic ecosystem health in the Bronte Creek Watershed was evaluated in the BCWS (2002) using the factors outlined above as well as water chemistry, instream habitat, and riparian cover parameters. The vast majority of the reaches of Limestone Creek upstream of Derry Road (including the reaches in the study area) were rated as having high aquatic ecosystem health while downstream of Derry Road the main branch of the creek was rated as having moderate health and tributaries to the main branch were rated as having poor health. Limited riparian cover, livestock access, and channelization were given as reasons for the lower ratings downstream of Derry Road. Riparian plantings were recommended to improve the conditions downstream of Derry Road and to help maintain coolwater habitat to the confluence with Bronte Creek.

A fluvial geomorphological assessment of Limestone Creek conducted for the BCHMS indicated that, although there are relatively few concerns for the creek on the whole, significant bank slumping is present in the creek's lower reaches near Bronte Creek where livestock access occurs and farm crossings are located. Additionally, the limited riparian buffer further upstream on the main channel was noted as having the potential to cause channel alterations. Restrictions to cattle and machinery access to the creek as well as public education on these matters was recommended to prevent further bank and bed alterations in the lower reaches. Although site descriptions and Rosgen classifications were provided in the study for seven stations on the creek, none were located in or near the study area as they were all below the escarpment.

Flow, sediment transport, and erosion were also studied throughout the watershed in the BCHMS. In terms of flow and sediment transport, the study found that, in general, bankfull dimensions were as expected, bedloads in the watershed are made up of many different

materials, suspended solids concentrations in the creeks are relatively low, and the watercourses were transporting sediment efficiently. Further, the report indicated that as suspended sediment is being transported through the watercourses, it is not collecting on the creek beds where it could degrade aquatic habitat. It was concluded that the watercourses are in equilibrium with the current flow regimes. Results of the erosion analysis from the study indicated little bank retreat in the watercourses over the study period. However, of the seven sites studied on Limestone Creek (as above, all were below the escarpment), three were assigned a Moderate Erosion Sensitivity-High Erosion Risk rating and one near the mouth of the creek was given a High Erosion Sensitivity rating.

3.1.2.2 Field Assessment

The Limestone Creek tributaries and the associated wetlands were examined during the field surveys completed for this study. The northern tributary which according to mapping would traverse Guelph Line at the wetland appears to be disconnected from the historic downstream by Guelph Line and no longer provides a surface connection from Crawford Lake. As a result, extensive ponding has occurred on the east side of Guelph Line, contributing to the PSW identified in the area (*Appendix C – Natural Sciences Report – Site Photographs*). The tributary currently flows southwest parallel to Guelph Line, crossing beneath the Bruce Trail where it converges with a second unnamed tributary and crosses Guelph Line via a 500 mm diameter corrugated steel culvert. The tributaries are approximately 260 metres apart and meander through an undisturbed/minimally impacted environment. As discussed above, various tributaries of Limestone Creek converge near Guelph Line and join the main channel near Twiss Road. One relatively large culvert (~500 mm diameter) appears to carry the bulk of the flows from the east side of Guelph Line. Ample riparian cover is present between Crawford Lake and the main branch connecting to Limestone Creek.

Roadside drainage is variable along Guelph Line ranging from defined swales to leveled shoulders. Based on the topography of the road and variability in roadside drainage, it is difficult to determine the hydrologic surface linkage between the roadside runoff and the existing surface water hydrologic features. However, given the proximity of the wetland pond feature to the road, it should be presumed that there is direct runoff from the road into both the wetland and the tributary crossing beneath Guelph Line.

Wetland areas immediately adjacent to Guelph Line were present on both the east and west sides of the road approximately 400 metres south of Steeles Avenue. East of Guelph Line, the slope from the road's edge to the edge of the open water pond was approximately 2:1 with primarily herbaceous vegetation coverage. Loose gravelly soil was evident beneath the vegetation and gravel could be seen extending 30 to 50 centimetres into the water. Given the direct roadside drainage, it is likely that a portion of the gravel is coming from the road. Aquatic vegetation at the water's edge was limited to detritus, algae and cattails. Small fish and tadpoles were visible during the spring field surveys; however, no fish data was collected.

Historical data from 2009 provided by Conservation Halton indicated an abundance of Pumpkinseed (Leponis gibbosus) within the wetland pond. No other species were recorded during that sampling event and there was no other data provided by Conservation Halton for this location. Standing snags and wildlife trails were evident along the road and wetland edges. The wetland area west of Guelph Line did not contain any open water and consisted primarily of marsh vegetation types. As there is no direct linkage (i.e. culvert) between the two wetland areas, it is unclear as to the origins of the western wetland area. It is possible, given the karst topography that a subsurface flow exists beneath the road.

The tributary traversing beneath Guelph Line is located approximately 225 metres south of the open wetland. There was no historical fisheries data for the small tributary at the crossing beneath Guelph Line; however, the channel was noted to be flowing during both the fall and spring field surveys and had the potential to support local fish populations. Conservation Halton data indicated that fish sampling was completed in 2009 at a sampling site located approximately 200 metres downstream (west) of the Guelph Line, below the steep ravine. The data confirmed the presence of Blacknose dace (Rhinichthys atratulus) and Brook stickleback (Culaea inconstans) at this location.

The majority of the historical fisheries data provided by Conservation Halton was recorded from the Crawford Lake area and within the downstream reaches of Limestone Creek, in locations well beyond the study area limits. The diversity of fish species was considerably higher within the downstream reaches of Limestone Creek below the escarpment. An assessment of the fisheries habitat characteristics and water quality was conducted at the point of convergence of the main channel where the channel crosses Guelph Line. In general, aquatic organisms require pH levels between 5 and 9, dissolved oxygen levels above 5 mg/L, conductivity levels below 1600 µS/cm, and total dissolved solids (TDS) levels below 1000 ppm although fish spawning can be affected by lower levels of conductivity and TDS. (See **Table 3-1**)

Table 3-1: General Water Quality Data

Parameter	Eastern Pond/wetland 06/03/2010	Limestone Creek at Bruce Trail 06/03/200	Limestone Creek at Guelph Line (10/20/2009)[5]	Limestone Creek at Guelph Line (06 /03 /2010)
Temperature (^{o}C)	22.8	20.0	10.3	19.1
Conductivity (µS/cm)	1426	649.8	742.4	641.2
TDS (ppm)	1001	444.5	516.9	439.5
pH	8.24	7.60	7.05	7.82
Dissolved Oxygen (mg/L)	7.97	3.53	12.02	5.07

[5] Measurements taken approximately three (3) metres upstream of the Guelph Line culvert.

While most parameters were within the tolerable range, the dissolved oxygen was considerably lower within Limestone Creek during the spring field survey. This result could be due to the difference in temperature or the relative contribution of groundwater as the tributary meanders through the wooded area. Conductivity was considerably lower in Limestone Creek than in the open water pond along Guelph Line.

The Limestone Creek tributary upstream of Guelph Line meanders through a heavily wooded portion of the Crawford Lake Conservation Area, traversing beneath the Bruce Trail through a small culvert before reaching Guelph Line. The watercourse wetted width ranged from 80 centimetres to 1.27 metres depending upon the season with a max depth of approximately 15 centimetres. The channel banks were low and heavily vegetated suggesting that the channel likely overtops the low-flow banks spreading into the adjacent floodplain during peak rainfall events. While the instream vegetation was limited to grasses and sedges, the canopy cover was robust shading approximately 90 percent of the channel with the only direct exposure near the Guelph Line crossing. The channel substrate consisted of cobble and rock (70 percent) with gravel and a minor sand component. During rainy periods the water depth appears to be sufficient to allow fish passage between the rocks, however, during low flow periods, the rocks may form a barrier to movement. The channel was stable both upstream and downstream of Guelph Line. West of Guelph Line the channel drops into a steep ravine system and meanders west through a heavily vegetated ravine.

There are three vernal pools identified within the study area, two of which have confirmed presence of Jefferson Salamander (Ambystoma jeffersonianum), a threatened species. The vernal pool located south of Conservation Road is approximately 90 metres east of Guelph Line within the Crawford Lake Conservation Area. Impacts to this vernal pool are not anticipated given the distance between the proposed works on Guelph Line and the vernal pool. The second vernal pool with confirmed presence of Jefferson Salamander is located approximately 10 metres east of Guelph Line, 100 metres south of the eastern wetland pond. The vernal pool is large and well shaded. There is an earthern and rock berm between the road and the vernal pool, as well as, debris. The upland area surrounding the vernal pool provides excellent habitat for adult salamanders. Several species of frogs and dragonflies were observed during the spring site visits.

3.1.2.3 Summary

Based on the historical data provided by Conservation Halton and the field assessments completed for this study, both the wetland system and the Limestone Creek tributary appear to be productive in terms of fish habitat, provide suitable aquatic habitat for a variety of species and are not limited by surrounding land uses or existing riparian buffer. The vernal pools support amphibian breeding and juvenile development and the surrounding upland area provides excellent adult habitat for a variety of amphibians and reptiles.

3.1.3 Terrestrial Ecosystems

The portion of Guelph Line within the study area extends from Conservation Road in the north to approximately one kilometre north of Derry Road, encompassing both natural conservation lands with heavily wooded riparian features and open, active agricultural areas with limited tree cover and rural residential development.

3.1.3.1 Historical Data

The Halton Natural Areas Inventory (2006) and the Bronte Creek Watershed Study (2002) have completed extensive evaluation and mapping of the vegetation communities throughout the Bronte Creek watershed which includes the vegetation communities within the Limestone Creek subwatershed. The Crawford Lake Rattlesnake Point Escarpment Woods (NAI-18) is located east of Guelph Line while Calcium Pits (NAI-19) is adjacent to the western side of Guelph Line. The NAI report (2006) documented ninety-seven plant communities in NAI-18 and twenty plant communities in NAI-19, including a number of significant plant communities in both natural areas. The vegetation community data is also summarized in the Halton Region Environmentally Sensitive Areas Consolidation Report (2005).

3.1.3.2 Field Assessment

Field investigations and air photo interpretation determined the geographical extent, composition, structure and function of vegetation communities on and adjacent to the study area. A review of vegetation communities presented in the Halton Natural Areas Inventory-Detailed ELC Mapping (2005) was undertaken for the study area. Air photos were also used to interpret and determine the limits and characteristics of vegetation communities found abutting Guelph Line.

Guelph Line traverses through several ecological land classification (ELC) polygons, specifically identified in map sheets BM080, BN081, and BO081 (*Appendix B – Natural Sciences Report*). The predominant polygons abutting Guelph Line within the study area are: Deciduous Mixed Forest, Mixed Forest, Treed Talus, Shallow Marsh, Deciduous Swamp, Cultural Plantation and Cultural Meadow, with the main branch of Crawford Lake traversing through a Mixed Forest polygon. The field evaluations completed for this study confirmed the ELC designations that had been assigned to the various areas along Guelph Line and documented the dominant and abundant species within these areas.

A roadside vegetation inventory was conducted for all lands within ten to twenty metres from the existing road in fall of 2009 and in June of 2010 where access was possible. Private land ownership prohibited the ability to complete comprehensive surveys beyond the road allowance in most areas. No additional (ELC) was completed for this report as the proposed road

improvements are primarily limited to the existing road footprint such that the ELC polygons identified in the historical reports will remain intact.

An inventory of the vegetation identified during the field site visits has been included in Appendix B for reference purposes. There were no threatened or endangered vegetation species identified within the right of way.

An inventory of the vegetation identified during the field site visits has been included in *Appendix B – Natural Sciences Report* for reference purposes. There were no threatened or endangered vegetation species identified within the right of way.

3.1.4 Wildlife and Wildlife Habitat

3.1.4.1 Historical Data

The BCWS Natural Heritage Report (*Appendix B – Natural Sciences Report*) lists rare species occurrences for all NAI's within the Halton Region. Specifically Appendix 1 contained in Appendix 7 of the BCWS lists flora and fauna occurrences for the Crawford Lake/Rattlesnake Point Escarpment Woods which encompasses the areas identified as NAI 18 and 19. Appendix 1 of the BCWS lists 38 rare vascular plants species, 2 rare species of reptile and amphibians, and 1 rare mammal occurrence.

The study area is evenly divided by anthropegenic uses of rural farmland, rural residential areas and a commercial aggregate operation. The remaining portion of the study area is of ecologically sensitive origin with multiple significant natural heritage features. Wildlife habitat throughout the study area is typical of undisturbed forest and interior forest habitat. The most significant habitat consists of the cliffs and talus slopes of Rattlesnake Point, the Niagara Escarpment Milton Outlier, Lowville Re-entrant Valley, meromictic Crawford Lake and Calcium Pits (BCWS, 2002).

The natural areas surrounding the watercourses and the woodlot provide nesting and dwelling habitat for many wildlife species including birds, mammals and herpetofauna. Wildlife expected to be found within the study limits include wildlife species that exhibit a tolerance for human activity, and wildlife species which require large tracts of undisturbed habitat. The Fauna Inventory presented in *Appendix B – Natural Sciences Report* details the species of wildlife that were documented within the project limits based on the current study and historical records.

Data supplied by Conservation Halton confirmed the presence of the Jefferson Salamander (Ambystoma jeffersonianum) within 10 metres of the road widening. This species is currently identified as threatened according to OMNR and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). While the Jefferson Salamander was not identified in the field inventories conducted for this study, there is suitable habitat within the study area as this

species prefers undisturbed closed canopy deciduous forests, ephemeral wetlands, and vernal pools as breeding habitat.

Correspondence from the Ministry of Natural Resources dated June 7, 2010 (*Appendix A – Natural Sciences Report*) indicated that there were historical records of a number of Species at Risk recorded within the study area. Species at Risk identified included the Snapping Turtle (Chelydra serpentina), Milksnake (Lampropeltis triangulum triangulum), Butternut (Juglans cinerea), Eastern Ribbonsnake (Thamnophis sauritus) and Jefferson Salamander (Ambystoma jeffersonianum). The Natural heritage features recorded in the study area include the Lowville Re-entrant Valley ANSI, Crawford Lake – Milton Outlier Valley ANSI, Crawford Lake Conservation Area, the Provincially Significant Crawford Lake and Calcium Pits Wetland Complex, Calcium Pits ESA and Crawford Lake – Rattlesnake Point Escarpment Woods ESA.

As previously discussed, Redside Dace has also been recorded south of the study area. With the exception of these species, no bird, amphibian or mammal species located within the study area are considered to be of provincial or regional significance according to the Natural Heritage Information Centre (NHIC) Provincial Rankings (SRANK) and the OMNR status list. The valley systems associated with the Limestone Creek main branch and its tributaries provide connectivity to upstream and downstream habitat.

According to the Halton Natural Areas Inventory (2006), NAI-18, defined as the Crawford Lake-rattlesnake Point Escarpment Woods and Extensions, provides a rich habitat supporting diverse flora and fauna, many of which are native. In terms of species richness, NAI-18 supports twenty-six species of butterflies, twelve native species of dragonflies and damselflies, thirty native herpetofaunal and a total of one hundred and six breeding birds, including twenty-three interior species. Twenty-four mammal species were also recorded in NAI-18, all of which are native species. The significant species within this area have been summarized in the NAI (2006) report (pages 124-127).

3.1.4.2 Field Assessment

Field surveys conducted in June 2010 confirmed the presence of American Toad (Bufo americanus), Western Chorus Frog (Pseudacris triseriata), Green Frog (Rana clamitans) and Northern Leopard Frog (Rana pipiens), as well as, Red-back Salamanders (Plethodon cinereus). As well, several mammals and/or tracks were recorded during the site visits completed in fall of 2009 and spring of 2010. Numerous dreys were observed in the woodland canopy indicating the site offers suitable habitat for squirrels. Various standing snags, tree cavities and a number of stick nests were also observed in the woodland indicating current and potential habitat for nesting birds. Although no deer were observed directly, White-tailed Deer (Odocoileus virginianus) are also utilizing the property as evidenced by their tracks in various locations. Mast and berry producers in the woodlot and thicket areas provide a food source for various mammalian and avian species.

South of the Crawford Lake Conservation Area, the surrounding landscape transitions to agricultural uses, including active fields, mowed lawns and fallow fields. While these areas provide suitable habitat for a variety of small mammals and a variety of birds, there are no water features or wooded areas within the southern portion of the study area. As such, the wildlife habitat diversity is very limited on the southern portion of the study area.

Avifaunal surveys were completed in the fall of 2009 and the spring of 2010 and included an assessment of the potential habitat along Guelph Line. The surveys were limited to the areas along the road in order to determine which species are actively utilizing the lands adjacent to the road and those that may be impacted by the proposed road works. The avifaunal species present in the study area are a mixture of open country and woodland species. The observed woodland species were at the edge of their habitat in the large woodlot.

Thirty-four avian species, five herptofaunal species, and two mammalian species were observed or heard during the site visits completed for this study. The majority of species identified were ranked as common nationally, provincially, and regionally according to the Natural Heritage Information Centre (2008) and supporting documentation. The species lists include those fauna identified on the site and on adjacent lands and include species expected but not observed based on range and habitat availability. Additionally, historical data for the area from the Ontario Breeding Bird Atlas (OBBA), Ontario Partners in Flight (PIF), the SARO and NHIC databases, Bird Studies Canada and the Audobon Christmas Bird Count (CBC) databases is presented in the bird inventory. A search of the NHIC database confirmed historical records of rare, threatened or extirpated wildlife species within an approximately one kilometre radius of the subject lands. The NHIC database information is presented in *Appendix B – Natural Sciences Report*. None of these species were identified during the field assessments completed for this study; however, Conservation Halton has confirmed the presence of Jefferson salamander in recent years. The bird survey confirmed the presence of Barn Swallow, a high priority candidate due for assessment in April of 2011. Eastern Wood-Peewee and Wood Thrush are also identified as high priority candidates, while the Belted Kingfisher is classified as mid-priority.

Several avifaunal species identified within the study area are candidates for assessment by COSEWIC. This designation indicates that they are species of concern but require further evaluation. Of the candidate species, Eastern Wood-Pewee (Contopus virens) and Wood Thrush (Hylocichla mustelina), are High Priority Candidates. Eastern Wood-Pewee belongs to the aerial insectivore group of birds which have undergone dramatic declines in population numbers over the last twenty years. The reason for the decline is not clear. Several aerial insectivore species were observed in the study area due to the presence of habitat that supports diverse food sources. Other woodland area-sensitive birds included the Veery (Catharus fuscescens) and the Ovenbird (Seiurus aurocapilla). Species of interest utilizing the wetland area include Belted Kingfisher (Ceryle alcyon) which is considered Mid-Priority under COSEWIC and Barn Swallow (Hirundo rustica) which is a COSEWIC High Priority Candidate under review.

Area-sensitive species either require a large area of suitable habitat for breeding or breed in higher densities in such areas. These species generally will not breed in what appears to be suitable habitat if it is not part of a much larger tract, irrespective of the size of their home ranges which can be quite small. The significance of area-sensitive species is that they act as indicators of the overall health of the landscape, and quality of the habitat (Environment Canada, 2007).

Four observed bird species have been identified by Ontario Partners in Flight (OPIF) or Bird Studies Canada (BSC) as species of conservation concern. These include Savannah Sparrow, Wood Thrush, Eastern Wood Peewee and Belted Kingfisher. It is important to note however, that both the OPIF and BSC rankings, in and of themselves, confer no protection under the PPS or other applicable regulations and policies. Rather, they are meant to be used as guides in identifying habitat and features that may be subject to the policies and regulations.

Partners in Flight (PIF), established in 1990 as a response to declining neotropical bird species, now includes all landbirds and PIF partnerships now extend throughout North and Central America. The PIF mission is to keep common birds common, to help species at risk, and to work in partnership for birds, habitat, and people. Assessment scores and prioritization methods are provided by the PIF Science Committee (Canada, USA, and Mexico). In Canada PIF activities are coordinated by a National Working Group. In Ontario this conservation initiative began in 1995. A partnership of government and nongovernmental agencies produced a bird conservation plan for Ontario that was published in 1997 as the Ontario “Flight Plan”. Priority species lists for southern Ontario were subsequently produced by Bird Studies Canada (Couturier, 1999). The current plan, OPIF, builds on these earlier efforts with data provided by the Canadian Wildlife Service, the Breeding Bird Survey, the Ontario Breeding Bird Atlas, Christmas Bird Counts, and others. The plan is positioned within the North American Bird Conservation Initiative (NABCI) Bird Conservation Region (BCR) planning framework where southern Ontario is identified as BCR 13. OPIF identifies 42 species that regularly breed and/or winter in ON BCR13. For each species the OPIF plan identifies a category (forest, grassland/agricultural, shrub/successional, and/or aerial insectivore), lays out reasons for concern, sets overall conservation objectives, and recommends action. The intent is to both facilitate and evaluate implementation of landbird conservation efforts in ON BCR 13.

The purpose of the Bird Studies Canada rankings is to assist municipalities in identifying natural heritage features, in particular significant wildlife habitat and significant woodlands, by using bird species that have been deemed of conservation concern. A species level of conservation concern was arrived at by a screening process through 3 main criteria: its range distribution and importance of a particular region to the overall range; the biological characteristics that make it vulnerable; and its habitat area requirements. Species are separated into 3 broad categories: forest, marsh, and open country, and within each category are 4 levels of conservation priority with Level 1 being the highest level of concern. All species within each category are considered to be of equal conservation importance. These conservation priorities were incorporated into

OPIF. All wildlife data and historical reports and information are presented in Appendix B of the *Natural Sciences Report* for reference purposes.

Significant Wildlife Habitat – Four general types of significant wildlife habitat may be designated according to the PPS including migration corridors, seasonal concentration areas, rare or specialized habitat, and habitat for species of conservation concern. The MNR description of the four categories of significant wildlife habitat is presented in *Appendix G – Natural Sciences Report (Section 2.5.6 - Table 3: OMNR Descriptions of Significant Wildlife Habitat)*. Based on the MNR defined criteria, the wetland areas, localized vernal pools and the surrounding woodland areas provide for seasonal concentration areas, habitat of species of conservation concern and animal movement corridors. However, as these features are outside of the proposed work area, the relatively impacts are deemed negligible as none of the identified features or functions will be altered.

3.1.5 Designated Natural Areas

3.1.5.1 Greenbelt and Niagara Escarpment Plans

According to mapping contained within the Greenbelt Plan (2005), the study area is located within the Niagara Escarpment Plan Area on both sides of Guelph Line and to the east and west at Derry Road and Conservation Road. The Niagara Escarpment Plan (2008) mapping depicts the portion of the study area within the Niagara Escarpment Plan Area as Escarpment Natural Area, Escarpment Protection Area and Public Land within the Area of Development Control. Transportation facilities are permitted within the Escarpment Areas according to the policies contained within the Niagara Escarpment Plan.

3.1.5.2 Greenlands

ROPA 38 (Five-Year Regional Official Plan Review) identifies the Escarpment Natural Area and Escarpment Protection Area within the study area and Prime Agricultural Area adjacent to Guelph Line. Additionally, the Official Plan of the Town of Milton identifies Greenlands A and Greenlands B in the study area. The Greenlands A area appears to correspond with the main channel and portions of the tributaries of Limestone Creek and Crawford Lake and also correspond to a provincially significant wetland polygon identified in the Official Plan on the north and south side of Guelph Line. The Greenlands B designation appears to encompass the overall areas of NAI 18 and 19 and correspond with the Regional Woodlands Mapping.

3.1.5.3 Environmentally Sensitive Areas (ESAs)

The Region of Halton designates Environmentally Sensitive Areas (ESAs) based on criteria contained in the ROPA 38 (Five-Year Regional Official Plan Review). The study area lies between two Regionally designated ESA's. The Regional Municipality of Halton identifies the

study area as ESA No. 18 (Crawford Lake-Rattlesnake Point Escarpment Woods and Extensions) and ESA No. 19 (Calcium Pits and Extension). Guelph Line which lies within the middle of the study area represents the border between ESA 18 and ESA 19.

3.1.5.4 Valleylands

There are no significant valleylands identified within the study area according to the agency mapping; however, the steep terrain adjacent to the tributary of Limestone Creek west of Guelph Line provides a valley corridor and connectivity from the woodland area to the lands west of Guelph Line.

3.1.5.5 Wetlands

Figure A1 from the ROPA 38 (Five-Year Regional Official Plan Review) identifies a wetland polygon in the study area on the north and south side of Guelph Line labeled 'Provincially Significant'. Mapping in the BCWS identifies a similar polygon designated also as Provincially Significant Wetland. The identified PSW directly abutting the north and south sides of Guelph Line is identified as the Crawford Lake and Calcium Pits Provincially Significant Wetland Complex.

3.1.5.6 Woodlands

Figure A2 from the Appendix to the ROPA 38 (Five-Year Regional Official Plan Review) displays Guelph Line bisecting a woodland greater than 0.5 hectares in size. Detailed information regarding the Crawford Lake Conservation Area and adjacent lands is presented in the Halton Natural Areas Inventory. The woodlands within the study area provide diverse habitat for flora and fauna.

3.1.5.7 Areas of Natural and Scientific Interest (ANSIs)

There are two ANSI's located in or adjacent to the study area. The identified ANSI's within the vicinity of the study area are the Crawford Lake-Lowville Re-Entrant Valley (Earth Science) ANSI and Crawford Lake-Milton Outlier Valley (Life Science) ANSI.

3.2 Social Environment

3.2.1 Noise

The Ministry of Environment (MOE) does not have noise guidelines specifically relating to the construction or widening of roadways. However, the MOE does have a protocol with the Ministry of Transportation (MTO) relating to Provincial Highway Expansions. The protocol states that the primary objective is to achieve sound exposures not exceeding 55 dBA or the

preconstruction ambient sound exposure, whichever is higher, at outdoor receptor locations. In addition to the absolute sound exposure, changes are also considered. Changes of 0 to 3 dBA are considered insignificant; 4 to 5 dBA are just noticeable and considered minor; 10 dBA and above are considered significant. The MOE/MTO protocol indicates that no mitigation is required for sound exposure increases of 0 to 5 dBA. Increases in excess of 5 dBA require investigation into the feasibility of effective noise mitigation. (For example, to be implemented, a sound barrier must be shown to provide at least 5 dBA of attenuation).

An environmental noise assessment study was carried out as part of this Class EA process to determine the existing and projected future noise levels at a number of property locations adjacent to Guelph Line within the study area. Details on the noise assessment study are provided in **Section 7.3.3**. The complete environmental noise assessment report is provided in **Appendix H**.

3.2.2 Community/Recreation

Currently, there are no community centres or facilities located within or adjacent to the study area.

In terms of recreational parks and open space areas, the Crawford Lake Conservation Area located at 3115 Conservation Road (formerly Steeles Avenue) in Milton is situated to the north of the study area. Crawford Lake Conservation Area is one of six primary parks maintained by Conservation Halton with well-developed facilities for recreation and education including hiking and biking trails. Open all year from 10 a.m. to 4 p.m., Crawford Lake is a 232 hectare park established in 1969 on the Niagara Escarpment in Milton. The park is a Regionally Environmentally Sensitive Area and Provincial Area of Natural and Scientific Interest. The park is also part of the World Biosphere Reserve as part of Niagara Escarpment including a rare meromictic lake with surrounding boardwalk.

Crawford Lake contains one of the most accurately dated pre-contact archeological sites in Canada in the form of a 15th century reconstructed Iroquoian Village and heritage site. Other features include the Nassagaweya Canyon Interpretive Lookout and 19 kilometres of hiking and cross-country skiing and snowshoeing trails with connections to Bruce Trail, elevated boardwalk with interpretation stations surrounding Crawford Lake, education programs and exhibits, and a Visitors Centre and Gathering Place facilities with Gift Shop, theatres, lunchrooms, exhibits, displays and outdoor picnic areas.

3.3 Economic Environment

3.3.1 Land Use

The study area lies within the Halton Region and Town of Milton Official Plan areas. Guelph Line traverses through and adjacent to several distinct Provincial Plan and municipal land use designations. The following land use designations, shown by jurisdiction, currently form part of the Official Plans for Halton Region and the Town of Milton.

Province of Ontario

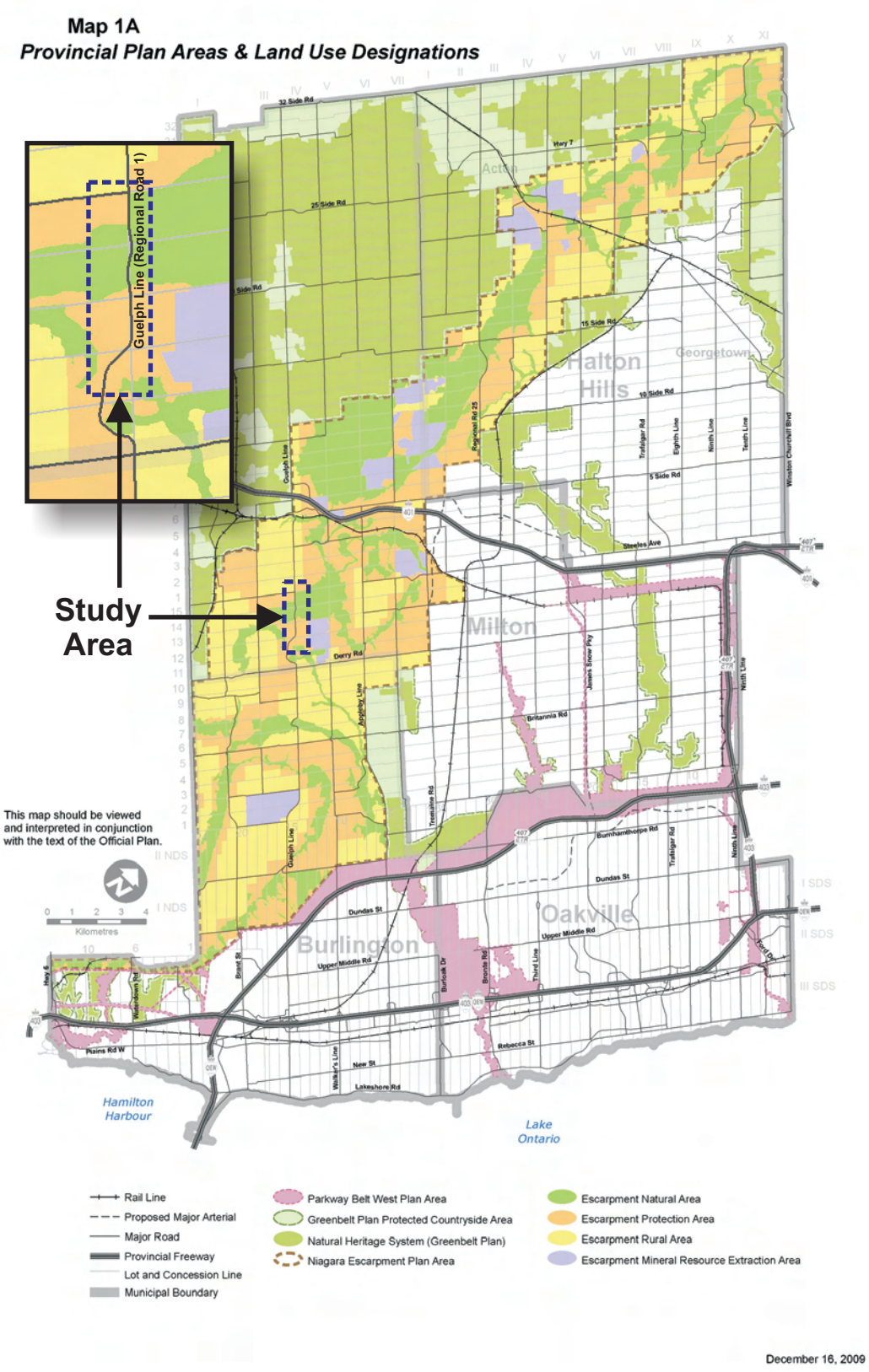
For the most part, the areas surrounding the Guelph Line study area are designated by the Province of Ontario as "Escarpment Protection Area" and "Escarpment Natural Area". The Provincial land use designation is illustrated in "Map 1A" of the ROPA 38 (Five-Year Regional Official Plan Review) (December 16, 2009), reproduced herein as **Figure 3-1**.

Halton Region

The areas adjacent to the Guelph Line study area include natural heritage system features designated as "Key Features within Natural Heritage System", and "Remaining Natural Heritage System". Guelph Line also traverses through an identified "Prime Agricultural Area". The Regional land use designations are illustrated in "Map 1E" and "Map 1G" of the ROPA 38 (Five-Year Regional Official Plan Review) (December 16, 2009), reproduced herein as **Figures 3-2** and **3-3**.

Town of Milton

The Guelph Line study area, lies within the Town of Milton (Nelson Rural District), with Conservation Road (formerly Steeles Avenue) forming the northern boundary with the Nassagaweya Rural District. Land Use designations north of and adjacent to Guelph Line include "Escarpment Rural Area", "Escarpment Natural Area" and "Escarpment Rural Area". "Environmentally Sensitive Areas" are noted directly adjacent to Guelph Line through the Escarpment Natural Areas. The Town of Milton land use designations are illustrated in "Schedule A" and "Schedule D1" of the Town of Milton Official Plan (August 2008), reproduced herein as **Figures 3-4** and **3-5**.



Halton REGION

NTS

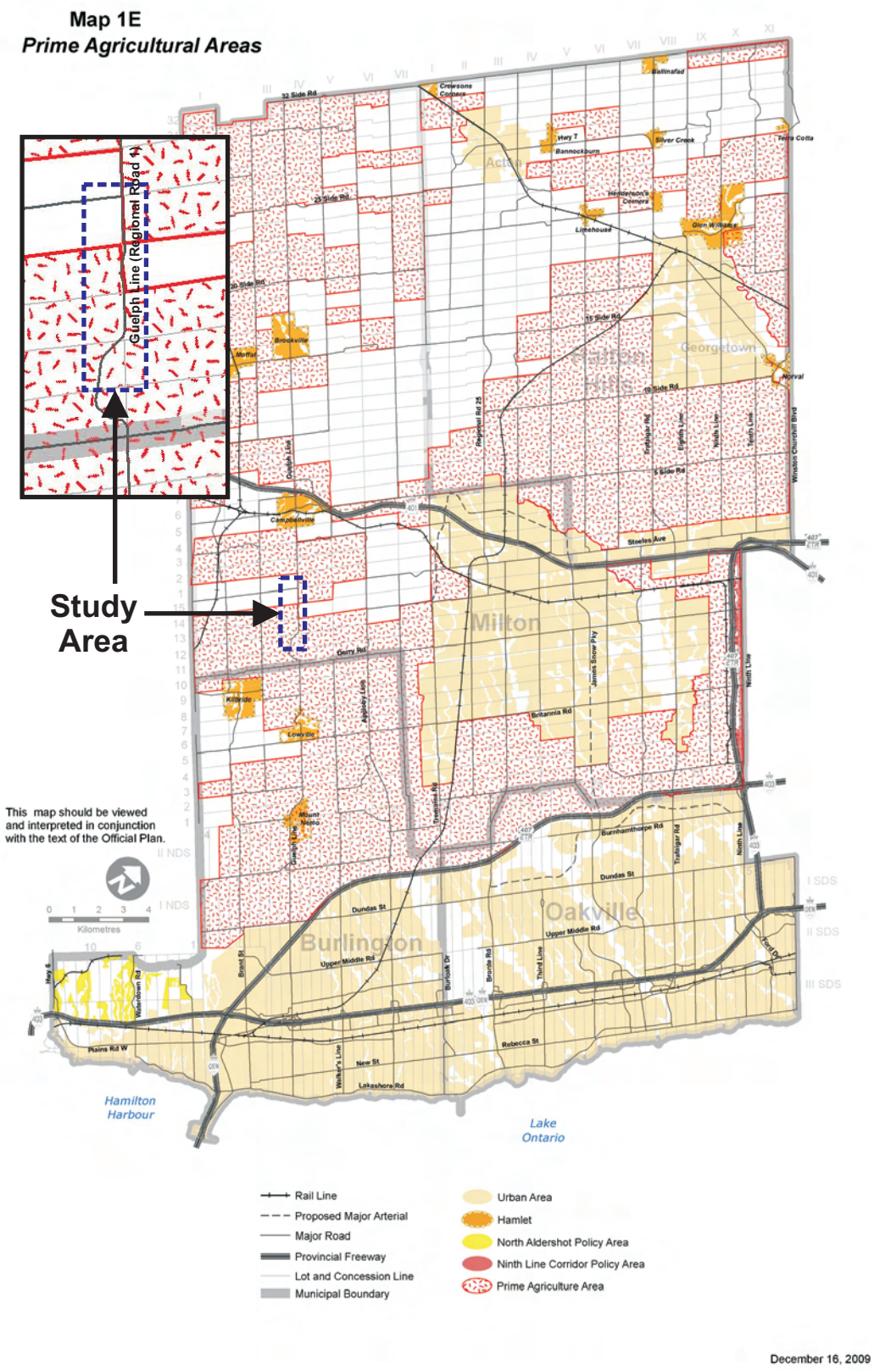
Guelph Line (Regional Road 1) Transportation Corridor Improvements

Figure 3-1

PROVINCIAL AND REGIONAL LAND USE DESIGNATIONS (MAP 1A)

November 2010

IBI ASSOCIATES



Halton REGION

NTS

Guelph Line (Regional Road 1) Transportation Corridor Improvements

Figure 3-2

REGIONAL LAND USE DESIGNATIONS (MAP 1E)

November 2010

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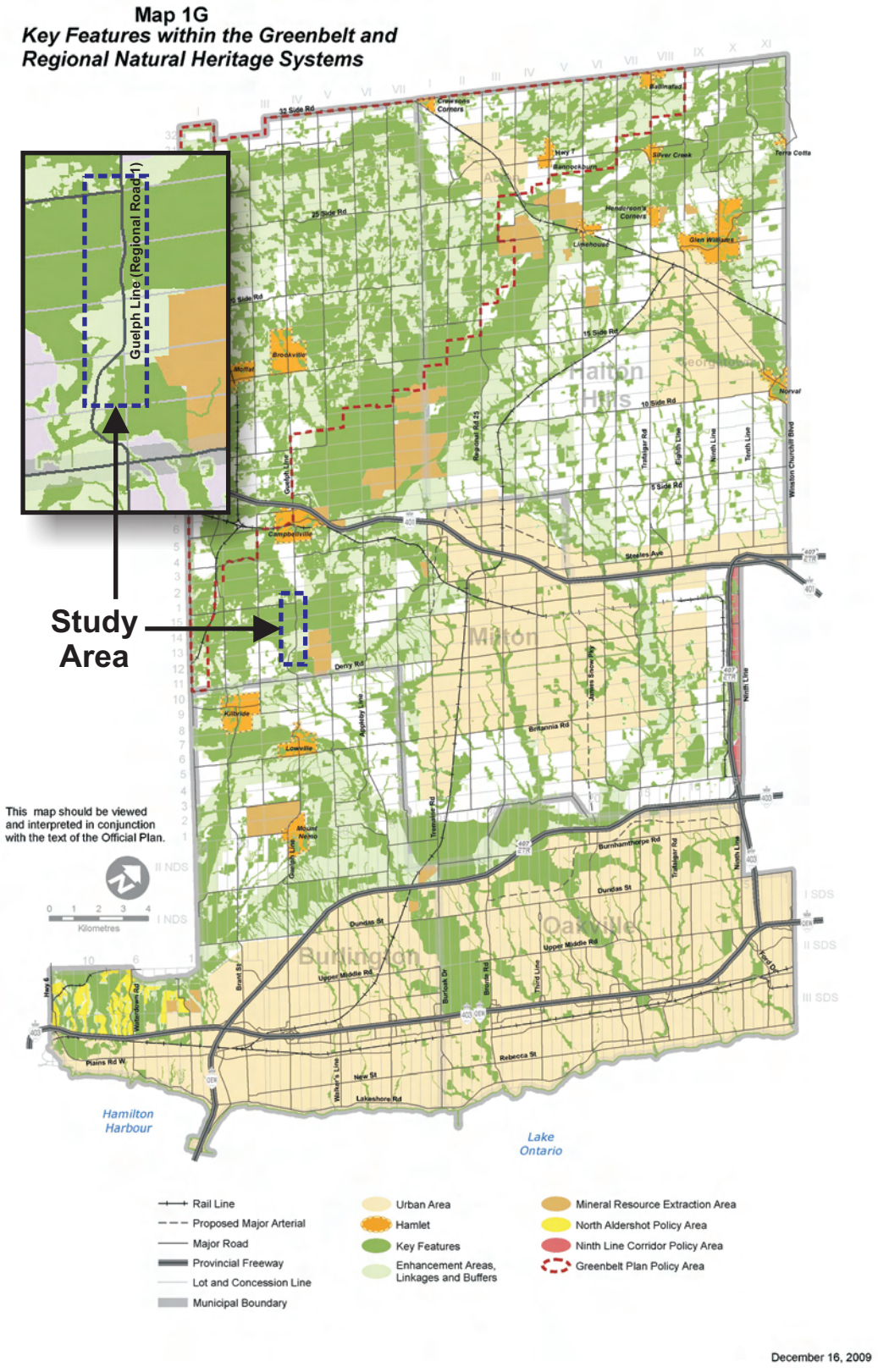


Halton Region

NTS

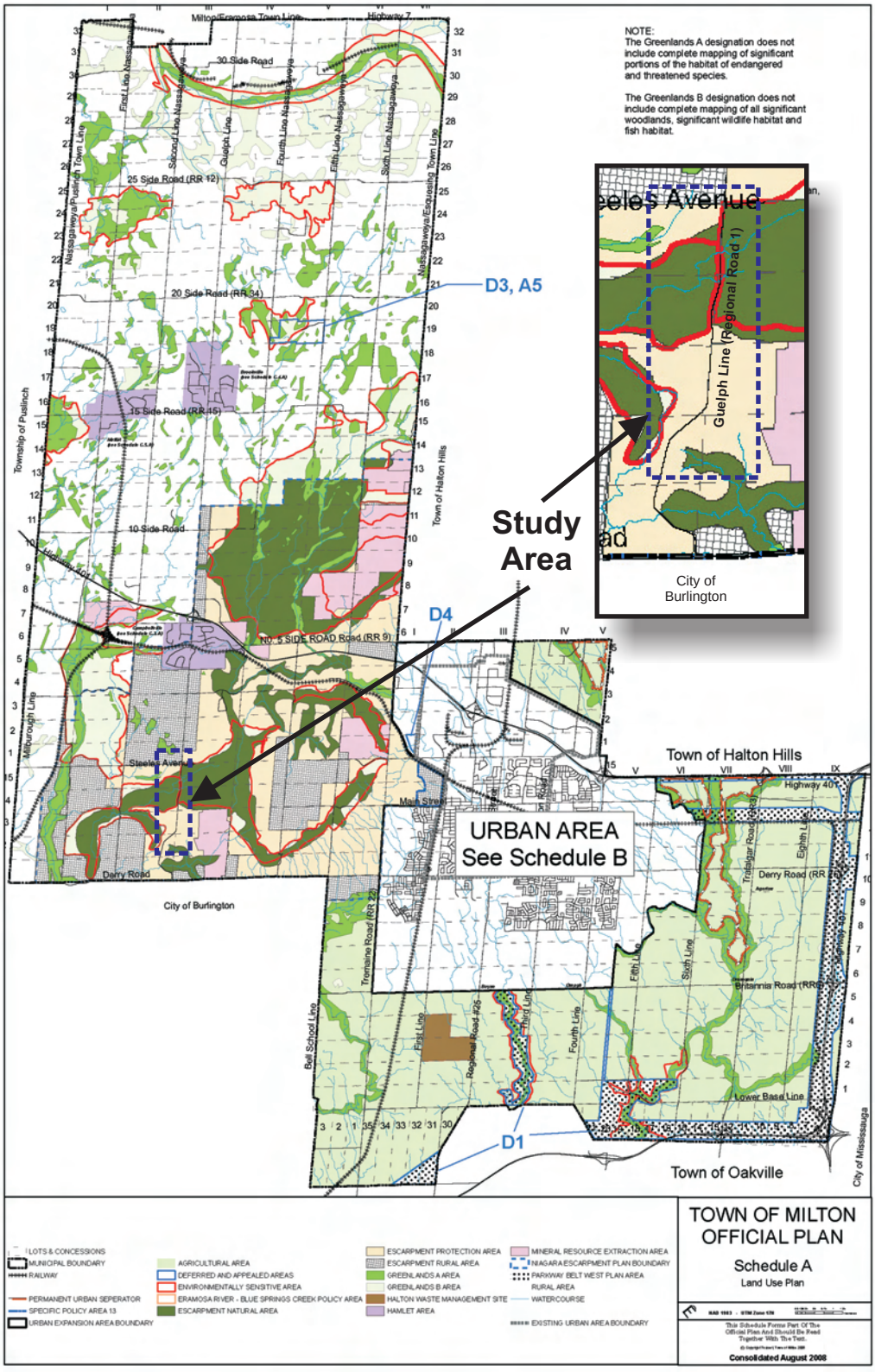
Guelph Line (Regional Road 1) Transportation Corridor Improvements

Figure 3-3

REGIONAL LAND USE DESIGNATIONS (MAP 1G)

November 2010

IR Associates



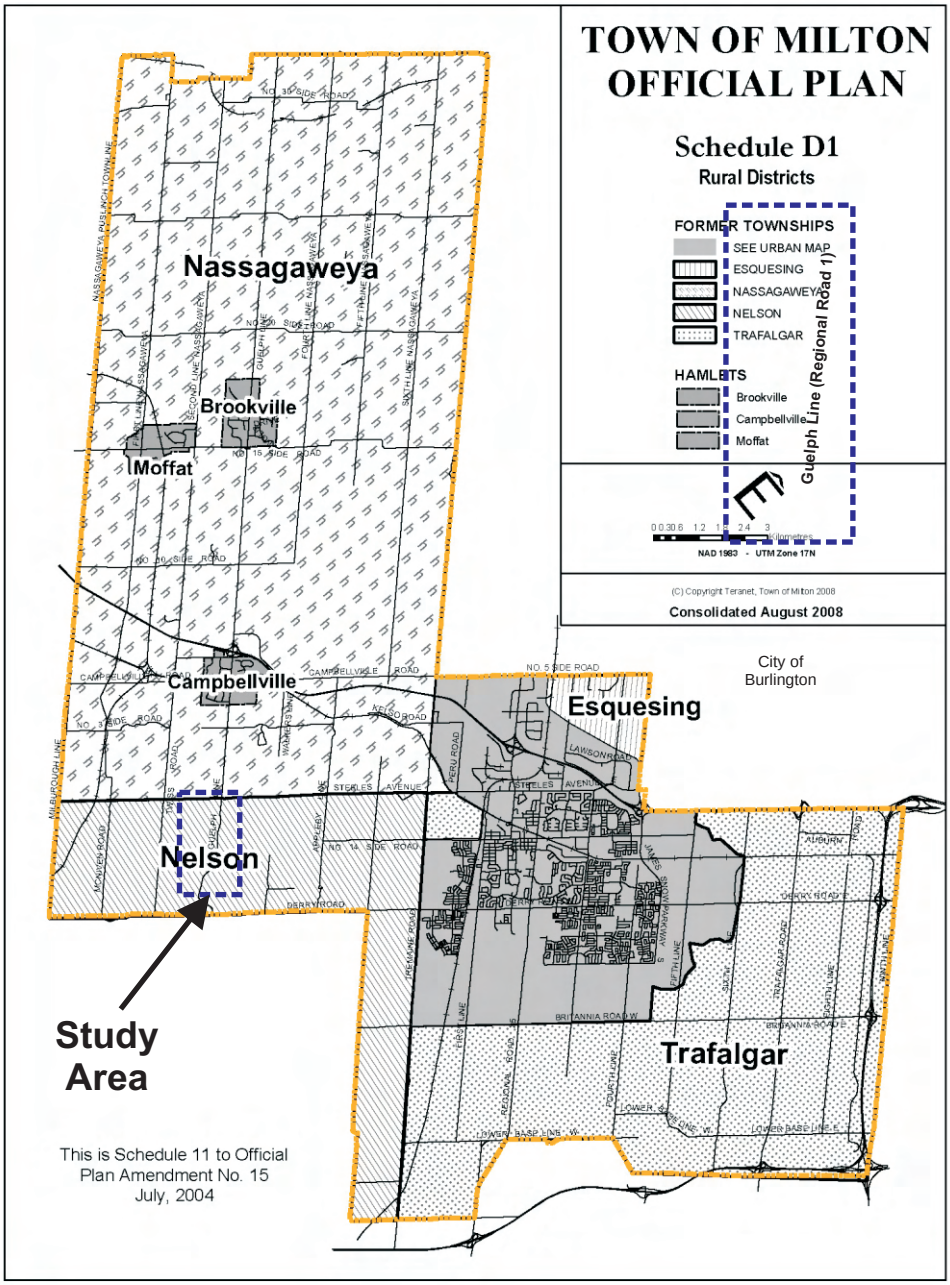
NTS

Guelph Line (Regional Road 1) Transportation Corridor Improvements

Figure 3-4

TOWN OF MILTON LAND USE DESIGNATIONS (SCHEDULE A)

November 2010



NTS

Guelph Line (Regional Road 1) Transportation Corridor Improvements

Figure 3-5

TOWN OF MILTON LAND USE DESIGNATIONS (SCHEDULE D1)

November 2010

3.3.2 Existing Commercial Uses

There are two main commercial (agricultural) operations located within the study area including Stonehaven Farms located at 7388 Guelph Line (west side of the study area) and Rol-Land Farms located at 7345 Guelph Line. Stonehaven Farms is a large-scale working berry farm with an on-site market and bakery. Rol-Land Farms is Canada's largest mushroom producer.

3.3.3 Potential Future Development

The current land use designation adjacent to the Guelph Line corridor is "Natural Heritage System" in accordance with the ROPA 38 (Five-Year Regional Official Plan Review). It is not anticipated that future commercial development will occur within the study area corridor.

3.4 Cultural Environment

3.4.1 Archaeological Resources

As part of the Class Environmental Assessment, a Stage 1 Archaeological Assessment of the study area was conducted in accordance with the *Ontario Heritage Act* (2005) and the Ontario Ministry of Culture's (MCL) *Draft Standards and Guidelines for Consultant Archaeologists* (2009). A Stage 1 Archaeological Assessment involves a background study to provide detailed documentary research on the archaeological and land use history and present conditions of the study area. Specifically, the background study provides information about previous archaeological fieldwork within and around the study area, its geography and history, and current land conditions.

3.4.1.1 Background Research

In order that an inventory of archaeological resources could be compiled for the study corridor, three primary sources of information were consulted including the site record forms for registered sites housed at the MCL; published and unpublished documentary sources; and the files of Archaeological Services Inc. In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (OASD) maintained by the MCL.

This database contains archaeological sites registered within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and longitude. A Borden block is approximately 13 kilometres east to west, and approximately 18.5 kilometres north to south. Each Borden block is referenced by a four-letter designator, and sites within a block are numbered sequentially as they are found. The study corridor under review is located in Borden block "AiGx". According to the OASD, seven archaeological sites have been registered within one kilometre of the study corridor, none of which are located immediately adjacent to the corridor. The list of registered archaeological sites is provided in **Table 3-2**.

Table 3-2: List of Registered Sites within 1 Kilometre of the Study Corridor

Borden #	Site Name	Cultural Affiliation	Site Type	Researcher
AiGx-6	Crawford Lake	Aboriginal – Woodland	Village	W. Finlayson n.d.
AiGx-9	Plunge Pool	Aboriginal – Woodland	Undetermined	MIA 1975, 1985
AiGx-67	Strawberry Patch	Aboriginal – Woodland	Undetermined	MIA 1985
AiGx-89	Crawford Lake 2	Aboriginal – Woodland	Campsite	MIA 1985
AiGx-138	Plunge Pool 2	Unknown	Undetermined	MIA 1985
AiGx-139	Plunge Pool 3	Unknown	Undetermined	MIA 1985
AiGx-159	Cedar Acres	Aboriginal - Woodland	Undetermined	S. Janusas 1989

3.4.1.2 Geography

The study corridor is situated within the Niagara Escarpment Physiographic Region (Chapman and Putman 1984: 114-122), which extends from the Niagara River to the northern tip of the Bruce Peninsula, continuing through the Manitoulin Islands. Vertical cliffs along the brow mostly outline the edge of the dolostone of the Lockport and Amabel Formations, which the slopes below are carved in red shale. Flanked by landscapes of glacial origin, the rock-hewn topography stands in striking contrast, and its steep-sided valleys are strongly suggestive of non-glacial regions. While the escarpment stands out boldly in the Niagara Peninsula and along the shore of Georgian Bay, there is an intervening area in which the slopes are mantled by morainic deposits, particularly in Mono and Mulmur Townships, and in the Town of Caledon, long stretches are almost completely hidden.

The study corridor is located within the area of the escarpment that increases in elevation from 240 metres to 440 metres a.s.l. In this section, the escarpment is cut by numerous creeks, and several fairly large valleys are found near Waterdown, Lowville, Campbellville, and Limehouse. There are also several mesa-like outliers of the escarpment, the largest one located near Milton, has an area of about 10 square kilometres and is separated from the main body of the upland by a deep valley partially filled with glacial stream deposits. The promontory at the southern end of this valley is known as Rattlesnake Point (Chapman and Putman 1984: 115).

Potable water is the single most important resource necessary for any extended human occupation or settlement. Since water sources have remained relatively stable in southeastern Ontario after the Pleistocene era, proximity to water can be regarded as a useful index for the evaluation of archaeological site potential. Indeed, distance from water has been one of the most commonly used variables for predictive modeling of site location.

The MCL's *Draft Standards and Guidelines for Consultant Archaeologists* (2009:5) stipulates that primary water sources (lakes, rivers, streams, creeks, etc.), secondary water sources

(intermittent streams and creeks, springs, marshes, swamps, etc.), ancient water sources (glacial lake shorelines indicated by the presence of raised sand or gravel beach ridges, relic river or stream channels indicated by clear dip or swale in the topography, shorelines of drained lakes or marshes, cobble beaches, etc.), as well as accessible or inaccessible shorelines (high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh, etc.) are characteristics that indicate archaeological potential. Crawford Lake is located approximately 250 metres northeast of the intersection Guelph Line and Conservation Road (formerly Steeles Avenue), and a tributary of Bronte Creek bisects Guelph Line.

Other geographic characteristics that can indicate archaeological potential include: elevated topography (eskers, drumlins, large knolls, plateaux), pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground, distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases. There may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings. Resource areas, including; food or medicinal plants (migratory routes, spawning areas, prairie) and scarce raw materials (quartz, copper, ochre, or outcrops of chert) are also considered characteristics that indicate archaeological potential (MCL 2009:5-6).

Therefore, due to the proximity of Crawford Lake and a tributary of Bronte Creek, much of the study corridor has potential for recovery of Aboriginal cultural material.

3.4.1.3 Land Use History

The study corridor is located within the Township of Nelson, Halton County. Historical research revealed that the land which encompassed the Township of Nelson contains a long and well-documented history extending to the early nineteenth century. The 1877 *Illustrated Historical Atlas of the County of Halton, Ontario* (Walker & Miles)[6] was reviewed to determine the potential for the presence of historical archaeological remains within the study corridor during the nineteenth century. Historically, the study corridor is located on part of Lots 12 to 15, between the road allowance for Concessions III and IV, in the former Township of Nelson, Halton County. The atlas depicts several property owners/residents and historic features adjacent to the study corridor as listed in **Table 3-3**.

[6] Stage 1 Archaeological Assessment Report - Figure 2: The study corridor overlaid on the map of Nelson Township.

Table 3-3:
Summary of Property Owners and Historic Features Adjacent to the Study Corridor

Concession	Lot	Property Owners	Historic Features
III	12	Thomas Coulson S.P. Coulson Parsonage	Homestead, orchard
	13	John Richardson	Homestead
	14	Mrs. Charles Langford	Homestead, orchard
	15	Alexander Whitley John Patterson	
IV	13	R.P. Coulson Thomas Dales	Homestead, orchard Homestead, orchard
	14	Dennis Hunter	Homestead, orchard
	15	Robert B. Ireland Samuel Dice Richard Corrigan	

Additional details on the land use history are provided in the *Stage 1 Archaeological Assessment Report* located in **Appendix I**.

3.4.1.4 Archaeological Potential Evaluation

The MCL's *Draft Standards and Guidelines for Consultant Archaeologists* list characteristics that indicate where archaeological resources are most likely to be found (2009: 5-6). Archaeological potential is confirmed when one or more features of archaeological potential are present. Per Section 1.3.1 of the MCL standards and guidelines, the study corridor meets three of the criteria used for determining archaeological potential:

- Water sources: primary water source, or secondary water source; or past water source (i.e. Crawford Lake, tributary of Bronte Creek);
- Areas of early Euro-Canadian settlement (i.e. numerous early 19th century homesteads); and
- Early historical transportation routes (i.e. Guelph Line).

These criteria characterize the study corridor as having potential for the identification of Aboriginal and Euro-Canadian archaeological sites.

3.4.1.5 Property Inspection

A property inspection of the study corridor was conducted by Peter Carruthers (P163), ASI, on November 6, 2009, in order to gain first-hand knowledge of its geography, topography, and current conditions, and to evaluate and map its archaeological potential.

Based on the results of the property inspection, it was determined that the Guelph Line right-of-way has been subject to extensive and deep land alterations. The Niagara Escarpment cuts across the northern end of the Guelph Line corridor, and the lands adjacent to the right-of-way consist of rocky uneven terrain. However, minimal disturbances have occurred at the southern half of the corridor and at the west and south corners of the Guelph Line and Conservation Road (formerly Steeles Avenue) intersection.

3.4.1.6 Conclusions

Based on the results of the *Stage 1 Archaeological Assessment*, the following conclusions were determined:

- The existing Guelph Line right-of-way does not retain archaeological site potential due to previous ground disturbances. Additional archaeological assessment is therefore not required along this portion of the study corridor; and

- If construction extends beyond the disturbed right-of-way, a Stage 2 assessment is recommended on any lands within the study corridor where there is potential for archaeological sites (See Appendix I of the ESR – *Stage 1 Archaeological Assessment Report, Figures 4 to 6: areas marked in green*), in accordance with Ministry of Culture's Draft Standards and Guidelines for Consultant Archaeologists (MCL 2009).

Additional information on the *Stage 1 Archaeological Assessment*, including detailed graphical plots of the assessment are provided in **Appendix I**.

3.4.2 Built Heritage Resources and Cultural Heritage Landscapes

The purpose of a cultural heritage resource assessment was to identify built heritage resources and cultural heritage landscapes potentially impacted by the undertaking and to develop appropriate mitigation measures to minimize any negative effects. Background research was undertaken and a site visit was conducted to complete the identification of built heritage resources for the Guelph Line study area.

A review of background historical research and the Town of Milton's heritage inventory was completed to document the land use history of the study corridor and to inventory any previously identified cultural heritage resources. This review confirmed that the study corridor is historically

located on part of Lots 12 to 15, between the road allowance for Concessions III and IV, in the former Township of Nelson, Halton County. The Township of Nelson experienced Euro-Canadian settlement activities in the early nineteenth century, and by the end of the century, the township had flourished as an ideal place for agricultural land use activities. The 1877 historical atlas maps confirms that lands adjacent to the study corridor had been cleared and developed into farmstead properties, featuring homestead structures and landscape features such as orchards.

The results of the field review confirmed that the study corridor retains visual, landscape, and structural reminders of this rural nineteenth century land use history. Six cultural heritage resources were identified adjacent to the Guelph Line road right-of-way. **Table 3-4** provides a description of the identified features. Additional photographic inventories of the various properties, matched by feature identifier, along with mapping illustrating the locations of each property is provided in **Appendix I**.

Table 3-4:
Identified Built Heritage Resources (BHR) and Cultural Heritage Landscapes (CHL)

Feature	Location	Feature Type	Description/Comments
BHR 1	7279 Guelph Line	Residence	Identified during the field review. One and a half storey residence of frame construction featuring a salt-box roof line and internal brick chimney.
BHR 2	7447 Guelph Line	Residence	Identified in the Town of Milton's Heritage Inventory. Two and a half storey brick residence with hipped roof line and central gabled dormer. Frontispiece, rear accretion and rear veranda are indicative of a late nineteenth century construction date.
CHL 1	7219 Guelph Line	Farmstead	Identified in the Town of Milton's Heritage Inventory. One and a half storey residence with cross-gabled roof line and of frame construction. Its original, low-hanging roof line is indicative of an early twentieth century construction, which is reinforced by its notable set back from the road right-of-way and mature vegetation.
CHL 2	7372 Guelph Line	Farmstead	Identified in the Town of Milton's Heritage Inventory. This property consists of a two storey, Georgian-styled, stone residence set well back from the road right-of-way. There are additional outbuildings to the rear of the residence. The entrance drive to the residence is flanked by mature maples which are of heritage interest.
CHL 3	7388 Guelph	Residence	Identified in the Town of Milton's Heritage Inventory. This property consists of a one and a half storey

Table 3-4:
Identified Built Heritage Resources (BHR) and Cultural Heritage Landscapes (CHL)

Feature	Location	Feature Type	Description/Comments
	Line		frame residence and constructed in the Ontario Gothic farmhouse style. It is set well back from the road right-of-way but landscape features, such as the entrance drive, adjacent farm fields and a windbreak consisting of Norway Spruce are of heritage interest.
CHL 4	7518 Guelph Line	Residence	Identified in the Town of Milton's Heritage Inventory. This property consists of a one and a half storey stone farmhouse with rear accretion and several agricultural-related outbuildings. The structures are located in close proximity to the road right-of-way, as are several landscape elements such as mature trees and fence lines.

3.5 Transportation Facilities

3.5.1 Existing Road Network

The location of the study area, in the context of the Regional and local road network, is illustrated in **Figure 3-6**. The project limits include the Guelph Line corridor, extending from Conservation Road, southerly to one kilometre north of Derry Road in the Town of Milton, Ontario. Guelph Line (Regional Road 1) is under the jurisdiction of the Regional Municipality of Halton and is designated as a Major Arterial roadway in accordance with the Halton Region Official Plan and Halton Region Transportation Master Plan (HTMP), 2004.

Within the Town of Milton, Guelph Line travels in a north-south direction, beginning in the north at 32 Side Road (Regional Road 32) and traveling southerly to terminate at Lakeshore Road in the City of Burlington. The road serves as a significant link between the two municipalities. Guelph Line connects with the Regional road network in the south at Derry Road (Regional Road 7) and then continues south into the City of Burlington. Completing the local Regional road network, Twiss Road (Regional Road 24) extends southerly from Derry Road into the City of Burlington. The remaining roadways north and south of Derry Road are under the jurisdiction of the Town of Milton and City of Burlington, respectively. These area roads are mainly designated Collector and Local roadways under their respective jurisdictions. For the most part, these municipal roads maintain two lane rural cross-sections.

Guelph Line is a two lane rural roadway within the study corridor with a posted speed limit of 60 km/hr. Beyond the southern limit of the study area, traffic signal control is provided at the intersection of Guelph Line and Derry Road. Exclusive left turn lanes are provided at all approaches to this intersection. At the northern limit of the study area, the unsignalized

intersection at Conservation Road (formerly Steeles Avenue) is controlled via a two-way STOP control on the minor approaches (i.e. Conservation Road eastbound and westbound directions).

Figure 3-6: Transportation Network

3.5.2 Transit Service

At the present time, there are no local Milton Transit or GO Transit services operating within the study limits.

3.5.3 Cycling Network and Pedestrian Facilities

There are currently no dedicated cycling or pedestrian facilities located along Guelph Line within the study area limits.

3.5.4 Traffic Operations Analysis

The traffic operations analysis encompassed an assessment of the existing and future traffic conditions within the study area including the determination of operating speeds, a review of intersection operations, potential remedial measures required to alleviate traffic congestion, and the need for modifications to existing traffic controls.

3.5.4.1 Existing Traffic Data

Traffic data used in undertaking the traffic operations analysis was provided by Halton Region as follows:

Peak Period Turning Movement and Automatic Traffic Recorder Counts

Existing traffic volumes at the intersections were obtained from current turning movement counts (TMCs). The TMCs included the weekday morning (AM) and afternoon (PM) peak periods for the following intersections:

- Guelph Line (Regional Road 1) at Conservation Road (27-May-2009); and
- Guelph Line (Regional Road 1) at Derry Road (Regional Road 7) (7-May-2009).

Automatic Traffic Recorder (ATR) roadway Average Daily Traffic (ADT) volumes were provided at the following location:

- Count ID #100112 – Guelph Line (Regional Road 1) between Derry Road (Regional Road7) and Conservation Road (formerly Steeles Avenue) (30-Apr-2008).

Vehicle Speed Data

Vehicle speed data (in both northbound and southbound directions) were provided at the following location:

- Guelph Line (Regional Road 1) between Derry Road (Regional Road 7) and Conservation Road (formerly Steeles Avenue) (30-Apr-2008).

Traffic Signal Timings

Traffic signal phasing and timing for the existing traffic signal at the intersection of Guelph Line (Regional Road 1) and Derry Road (Regional Road 7) was provided by Halton Region. The existing signal is currently operating in a semi-actuated state.

Roadway Geometrics

Roadway geometrics, including existing lane widths, grades, auxiliary lane storage lengths, etc. were derived from available survey and drawing information supplemented by field measurements where required.

3.5.4.2 Existing Traffic Volumes

Guelph Line, within the study area limits, carries approximately 6,400 vehicles per day. Two-way vehicle volumes during the weekday AM peak hour and PM peak hour are in the range of 620 and 660 vehicles per hour, respectively. In terms of the directional distribution of traffic along Guelph Line, the majority of traffic travels southbound during the weekday AM peak hour—61 percent—while traffic is distributed fairly evenly in the northbound/southbound directions during the weekday PM peak hour. Commercial and heavy vehicles represent about six percent of the total traffic on Guelph Line during the weekday. A summary of the area roadway traffic volumes and traffic distribution is provided in **Table 3-5**.

Table 3-5: Two-Way 24-Hour and Peak Hour Directional Traffic Volumes

Roadway	ADT Volume (24-Hr)	Weekday Peak Hour Directional Splits (%)								Commercial/ Heavy Vehicles (%)	
		Northbound		Southbound		Eastbound		Westbound			
		AM	PM	AM	PM	AM	PM	AM	PM	NB	SB
Guelph Line (Regional Road 1)	6,400	39.6	50.5	60.4	49.5	-	-	-	-	5.1	6.2

3.5.4.3 Operating Speeds

Operating speeds were sampled along Guelph Line in the northbound/southbound directions on April 30, 2009 at one location between Conservation Road and Derry Road (Regional Road 1). The data sample size included 3,071 vehicles traveling in the northbound direction and 3,316 vehicles traveling in the southbound direction.

A range of statistical measurements were derived from the speed data including operating speed, average speed, 50th and 85th percentile speeds, and pace. Operating speed is commonly recognized as the speed at which drivers are observed operating their vehicles during free-flow conditions. Percentile speeds are speeds at or below which a specified percentage of traffic is traveling. The 85th percentile speed is the most frequently used measure of the operating speed and is often considered the maximum reasonable speed of a traffic stream under geometric and control conditions. The “pace” refers to the speed range (typically 16 kilometres per hour) that contains the greatest number of vehicle speeds compared to all other corresponding range intervals. A summary of the speed data measurements for the combined northbound/southbound directions is provided in **Table 3-6**. Graphical

representations in the form of cumulative frequency distribution curves are illustrated in **Figures 3-7** and **3-8** for the northbound and southbound directions, respectively. The data was developed at a 95 percent or higher confidence level.

Table 3-6: Speed Survey

Road	Road Section	Direction	Speed Measures (km/h)					Percent Compliance (%)
			Posted	Average	50th Percentile	85th Percentile	Pace	
Guelph Line	Between Conservation Road and Derry Road	NB/SB	60	76	70	78	62 to 78	4.7%

It can be observed from the speed data that drivers traveling along Guelph Line generally disregard the posted speed limit of 60 km/h. The average percentage compliance was found to be 4.7 percent. This indicates that 94.3 percent of motorists are exceeding the posted speed limit.

Figure 3-7: Speed Data Summary – Guelph Line Northbound Direction

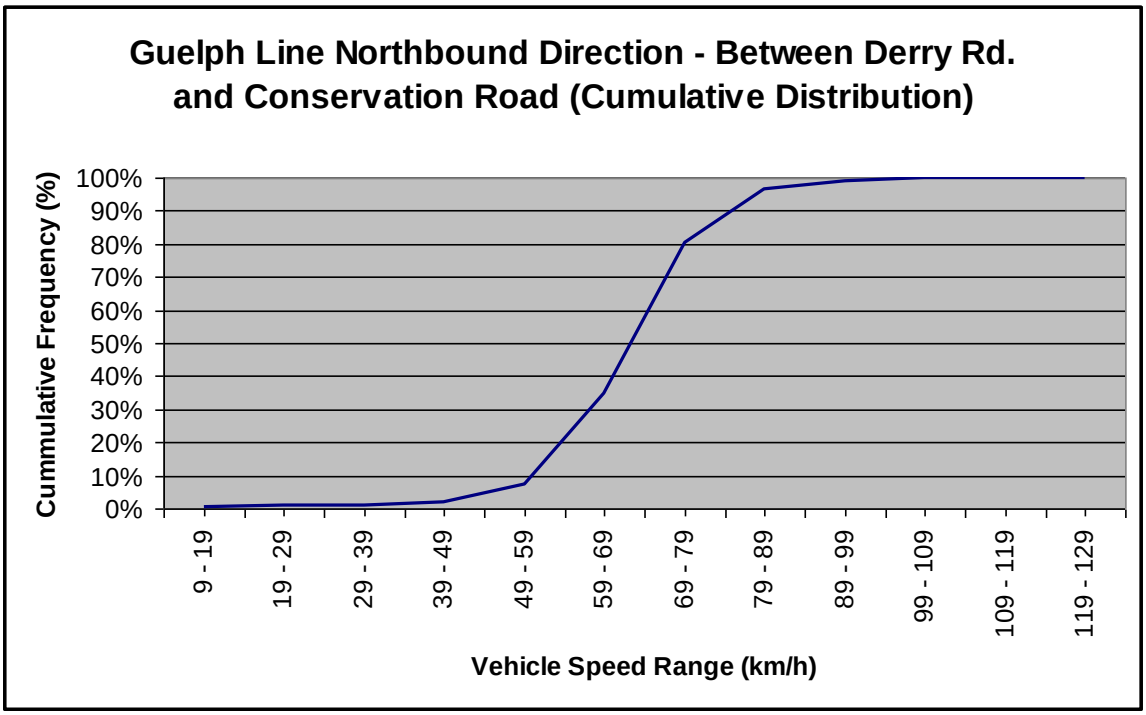
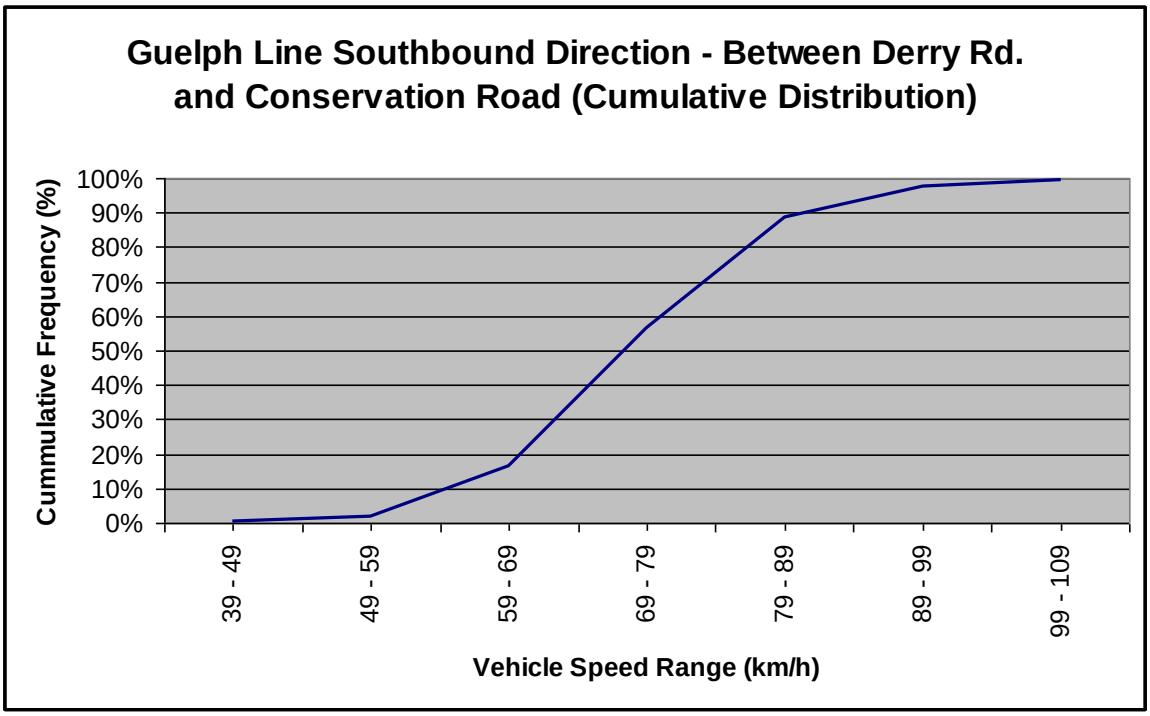
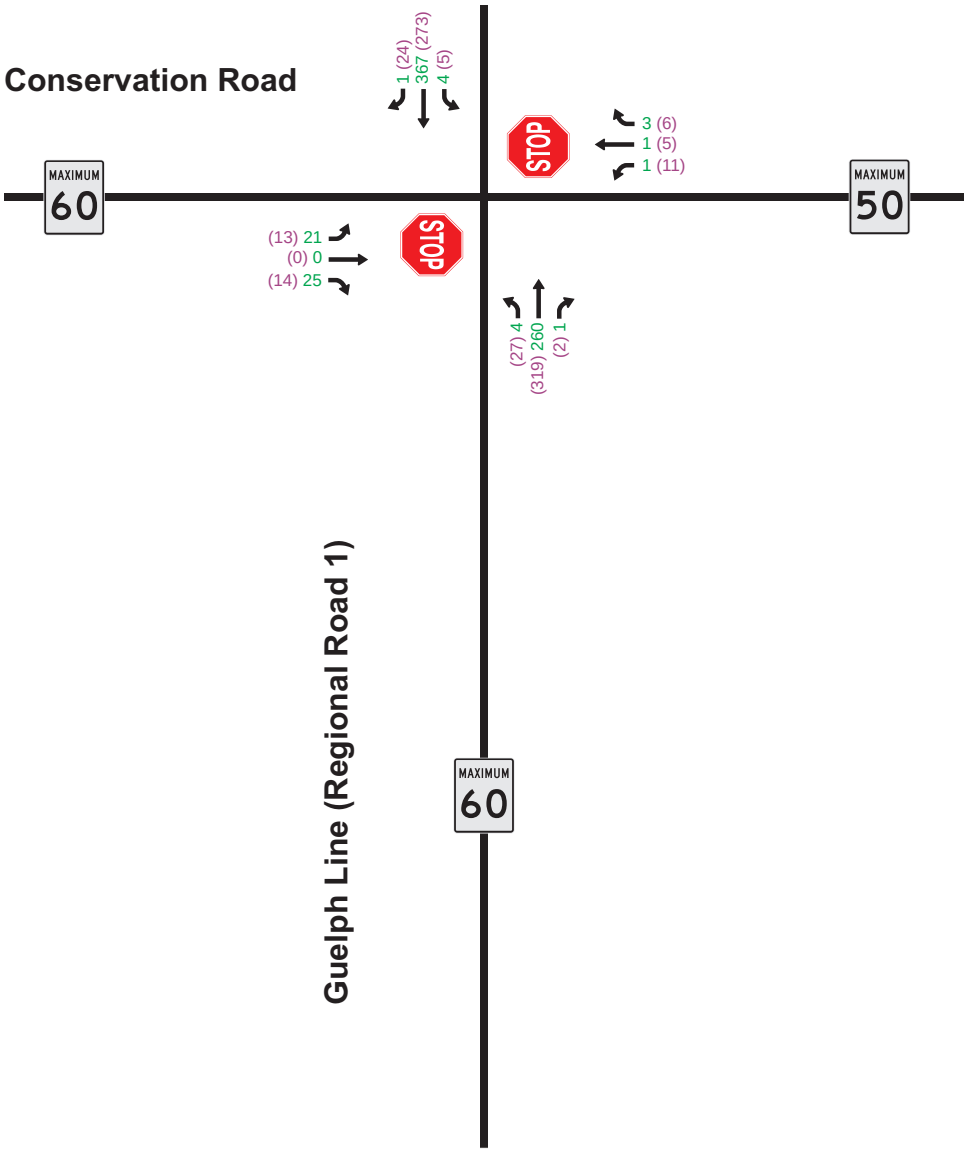


Figure 3-8: Speed Data Summary – Guelph Line Southbound Direction



3.5.4.4 Existing 2009 Weekday Peak Hour Traffic Volumes

A review of the turning movement count (TMC) data for the weekday morning period revealed that entering/exiting traffic volumes at the study area intersections remained fairly stable from 7:30 a.m. to 8:30 a.m., representing the AM peak hour. The weekday afternoon traffic volumes exhibited a similar stability from 4:15 p.m. to 5:15 p.m., representing the PM peak hour. These two peak hours were considered to be the critical design hours for evaluating the existing traffic conditions at the study area intersections. Since the TMC data was collected on two different days, a selected number of volumes were adjusted conservatively upwards where required to ensure that the traffic flows were balanced throughout the study area. The existing balanced 2009 traffic volumes are illustrated in **Figure 3-9**.



Halton REGION

NTS

Guelph Line (Regional Road 1) Transportation Corridor Improvements

Legend

- Directional Turning Movement
- XX (XX) AM Peak (PM Peak)
- Existing Traffic Signal
- Existing Stop Sign
- Maximum Speed Sign 50

Figure 3-9

EXISTING WEEKDAY PEAK HOUR TRAFFIC VOLUMES

November 2010

IR ASSOCIATES

3.5.4.5 Existing 2009 Intersection Operational Performance

The operational performance of the study intersections at Guelph Line/Conservation Road made use of the Highway Capacity Manual (HCM) techniques for unsignalized intersections as employed by the Synchro-SimTraffic package (Version 6). Capacity analysis of an intersection, signalized or unsignalized, is a process that is undertaken to determine how well an intersection will perform under various traffic conditions. The analysis results can then be evaluated to determine the need for capacity improvements at the intersection. For this study, the intersections were analyzed for both the AM and PM peak hours and were evaluated using Level of Service (LOS) measures.

LOS is a qualitative concept used to define the quality of service of traffic conditions at an intersection or along a road segment. Intersection LOS is based on the average control delay per vehicle for various movements occurring within the intersection. "Delay" is a measure of the quality of service to the road user based on a number of weighted factors. LOS ranges from 'A' to 'D' with LOS 'A' representing traffic operations with associated delays up to 10 seconds per vehicle. LOS 'D' can represent delays in the range of 35 to 55 seconds per vehicle with traffic congestion becoming much more apparent. This level of service is generally considered to be at the upper limit of acceptable delay. Beyond LOS 'F', delays can typically reach 80 seconds or higher per vehicle and is considered to be unacceptable. The capacity of an intersection at LOS 'F' becomes oversaturated with demand exceeding capacity.

Operational performance measurements for the unsignalized intersection at Guelph Line and Conservation Road are provided in **Table 3-7**. The direction of the minor approach (i.e. EB-eastbound, WB-westbound) is noted under the intersection location descriptions listed in Table 3-8 and correspond with the various performance measures for those movements. In this case, the minor approach is the eastbound/westbound directions along Conservation Road. The critical major approach left turn is also noted by movement, v/c, delay and LOS.

Table 3-7: Existing 2009 Operational Performance – Unsignalized Intersection

Intersection	Minor Approach				Major Approach Critical Left Turn Movement			
	HCM v/c	HCM Delay (sec/veh)	LOS	95th Percentile Queue (metres)	Movement	v/c	Delay (sec)	LOS
Weekday AM Peak Hour								
Guelph Line at Conservation Road (EB/WB)	0.13	13.8	B	3.4	NB-Left	0.0	0.2	A
Weekday PM Peak Hour								
Guelph Line at Conservation Road (EB/WB)	0.10	16.3	C	2.5	NB-Left	0.02	0.8	A

A review of the minor approaches at the unsignalized intersection revealed that the two-way STOP controlled intersection at Conservation Road is operating at acceptable levels of service with reasonable delays and good v/c ratios under both morning and afternoon peak hour traffic conditions.

3.5.4.6 Future 2021 Traffic Volumes

Traffic projections for the study area were derived from travel demand forecasts for the 2021 horizon year were provided for the weekday PM peak hour for selected roadway links from Halton Region's EMME/2 transportation model. The Region's transportation model is a planning tool that consists of assigning travel demand to a road network to estimate traffic volumes on the road sections and intersections. The model provides directional link traffic forecasts based on a set of road network improvements, future land use and development scenarios, trip rates and travel patterns. The Region's forecasts for the 2021 PM peak hour were used to estimate growth rates and adjustment factors that were then applied to the 2008 link volumes to yield computed 2021 link volumes comparable to the Region's model forecast levels. As the EMME/2 transportation model volumes represent PM peak hour volumes, to determine AM peak hour volumes, existing counts were used to determine the relationship between the AM peak hour and PM peak hour.

In addition to the review of the transportation model link volumes, historical ATR counts were also reviewed and compared to the transportation model growth rate findings. The results of the comparisons indicated that there is a conservative growth rate of about two percent per year from 2009 to 2021 along the Guelph Line corridor within the study area. The future 2021 weekday AM and PM peak hour traffic volumes are illustrated in **Figure 3-10**.

3.5.4.7 Future 2021 Intersection Operational Performance

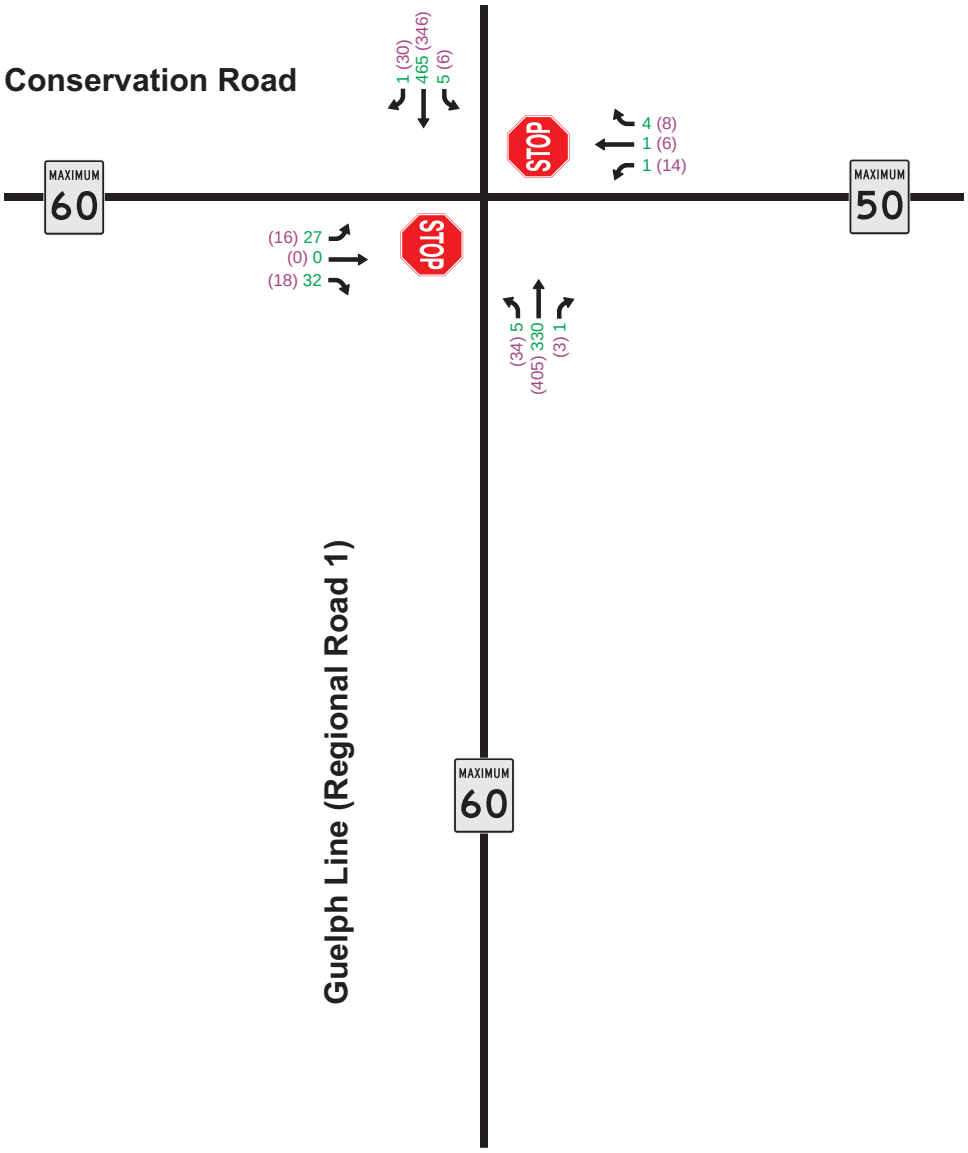
The operational performance of the study area intersections with the future 2021 weekday AM and PM peak hour traffic volumes were evaluated to determine the operational performance. It should be noted that there are no programmed roadway improvements currently planned by Halton Region in the vicinity of the study area.

The results of the operational performance of the unsignalized intersection are presented in **Table 3-8**. As traffic volumes along Guelph Line increase to the year 2021, traffic exiting Conservation Road is expected to encounter slightly longer vehicle delays and congestion, particularly during the afternoon traffic peak period. The level of service of the lowest priority movement on Conservation Road is expected to be 'C' by the 2021 timeframe and no remedial measures to address traffic flow operations are anticipated.

Table 3-8: Future 2021 Operational Performance – Unsignalized Intersection

Intersection	Minor Approach				Major Approach Critical Left Turn Movement			
	HCM v/c	HCM Delay (sec/veh)	LOS	95th Percentile Queue (metres)	Movement	v/c	Delay (sec)	LOS
2021 Weekday AM Peak Hour								
Guelph Line at Conservation Road (EB/WB)	0.19	17.7	C	5.2	NB-Left	0.01	0.2	A
2021 Weekday PM Peak Hour								
Guelph Line at Conservation Road (EB/WB)	0.11	17.3	C	2.9	NB-Left	0.03	1.0	A

Presently, driver sight lines are restricted at the intersection due to the natural vegetation that occupies each quadrant of the intersection. In the case of a STOP controlled intersection, drivers must have an unobstructed view in order to safely manoeuvre across the intersection as well as safely turn left and right onto the intersecting roadway and accelerate to the normal running speed without interfering with the passage of through traffic. Sight lines at the intersection will need to be improved to ensure that drives can safely manoeuvre through the intersection and to improve pedestrian safety. The provision of a sight triangle will ensure that drivers will have unobstructed sight distance at the intersection. A 15 x 15 metre sight triangle is required on all Regional roads as indicated in the Regional Official Plan. In addition, a turning movement count will be conducted during the detailed design phase, using Crawford Lake conservation area "event day" traffic volumes in consultation with Conservation Halton in order to determine the need for separate northbound/southbound left turn auxiliary lanes at the intersection.



NTS

Guelph Line (Regional Road 1) Transportation Corridor Improvements

Legend

- Directional Turning Movement
- XX (XX) AM Peak (PM Peak)
- Existing Traffic Signal
- Existing Stop Sign
- Maximum Speed Sign

Figure 3-10

FUTURE 2021 WEEKDAY PEAK HOUR TRAFFIC VOLUMES

November 2010

3.5.5 Collision Analysis

Collision data in the form of Motor Vehicle Accident (MVA) reports were provided by Halton Region for the period from January 16, 2004 to November 19, 2008. The data was summarized and categorized in accordance with the relevant coding contained within the standard motor vehicle accident report. During this time period, a total of 26 collisions occurred within the study area—two, representing approximately eight percent occurred at the Conservation Road/Guelph Line intersection and twenty-four, representing approximately 92 percent occurred at mid-block locations within the Guelph Line corridor. A collision diagram showing the collision patterns during this same period (January 16, 2004 to November 19, 2008) is provided in **Figure 3-11**.

3.5.5.1 Comprehensive Road Safety Action Plan (CROSAP)

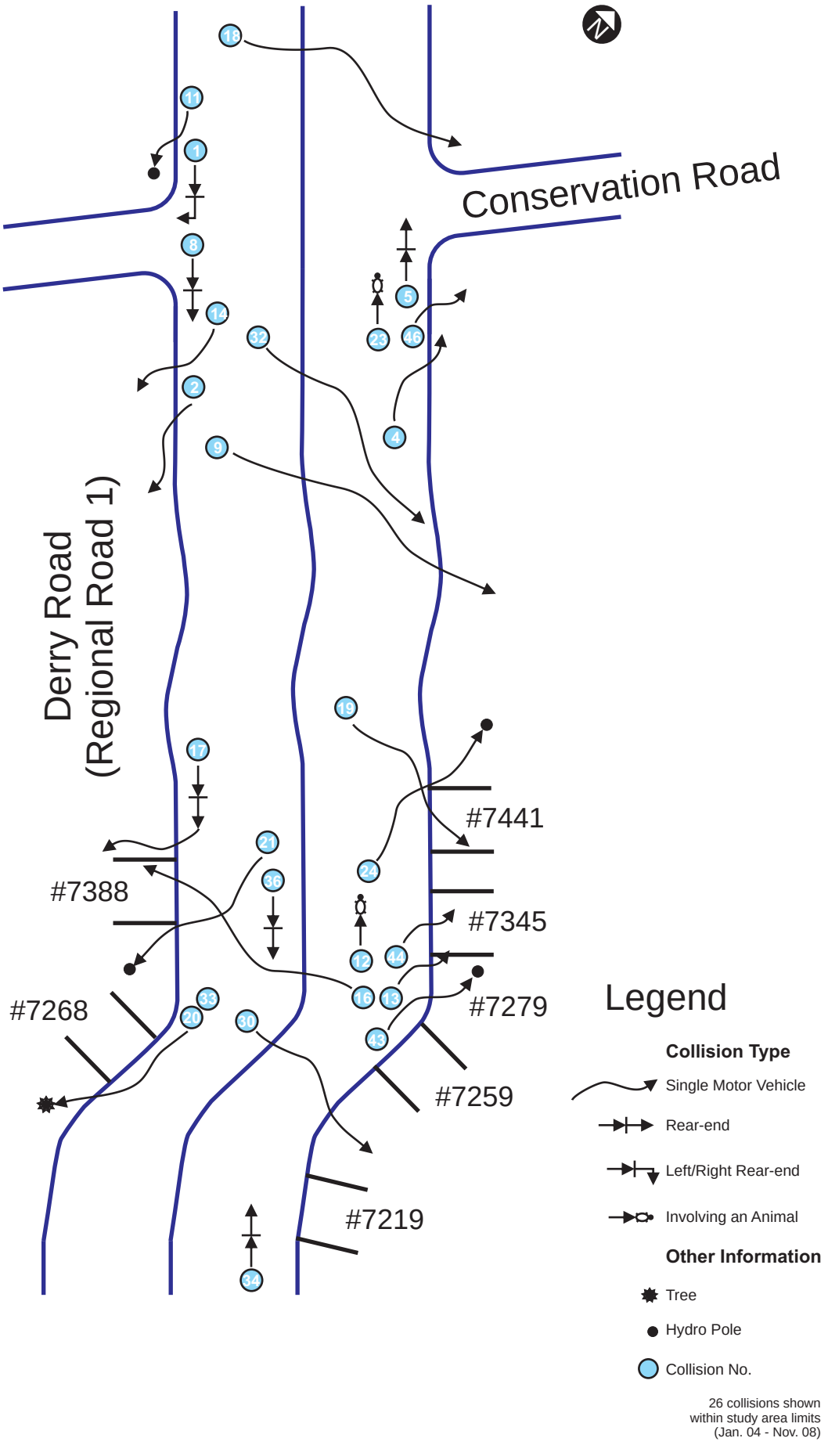
Halton Region has adopted a Comprehensive Road Safety Action Plan (CROSAP) to guide the implementation of a road safety management system for Regional Roads.

CROSAP – Phase 1

Phase 1 follows an efficient screening process to evaluate the actual safety performance of each Regional Road intersection and road section against expected performance measures, derived from the aggregate performance of similar intersections throughout the Region.

The Evaluation of the safety performance uses a number of Safety Performance Functions (SPFs) developed for different categories of road sections and intersections within the Region. Based on these functions, a Potential for Safety Improvement (PSI) index was developed for each road section and intersection along the Regional road network. PSI indices take into account the difference between a location's long-term safety performance and the expected safety performance for a comparison group with similar traffic, design, and control characteristics. They also incorporate the potential savings in societal costs by accident type if the safety record at the location can be improved to the nominal level. The PSI index can range from 0 to 30 in the case of Halton's Regional Road System.

If the PSI for a particular location is greater than zero, it represents an opportunity for improvement (from a safety perspective) at that location, since more collisions are occurring at that location than typically occur at a similar/comparable group of locations in the Region. Conversely, if a location has a PSI index less than zero, fewer collisions occur at that location than at a comparable group of locations, and therefore, it is performing better than the "norm" for that type of facility.



NTS

Guelph Line (Regional Road 1) Transportation Corridor Improvements

Figure 3-11

EXISTING COLLISION PATTERNS

Jan-16- 2004 to Nov-19-2008

November 2010

For this study, the Regional Municipality of Halton provided the results from the 2006 CROSAP network screening for locations within the project limits. **Table 3-9** shows the value of the PSI index, and corresponding rank within the Region, for the intersection and mid-block locations along Guelph Line within the project limits.

Table 3-9: 2004 CROSAP Screening Results – Guelph Line Corridor

Guelph Line	PSI Index Value	Rank[7]
At Derry Road Intersection	0	251
Between Derry Road and Conservation Road	25.74	1
At Conservation Road Intersection	1.43	85

CROSAP – Phase 2

Based on the results of Phase 1, Phase 2 of CROSAP entails the undertaking of a roadway operational safety assessment for those locations with a high PSI Index Value. In the case of Guelph Line, an operations and safety assessment was undertaken for the section of Guelph Line between Derry Road (Regional Road 7) and Conservation Road (formerly Steeles Avenue)[8]. A review of the available collision data at the time concluded that one or more physical and/or operational features within the Guelph Line corridor were responsible for the poorer-than-expected performance and that it was unlikely from a statistical perspective that the poor performance was attributed to the result of random chance.

The CROSAP Phase 2 report found that collisions involving single motor vehicle loss of control, leading either to collisions involving opposing vehicles, or a run-off-the-road type incident, predominate the collision experience. The report also noted that the months of December and January were over-represented in the collision record. Icy, snowy or slushy road surface conditions were also over-represented. A number of improvement options were described and a subset subsequently analyzed in order that countermeasures could be recommended. The following improvement options were considered including:

- Realign the roadway;
- Improve opportunities for roadside recovery;
- Make the roadside more forgiving;
- Increase room for snow storage;
- Provide road edge delineators;
- Install centreline/edgeline rumble strips;

[7] Rankings obtained from their respective intersection or mid-block tables.
[8] Comprehensive Road Safety Action Plan (CROSAP), Phase 2 – Operations and Safety Assessment, Synectics Transportation Consultants, Final Report, 2002

- Enhance winter maintenance standards;
- Traffic calming; and
- Speed enforcement.

The report concluded that improving the northernmost one kilometre section of Guelph Line south of Conservation Road should be considered. Other suggestions included the addition of post-mounted delineators within this same section of roadway and at selected other locations within the study limits. Finally, enhanced winter maintenance practices were also suggested. Overall, improving the opportunities for roadside recovery, making the roadside more forgiving, and improving snow storage and drainage were suggested and recommended that these options be pursued further in subsequent studies.

3.5.5.2 Macro-Analysis of Collision Experience

A macro-analysis of the study area collision experience provides an indication of and identifies any unusual trends that exist in the collision summary data. Collision distribution patterns were calculated for the various Motor Vehicle Accident Report fields to identify any unusual collision trends. The study area collision records, included both mid-block and intersection collisions and were summarized by time, location, initial impact type, environmental (weather) condition, lighting condition, road surface condition and severity. **Figure 3-12** presents a summary of the macro-analysis collision trends for the various collision attributes.

A review of the collision experience confirms similar collision patterns (Refer to Figure 3-13) found through the CROSAP Phase 2 analysis. For the most part, the following more prevalent trends are notable, representing a statistically significant over-representation of collisions, based on the macro-analysis review of the collision data.

Collision Attribute	Description
Types:	Single Motor Vehicle and Approaching
Location:	Mid-block
Lighting Conditions:	Dark and Dawn/Dusk
Weather Conditions:	Rain or Snow/Drifting Snow
Road Surface Conditions:	Wet, Slush/Loose Snow, or Ice
Time of Day:	Off Peak/Overnight
Day of Week:	Saturday and Sunday
Month:	January, February and July
Season:	Winter

Figure 3-12: General Collision Trends in the Study Area

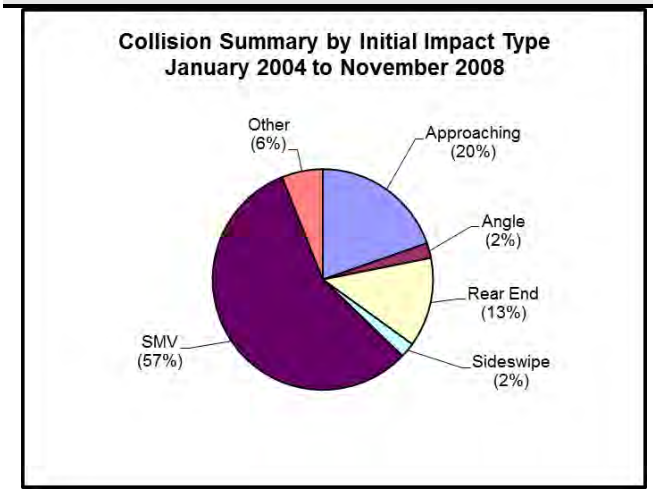
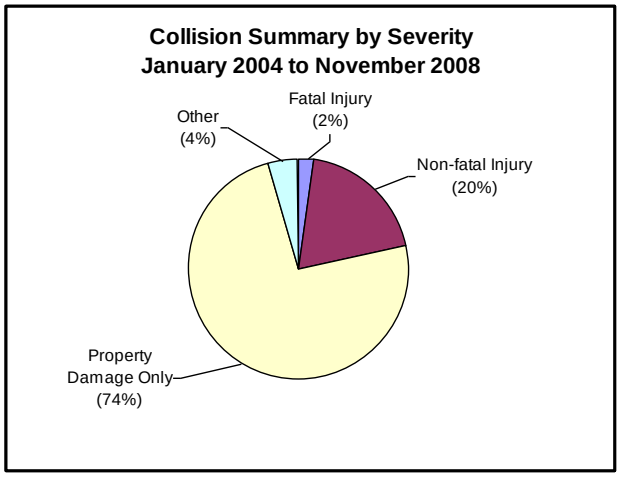
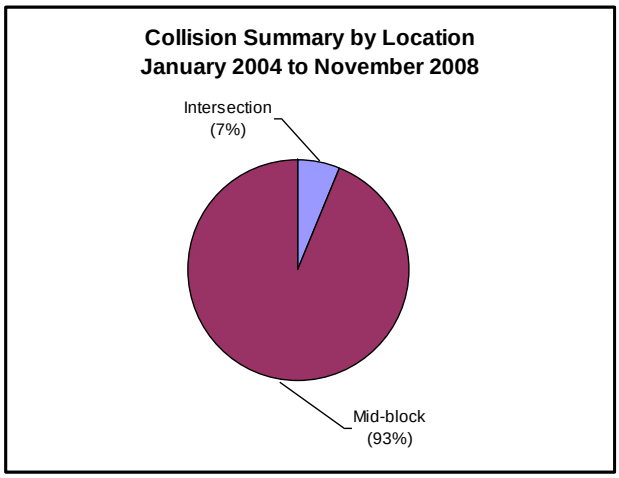
Collision Data Summary – Guelph Line	Summary
	• The majority of collisions were single motor vehicle collisions (57%) followed by approaching and rear end collisions at 20% and 13%, respectively. • The remainder of the collisions (10%) were comprised of sideswipe, angle or were related to other causes.
	• There was one fatal injury recorded during the period from January 16, 2004 to November 19, 2008. • The majority of the collisions were property damage only collisions (74%) with the remainder of the collisions made up of non-fatal (20%) or other (4%).
	• Mid-block collisions were in the majority, representing 93% of total number of collisions within the study area. The remainder of the collisions occurred at the Conservation Road intersection (7%).

Figure 3-12: General Collision Trends in the Study Area

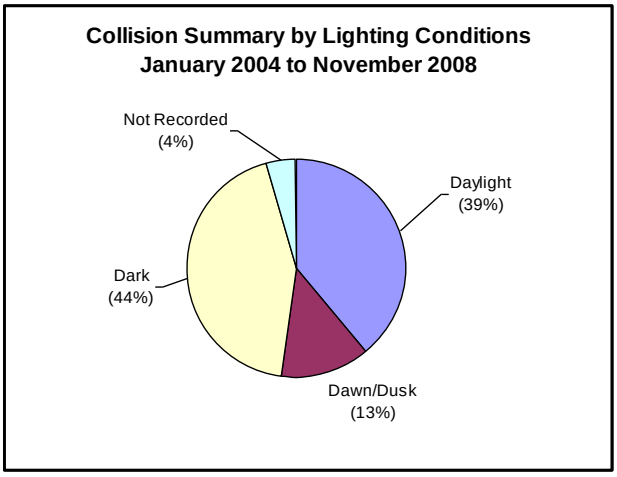
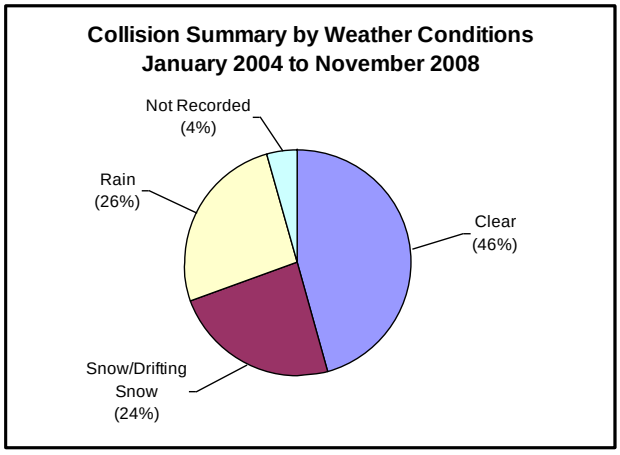
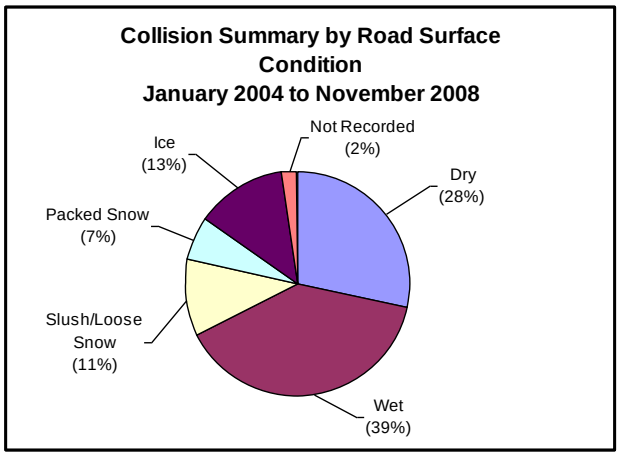
Collision Data Summary – Guelph Line	Summary
	• In terms of lighting conditions, the majority of collisions occurred during either dark or daylight conditions (83%). • The remainder of the collisions within the study area occurred during dawn/dusk light conditions (13%) or the lighting condition was not recorded as part of the collision history.
	• The slight majority of collisions (50%) occurred during inclement weather conditions (rain or snow). • The remainder of reported collisions occurred under clear conditions (46%). • The weather conditions were not recorded in about 4% of the reported collisions.
	• The majority of collisions occurred during either wet or dry roadway conditions at 39% and 28%, respectively. • 31% of the collisions occurred during icy, snowy, or slush/loose snow roadway conditions.

Figure 3-12: General Collision Trends in the Study Area

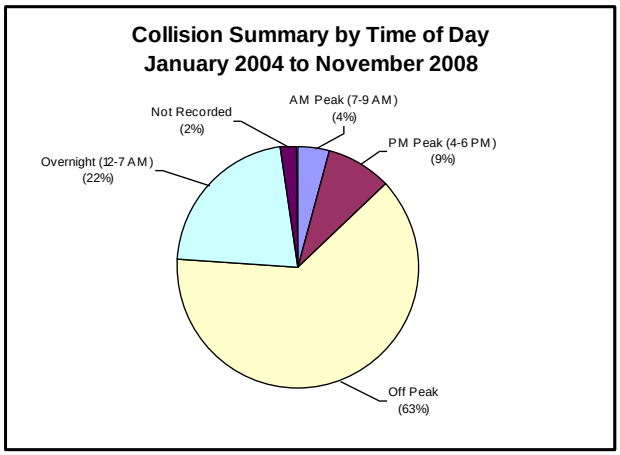
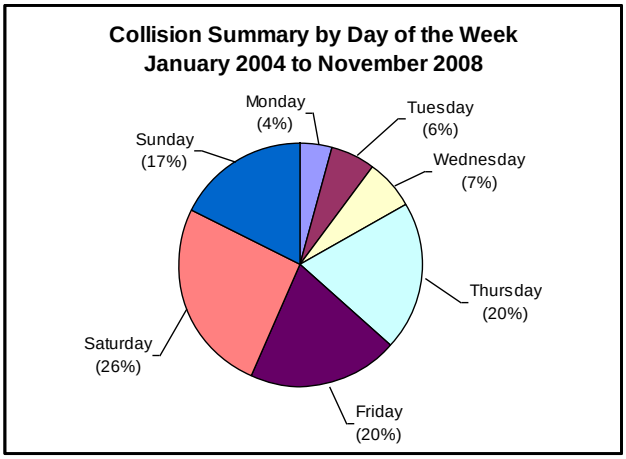
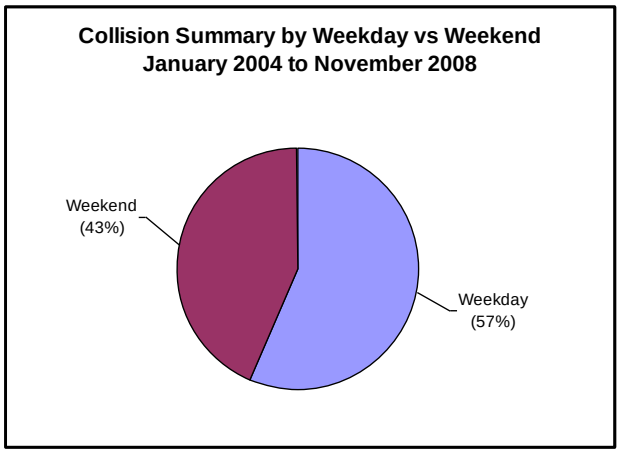
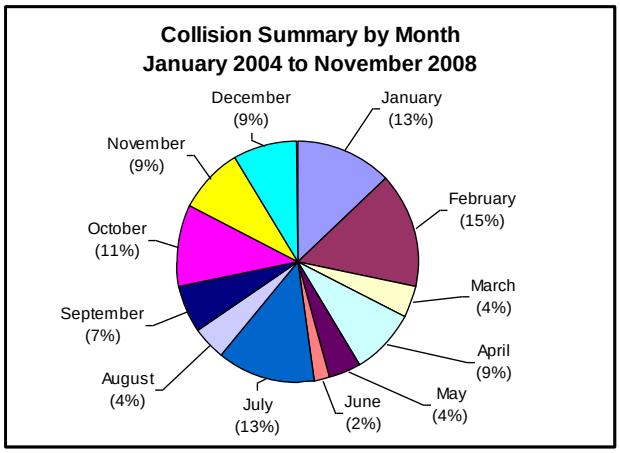
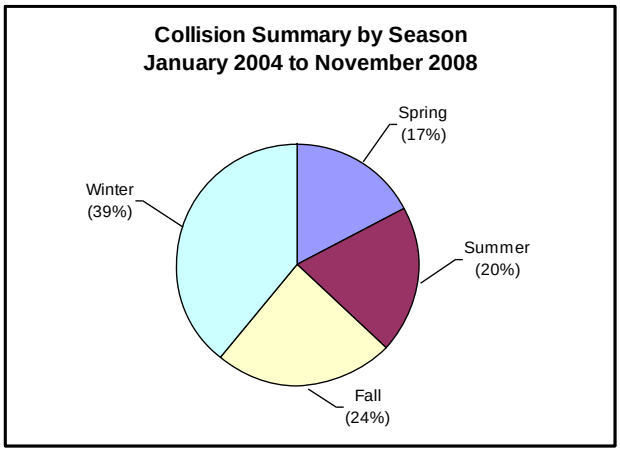
Collision Data Summary – Guelph Line	Summary
	• In terms of the time of day that collisions occurred, the majority took place during off-peak traffic hours (63%). • Fewer collisions occurred during the peak traffic hours (7-9 AM and 4-6 PM)—13%. • 22% of the reported collisions occurred during the overnight period from 12-7 AM.
	• Thursday through Sunday represented the weekdays during which the majority of collisions occurred within the study area—20%, 20%, 26% and 17%, respectively. • The remainder of the collisions occurred during the period from Monday to Wednesday, being fairly evenly distributed.
	• Overall, the majority of collisions occurred during the weekday period from Monday to Friday (57%) with the remainder of the reported collisions taking place during the Saturday/Sunday weekend period (43%).

Figure 3-12: General Collision Trends in the Study Area

Collision Data Summary – Guelph Line	Summary
	• The highest number of collisions occurred during the winter months of January (13%) and February (15%) followed by July (13%) and the fall month of October (11%). • Other notable months with a higher number of reported collisions included April, November and December, each representing 9% of the total number of collisions.
	• Winter (December to February) represented the highest number of collisions (39%) followed by Fall (September to November) at 24% and Summer (June to August) and Spring (March to May) representing 20% and 17% of the reported collisions, respectively.

The CROSAP Phase 2 report noted a number of causal factors relating to the summary of prevalent collision attributes listed earlier as they related to the type, conditions and times of collision occurrences including:

- Speeding (speed exceeds posted speed limit);
- Speed too fast for conditions (speed greater than that at which the available visibility/traction would allow for retention of control, safe stopping/collision avoidance);
- Lack of attention/distraction;
- Failure to perceive the correct (roadway alignment) path;
- Insufficient recovery area;
- Traffic control (regulatory, warning) devices lack credibility;
- Winter maintenance standards inadequate in terms of driver expectations; and
- Inconsistent and/or unexpected environmental/roadway conditions (micro-climates).

3.5.5.3 Safety and Operational Issues

A review of the speed data for this section of Guelph Line indicated that, in general, the observed travel speeds were higher than the posted speed limit with less than five percent compliance during the weekday peak periods under favourable road and weather conditions. However, the majority of collisions were observed to occur during off-peak and weekend periods during less favourable road and weather conditions. This may be attributable to drivers simply not adjusting their travel speed to the prevailing road and weather conditions. The lack of driver attention during a critical moment on the roadway combined with continuing changes in the horizontal and vertical roadway alignment and the lack of room for roadside recovery may be leading to the larger volume of run-off-road and fixed object type collisions noted in the collision data. Drivers may also be traveling at excessive speeds during periods of lower traffic volumes as evidenced by the larger number of collisions taking place during weekend and off-peak periods. The higher volumes of traffic during the weekday peak periods may be helping to slow traffic during these periods due to the increased number of vehicles using the roadway and potentially the mix of traffic with higher volumes of commercial vehicles on the roadway.

Based on the CROSAP Phase 2 report, another possible factor contributing to the number of single motor vehicle collisions could be related to poor delineation or lighting along the roadway. This can be compounded by poorer driver visibility when the roadway is wet, slushy or snow-covered thereby reducing the effectiveness of the existing pavement markings. Insufficient lighting, warning signs, or retroreflective/illuminated warning signs at key locations could also be a causal factor. The need for additional lighting should be reviewed during the detailed design phase. Although there is only partial illumination along this section of Guelph Line, the roadway was resurfaced in July 2008 and provided with wider one metre paved shoulders, pavement widenings at the horizontal curves, and new pavement delineations in the form of new centreline and pavement edge markings. No additional signing was provided as part of the pavement contract other than advanced street name signs. The CROSAP Phase 2 report indicated that: *"the warning information provided is appropriate to the conditions and the level of emphasis is proportionate to the degree of hazard posed by the signed-for elements"*. Improvements to the roadway surface including a new pavement structure, wider shoulders and new pavement delineation would typically help improve skid resistance, improve roadway drainage, and provide additional space for vehicle recovery during an incident. Additional delineation in the form of reboundable, retroreflective road edge delineators for both directions of travel could be considered during the detailed design phase, particularly during the winter conditions during which pavement markings can become obscured by snow-cover.

During the winter season, various open field areas along the Guelph Line corridor within the study area are known for blowing and drifting snow as well as patches of light and dark conditions related to the existing wooded areas. The blowing winds can cause drifting snow resulting in a snow-covered road surface while the uneven lighting conditions can cause uneven melting of ice patches or the creation of new ice patches. All Regional roads, including Guelph

Line, are given a priority during all winter storm events. Regional standards are currently in excess of the minimum maintenance standards. The ponding of water is also known to be an issue during rain events, possibly contributing to slippery road surface conditions.

In terms of the roadway geometrics, the existing posted speed limit of 60 km/hr is reasonable for the roadway alignment; however, drivers tend to travel at operating speeds they consider appropriate to the prevailing road traffic and environmental conditions. Improvements to the horizontal and vertical alignments (where feasible), would be desirable to improve the ability of drivers to negotiate the roadway transition zones (i.e. curved to tangent sections and vice versa). Improvements to the roadway cross-section would provide a number of additional benefits including better roadside recovery opportunities for drivers that might otherwise be unable to regain control during an incident, providing for improved roadside forgiveness through an improved clear zone (i.e. elimination/protection of roadside objects, reduced slopes or rock ledges, etc.), providing additional space for snow storage, and improving road surface drainage to reduce icing during the winter months. Any geometric improvements would need to recognize the impacts of such improvements on adjacent properties and environmentally sensitive areas.

3.6 Engineering Considerations

3.6.1 Roadway Geometrics

The existing geometric conditions for the Guelph Line corridor are presented in **Table 3-10**. This table provides a description of the various geometric roadway criteria beginning with roadway classification through to right-of-way limits.

Table 3-10: Existing Geometric Conditions – Guelph Line Corridor

Geometric Design Criteria	Conservation Road to 1 km North of Derry Road
Classification	Rural Arterial Undivided
Design Speed	60 to >70 km/hr[1]
Posted Speed	60 km/hr
Number of Lanes	2
Minimum Stopping Sight Distance	No obstructions
Minimum Radius (Max. e 6%)	140 m
Maximum Grades	7.0% (in Northern Section)
Minimum Grades	0.2% (flat)
Vertical Curves (Min. K) Crest Sag	 ~25 ~25
Lane Widths – Through Lane	3.65 m± [2]

Table 3-10: Existing Geometric Conditions – Guelph Line Corridor

Geometric Design Criteria	Conservation Road to 1 km North of Derry Road
Shoulder Widths	1.0 m Paved Shoulder
Right-of-way	Varies from 20 to 26 m

Notes:

[1]Design speed based on current roadway geometry. 60 km/h design speed based on lowest radius horizontal curve of 140 m. Design speed of remainder of roadway is > 70 km/hr.

[2] Various horizontal curves include pavement widening to 4.0 m lane widths.

3.6.2 Crossing Roads

There is one crossing road—Conservation Road—located at the northern limits of the study area. The roadway, formerly known as Steeles Avenue, is currently under the jurisdiction of the Town of Milton and is classified as a Collector Road east and west of Guelph Line under Schedule E of the Town's Official Plan (August 2008). Conservation Road maintains a two lane rural road cross-section with narrow granular shoulders and drainage ditches. The pavement width of Conservation Road on the west side of Guelph Line is approximately 6.75 metres with lane widths of about 3.3 metres. The pavement width of Conservation Road on the east side of Guelph Line (entering into the Crawford Lake Conservation Area) is approximately 6.95 metres with lane widths of about 3.5 metres. There are no separate auxiliary turn lanes at the intersections of Guelph Line and Conservation Road.

3.6.3 Drainage

The terrain through the study area is generally steeply rolling. Ontario Soil Survey Report No. 43 identifies the soils in the study area to be primarily sandy and stony loams (*Font, Farmington and Dumfries*) which exhibit good drainage and low runoff potential. The presence of quarry operations in the area indicates that there may be fractured bedrock near the surface which collects runoff.

Drainage is provided by a roadside ditch collection system that conveys runoff toward two separate roadway watercourse crossings. In many areas, roadway drainage is conveyed onto adjacent private properties as sheet overland flow. Although this approach has the least overall environmental impact it is not the preferred method of handling roadway drainage as it presents potential liability issues for the Municipality.

The two culvert crossings are 400 mm and 500 mm Corrugated Steel Pipes (CSPs) and do not meet the hydraulic requirements to convey the 25-year storm design event. In addition, a third drainage area does not have a roadway cross culvert (or that could not be located during the site visit). This drainage area is approximately 66.1 hectares in size. Although there would

typically be significant runoff generated from an area of this size, it is suspected that because of the sandy soils and the presence of fractured bedrock at the surface, the drainage from this area does not travel along the surface.

3.6.4 Bridges and Culverts

Currently, there are no Guelph Line structural bridge crossings within the study area.

There a number of existing culverts located along Guelph Line within the study area including road crossings and driveway culverts as follows:

Guelph Line Culvert Crossings (east-west crossings)

- 500 mm diameter CSP approximately 16.3 metres in length located approximately 640 metres from the southeast property line at the intersection of Conservation Road and Guelph Line;
- 300 mm diameter CSP approximately 7.5 metres in length located at the entrance to the old road allowance ;
- 400 mm diameter CSP approximately 14 metres in length located approximately 77.5 metres north of the driveway centreline at #7279 Guelph Line;

Driveway Culverts

- 300 mm diameter plastic pipe on the east side of Guelph Line (#7345) approximately 20.5 metres in length located at the north driveway entrance;
- 300 mm diameter plastic pipe on the east side of Guelph Line (#7345) approximately 17.5 metres in length located at the south (currently closed) driveway entrance;
- 200 mm diameter CSP located at #7331 Guelph Line (east side) approximately 9 metres in length;
- 500 mm diameter CSP on the west side of Guelph Line (#7331) approximately 15 metres in length;
- 400 mm diameter CSP on the east side of Guelph Line (#7340) approximately 12 metres in length; and
- 400 mm diameter CSP on the west side of Guelph Line (#7220) approximately 12.5 metres in length.

3.6.5 Pavement and Geotechnical

In 2007, Halton Region undertook a pavement evaluation for the rehabilitation of Guelph Line from Derry Road to Conservation Road (formerly Steeles Avenue)—a distance of approximately 3.5 kilometres. The pavement evaluation was undertaken to determine the existing condition of the in-situ pavement and subgrade materials, estimate the remaining life of the in-place

pavement structure, identify potential rehabilitation options, and recommend a cost-effective pavement rehabilitation strategy.

The field investigation entailed the following:

- A detailed pavement conditions survey to determine the location, extent and severity of pavement distresses;
- Falling weight deflectometer (FWD) testing of the pavement to determine structural adequacy;
- Cross fall and rut depth measurements at regular intervals throughout the project limits;
- Pavement coring to determine information on the type and thickness of the various asphalt layers; and
- Boreholes to determine both the type and thickness of the existing pavement structure components, as well as the subgrade and groundwater conditions at the site.

The pavement surface conditions survey was completed in March 2007. The survey consisted of a detailed examination of the pavement surface, noting the general conditions of the pavement, including areas of pavement distress and distortion. The survey was conducted in general accordance with the *MTO Manual for Condition Rating of Flexible Pavements for Municipalities*.

The structural adequacy of the existing pavement was evaluated by FWD pavement load/deflection testing using a series of four load applications applied to the pavement surface. Pavement surface deflections under load were then measured to determine structural adequacy.

A total of 43 cores through the asphalt surface and seven boreholes (1.5 metres below existing grade) were advanced at randomly selected locations to determine pavement structure thickness.

Routine laboratory testing on the extracted materials included detailed visual examinations, grain size analysis, moisture content determination, and Atterberg Limits. Groundwater conditions were recorded during and upon completion of drilling.

Physiographic Setting

The site lies within the physiographic region known as the Peel Plain (*The Physiography of Southern Ontario, Third Edition, L.J. Chapman and D.F. Putnam).* The underlying geological material of the plain consists predominately of till containing large amounts of shale and limestone. In much of the Peel Plain, this material has been modified by a veneer clay which, when deep enough, can be varved. The area has a gradual and fairly uniform slope towards Lake Ontario.

Pavement Condition Survey

The condition of the existing pavement was assessed to be in fair condition with localized poor areas. The ride quality was considered to be fair with few to intermittent bumps or depressions. The predominant distresses throughout this pavement section included longitudinal cracking in the wheel paths, transverse cracking, alligator cracking, and pavement rutting. Many of the older longitudinal cracks had been sealed. Localized areas of patching and rutting were noted within this pavement section.

The estimated pavement quality index was estimated to be 4.4 based on a combination of the pavement distress manifestation and ride quality. Wheel path and rut depth typically ranged from 0 to 20 mm and cross fall measurements varied from 0 to 7 percent with an average cross fall of 2.2 percent.

Additional details on the results of the pavement conditions survey, including the FWD testing, are provided in **Appendix J**.

Subsurface Conditions

Based on the results of the geotechnical field investigation, the subsurface conditions comprise a flexible pavement structure underlain by the silty clay till subgrade. The existing asphalt thickness on the traveled portion of Guelph Line was found to range from a low of 100 mm to a high of 210 mm but was typically found to be in the order of 130 to 170 mm. At several locations within the project area, substantial differences in asphalt thickness were found between the northbound and southbound lanes. The average thickness in the northbound lane was 150 mm, while the average thickness for the southbound lane was 130 mm.

The granular base course was comprised of brown sand and gravel with the southern 800 metres of the roadway comprised of crusher run limestone. The typical thickness of the granular base layer varied from 100 to 1,040 mm. Granular subbase was encountered in the southern 800 metres of the project. In this section the granular base was underlain by 50 mm crusher run limestone in one borehole and brown sand and gravel in the other. The base course in this section varied from 200 to 550 mm, and subbase extended to depths of 670 and 820 mm, respectively.

The moisture content of the samples tested from the granular base and subbase varied from 3 to 5 percent indicating moist conditions. Underlying the pavement structure, the subgrade generally consisted of brown silty clay till to the termination depth of the boreholes. The moisture content of the till was in the order of 12 to 20 percent.

Additional details on the results of the pavement conditions survey, including the FWD testing, are provided in **Appendix J**.

Groundwater Conditions

Upon completion of drilling, free water was not encountered in any of the boreholes. The regional ground water table is likely lower than the depth investigated.

Pavement Rehabilitation of Guelph Line

Guelph Line, from Derry Road to Conservation Road, was resurfaced in 2008 as part of the Region's 2007/2008 asphalt-resurfacing program. A pulverizing and Expanded Asphalt Stabilization process was employed on Guelph Line from Derry Road to Conservation Road. Within the Guelph Line study area encompassing the rural areas, a depth of 200 mm of the existing asphalt surface was pulverized and replaced with 150 mm of expanded asphalt and a 50 mm overlay of surface course asphalt (SP 12.5FC1). In addition, one metre paved shoulders were added to either side of Guelph Line creating two 3.65 metre lane widths and one metre shoulders on each side. The lane widths were widened to four metres through various roadway horizontal curves.

3.6.6 Utilities and Services

There are a number of existing underground and overhead utilities within the study area at the following locations:

Natural Gas

An existing underground natural gas line travels along the east side of Guelph Line with underground connections to the residences provided along the west side of the roadway. The exact location and size of the gas main will need to be confirmed with the gas utility company during the detail design process.

Hydro Services and Illumination

Beginning at the northern limit of the study area, overhead hydro lines located on the east side of Guelph Line near the intersection of Conservation Road, supply power westerly across Guelph Line to the south side of Conservation Road where they continue in a westerly direction. Hydro lines also extend easterly along the north side of Conservation Road to provide power to the Crawford Lake Conservation Area. The main hydro lines extend southerly from Conservation Road along the east side of Guelph Line for approximately 355 metres where they cross over to the west side of the roadway and continue on for approximately 177 metres before crossing back to the east side. The hydro lines then cross back over to the west side of the roadway over the next 112 metres after which they continue in a southerly direction along the east side of the roadway, crossing the roadway several more times over the next 470 metres. The hydro lines continue in a southerly direction adjacent to the existing right-of-way limits along

the east side of Guelph Line through the remainder of the study area. There are also a number of east-west overhead hydro line crossings over Guelph Line throughout the study area supplying hydro power to adjacent properties.

Partial illumination is currently provided at the intersection of Guelph Line and Conservation Road on the northeast corner and on Conservation Road just west of the intersection on the south side of the roadway. Partial illumination is also provided along the east side of Guelph Line beginning just north of the driveway entrance to the property located at #7345 Guelph Line and extending southerly, ending to the south of a closed driveway entrance to #7345 Guelph Line. Additional partial illumination is provided on the east side of Guelph Line, extending southerly near the driveway entrance to the property located at #7219 Guelph Line to beyond the study area.

Bell Telephone

Existing overhead Bell Telephone lines travel along the east side of Guelph Line from Conservation Road to the property located at #7720 Guelph Line where they cross over to the west side of the roadway and continue south for approximately 118 metres. At this point the telephone lines travel underground along the west side of Guelph Line to the north side of the driveway entrance to the property located at #7388 Guelph Line. The underground line then extends diagonally underneath Guelph Line to the south side of the driveway entrance located at #7345 Guelph Line. The telephone lines on the west side of Guelph Line continue in a southerly direction traveling as overhead cables and terminating at #7220 Guelph Line on the north side of the driveway entrance. There are a number of overhead east-west telephone crossings along Guelph Line providing services to adjacent properties on both sides of the roadway.

3.6.7 Wells

There are a number of front yard wells located at various properties along Guelph Line including #7794 (west side), #7279 (east side), and #7268 (west side).

3.7 Problem Statement

The need to undertake a Class Environmental Assessment Study for Guelph Line from 1 kilometre north of Derry Road (Regional Road 7) to Conservation Road was identified as part of a Comprehensive Road Safety Action Plan (CROSAP) which identified the need for improvements to the roadway cross-section and geometric design within the corridor.

In order to address immediate roadway structural concerns, Guelph Line was resurfaced in 2008 to deal with the poor condition of the roadway at that time. The resurfacing provided a

degree of improvement until such time that the Class EA process could be initiated to review the Guelph Line corridor.

The *Problem Statement* provides a clear statement of the problem/opportunities that need to be addressed for a specific undertaking. The Problem Statement is based on and is a culmination of the analyses undertaken for a specific undertaking. The various analyses (e.g., traffic operations reviews, structural assessments, drainage reviews, etc.) provide input for and contribute to the identification and description of the problem and/or opportunity.

The prevailing and future deficiencies along Guelph Line from one kilometre North of Derry Road to Conservation Road are summarized by the following Problem Statement:

> ***"Presently, Guelph Line (Regional Road 1) has a number of opportunities for improvement which will increase the overall safety of the corridor including the potential reduction in the number and severity of collisions."***

In order to address the deficiencies described by the Problem Statement, a range of reasonable and feasible alternative "solutions" were identified to solve the Problem. The development and evaluation of the alternative solutions is the subject of Section 4 of the ESR.

4. PLANNING SOLUTIONS

4.1 Alternative Solutions Considered

Under Phase 2 of the Class EA planning and design process all reasonable and feasible solutions to the problem are identified and described. The type of project schedule that the Class EA is categorized under is also confirmed in Phase 2. In this case, the Guelph Line Transportation Corridor Improvements Class EA was confirmed as a Schedule 'C' under the Environmental Assessment process.

In order to address the Problem encompassing the deficiencies that were identified as part of the Guelph Line (Regional Road 1) Transportation Corridor Improvements, a range of reasonable and feasible "solutions" were identified as alternative ways to solve the Problem. The range of solutions also included the "Do Nothing" alternative. In the "Do Nothing" alternative, no improvements or changes would be made to solve the identified problem or opportunity. This means that the problem would remain in the system. A decision to "Do Nothing" would typically be made when the costs of all other alternatives, both financial and environmental, significantly outweigh the benefits.

The alternative solutions included the following:

1. **Do Nothing** – Do not undertake any improvements or changes within the Guelph Line corridor;
2. **Improve Other Roadways** – This alternative involved improving other roadways that travel parallel or perpendicular to Guelph Line such as Twiss Road, Appleby Line, Derry Road or Conservation Road to accommodate future traffic volumes;
3. **Limit Future Development** (within the vicinity of the study area) – This alternative would limit or restrict future development in the area to limit traffic growth along the Guelph Line corridor;
4. **Use of Travel Demand Management Measures** – This alternative is aimed at shifting travel behaviour to reduce peak hour vehicle travel demands (i.e. car-pooling, HOV lanes, flexible work hours);
5. **Implement Localized Intersection and/or Traffic Control Improvements** – This alternative involved localized intersection improvements that may include the provision of auxiliary lanes, improvements to traffic control such as the installation of traffic signal control signals and/or the optimization of traffic controls along the study corridor to increase efficiency of operation;
6. **Implement Geometric Roadway Improvements to Improve Safety** – This alternative included modifications to the existing roadway geometrics (i.e. horizontal and vertical

roadway alignments) and roadway cross-section elements (e.g., travel lane width, median width, shoulder width, side slopes, ditches, etc.) provide a safer;

7. **Roadway Reconstruction** – This alternative would involve full depth reconstruction of the roadway (i.e. removal and replacement of the roadway base and subbase structures);
8. **Improvements to Existing Drainage Culverts and Ditches** – This alternative would include modifications or replacement of existing culverts with larger, higher capacity culverts or augmentation of existing culverts (i.e. providing additional culvert drainage capacity through installation of new culverts in the area of existing culverts) and the improvement or construction of new roadside ditches where necessary to improve overall roadside drainage; and
9. **Combination of Roadway Improvement Alternatives and Other Supporting Measures** – This alternative entailed a combination of the various planning alternatives toward the goal of providing the best overall solution to the problem through addressing a range of issues within the study area.

4.2 Preliminary Screening of Alternative Solutions

A preliminary screening of the alternative planning solutions was undertaken to determine the overall positive and negative attributes of each alternative. In comparing alternative solutions, it is recognized that many of the potential solutions may resolve more than one problem and the feasibility of an alternative solution will depend, in part, on a range of factors including but not limited to the nature and location of the transportation system, the nature and location of the problem, comparative costing of alternative solutions, local area growth pressures, and municipal goals and objectives.

The following provides a discussion of the screening results:

1. **Do Nothing** – The “Do Nothing” solution does not address future travel demands, current geometric design standards, pavement structural issues, stormwater drainage concerns, and safety issues within the Guelph Line corridor. This alternative was carried forward for comparison purposes.
2. **Improve Other Roadways** – This alternative was identified in the Halton Transportation Master Plan (HTMP) and is currently part of an overall strategy to improve the Regional road transportation network within Halton Region.
3. **Limit Future Development** (within the vicinity of the study area) – Future travel demands are based on approved future development and growth. It is not anticipated that any significant amount of future growth will occur over the planning horizon within the vicinity of the Guelph Line study area due to the nature, classification and

environmental sensitivity of the surrounding lands. Therefore, this alternative was not carried forward.

4. **Use of Travel Demand Management Measures** – On its own, this alternative does not fully address the problem but was carried forward as part of the overall transportation strategy.
5. **Implement Localized Intersection and/or Traffic Control Improvements** – On its own, this alternative does not fully address the problem, but was carried forward as part of the solution.
6. **Implement Geometric Roadway Improvements to Improve Safety** – On its own, this alternative does not fully address the problem, but was carried forward as part of the solution.
7. **Pavement Resurfacing, Rehabilitation, Repair and/or Reconstruction** – On its own, this alternative does not fully address the problem, but was carried forward as part of the solution.
8. **Improvements to Existing Drainage Culverts and Ditches** – On its own, this alternative does not fully address the problem, but was carried forward as part of the solution.
9. **Combination of Roadway Improvement Alternatives and Other Supporting Measures** – This alternative represents a combination of the various alternatives and supporting measures listed previously and would fully address the problem.

4.3 Evaluation Factors

The following four categories of evaluation factors, which represents environmental issues and mitigation measures that are related to potential improvements for the Guelph Line corridor, were considered in the evaluation of the planning and design alternatives (See Section 5) for this study. These evaluation factors and their respective criteria were finalized based on input received from affected agencies, stakeholders, the public and Halton Region.

TECHNICAL

- Capacity and Level of Service
- Safety
- Access
- Active Transportation (e.g., Pedestrians and Cyclists
- Geometric Standards
- Structural (i.e. Pavement)
- Utility Relocations
- Construction and Property Costs

SOCIO-ECONOMIC ENVIRONMENT

- Land Use
- Effects on Official Plans and other Planning Initiatives (e.g., Greenbelt Plan and Niagara Escarpment Plan)
- Effects on business access/operations
- Effects on residential and rural land uses

- Construction Staging
- Potential property requirements
- Noise and vibration effects
- Aesthetics
- Emergency access

NATURAL ENVIRONMENT

- Effects on Vegetation
- Effects on Wildlife
- Effects on Aquatic Ecology
- Stormwater Management
- Effects on Groundwater Resources

CULTURAL ENVIRONMENT

- Effects on Built Heritage Features
- Effects on Archaeological Resources

The evaluation criteria are defined in more detail in **Table 4-1**.

Table 4-1: Evaluation Factors

Factor	Area of Study	Factor Criteria
Technical	**Capacity and Level of Service**	Potential adverse effects include traffic delays and poor levels of service. Potential advantages include increased traffic capacity to reduce traffic congestion. Need to improve intersections and/or roadways to improve traffic operations.
	Safety	Safety related factors include roadway geometrics, roadside hazards, intersection design, and control, accommodating pedestrians and cyclists.
	Access	Potential adverse effects include limited access during construction and changes to existing entrances.
	Active Transportation	Potential impact on existing and future pedestrian and cyclist facilities including type, continuity, and location.
	Geometrics Standards	Consistency with prevailing design standards/guidelines (i.e. horizontal and vertical road alignments and roadway cross-section.
	Structural	Potential adverse impacts to existing pavement structure.
	Utility Relocations	Potential adverse effects on existing utilities.
	Construction and Property Cost	The cost of constructing the preferred design and the cost of the property required to accommodate the preferred design.

Table 4-1: Evaluation Factors

Factor	Area of Study	Factor Criteria
	Construction Staging	Potential impact to local area businesses and transportation facilities through the staging of future construction works.
Natural Environment	**Effects on Vegetation**	Proximity, size, characteristics and sensitivity of significant natural areas, terrestrial ecosystems. Potential impact or loss of natural areas, terrestrial ecosystems or wetland areas, function or habitat.
	Effects on Wildlife	Presence of identified or documented wildlife habitat areas. Potential adverse effects on existing wildlife due to disturbance or loss of habitat.
	Effects on Aquatic Ecology	Potential adverse effects on aquatic ecology (e.g., existing fish populations) due to disturbance or loss of habitat.
	Stormwater Management	Potential for adverse effects on drainage, and effects on surface water and groundwater.
	Effects on Groundwater Resources	Potential for adverse effects on existing water resources (water quality and/or quantity).
	Natural Hazards	A natural process that has the potential to damage property and injure humans and wildlife. A natural hazard encompasses a variety of phenomenon ranging from fog and snow/ice to earthquakes, forest fires and tornadoes. In Halton Region, natural hazards of key concern include the potential for flooding and erosion.
Socio-Economic Environment	**Land Use**	Presence, number and characteristics of residences, community facilities, public parks, institutions or businesses within or adjacent to the study area.
	Effects on Official Plans and other Planning Initiatives	Potential impacts or effects on approved planning areas including Municipal Official Plans, Greenbelt Plan, Niagara Escarpment Plan and other special planning area adjacent to the study area.
	Effects on Business Access/Operations	Potential for displacement or disturbance to institutions or businesses within the study area including potential affects to business access.
	Effects on Residential and Rural Land Uses	Potential for displacement or disturbance to residences, community facilities, or agricultural land uses within the study area.
	Potential Property Requirements	Requirement for property acquisition and displacement or disruption of residences and businesses within the study area.

Table 4-1: Evaluation Factors

Factor	Area of Study	Factor Criteria
	Noise Effects	Number and characteristics of noise sensitive receivers (residences, community facilities, or institutions) within the study area. Potential effects of traffic related noise on residences, community facilities, or institutions adjacent to and/or within study area.
	Aesthetics	Impact to landscape and aesthetic nature of the roadway corridor and adjacent landscapes.
	Emergency Access	Potential to reduce travel times within study corridor that can lead to improved (reduced) emergency response times.
Cultural Environment	**Effects on Built Heritage Features**	Presence and characteristics of designated built heritage resources under the Heritage Act or registered built heritage resources by the Town of Milton.
	Effects on Archaeological Resources	Presence and characteristics of registered archaeological resources. Potential adverse impacts on archaeological resources adjacent to and/or within the study area.

4.4 Selection of Preferred Alternative Solution

The evaluation of the planning alternatives were based on an assessment of potential impacts for the various evaluation factors identified in the previous section and on an assessment of how each planning alternative best addressed the *Problem Statement*.

Alternative 1 and **Alternative 2** have minimal immediate capital costs in terms of addressing the technical issues associated with the Guelph Line corridor (e.g., improve the structural adequacy of the roadway, improve drainage, or address safety concerns). The implementation of either of these alternatives would also not impact the natural, social or cultural environment within the study area. However, neither alternative would address the Problem Statement. Further, improvements to other roadways outside of the study area are already considered as part of the Halton Transportation Master Plan (HTMP) initiatives for Regional roads entailing a strategic approach to the overall improvement of the transportation network within Halton Region. Any future improvements to other roadways within the vicinity of the study area would be under the jurisdiction of the Town of Milton.

Alternative 3 was not carried forward as no further development within or adjacent to the area is anticipated based on the Official Plan review for the Region and surrounding municipalities.

Current land use designations and policy planning areas, such as the Greenbelt Plan and Niagara Escarpment Plan, prohibit the expansion of development beyond existing levels.

While there may be some opportunities to implement Travel Demand Management measures in the future, on its own, **Alternative 4** is not expected to significantly reduce vehicular demands within the study area. However, this alternative was carried forward as part of the overall transportation strategy.

Alternative 5 through **Alternative 8** will address localized safety, operational, drainage and structural issues; however individually as stand-alone solutions, they will not fully address the problem. All of these alternatives were carried forward as part of the solution. It should be noted that some of the roadway structural deficiencies were addressed through the resurfacing of Guelph Line in 2008; however, there are still a number of structural modifications that need to be addressed as part of the solution.

The recommended planning solution was therefore determined to be represented by **Alternative 9**, which is a combination of the aforementioned alternatives. Alternative 9 includes the following general components:

- Provides geometric roadway improvements, where feasible, including adjustments to the horizontal and vertical roadway alignment to meet prevailing standards;
- Provides improvements to the roadway rural cross-section through adjustments to the travel lane widths, shoulder widths, and side slopes;
- Improves the pavement structure of the roadway as required;
- Improves the roadway and roadside drainage through enhancements to the road grades and profiles, replacement and/or addition of drainage culverts, and provision of proper roadside ditches; and
- Provides improvements or modifications to intersection traffic control where necessary to meet future traffic operational demands.

Alternative planning solution 9 was carried forward into Phase 3 of the Class EA planning and design process as the *Preferred Alternative Planning Solution*.

5. DESIGN CONCEPTS

The third phase of the Class EA Planning and Design process followed guidelines similar to that followed under Phase 2. A number of reasonable *Alternative Design Concepts* for the preferred alternative solution (i.e. Alternative 9) were identified and evaluated to determine the *Preliminary Preferred Design*.

The potential impacts of the various alternative designs on the environment were identified and documented. The alternative designs were then evaluated based on the range of criteria identified under Phase 2 of the EA process (refer to Section 4.3) taking into consideration the identified environmental impacts and appropriate mitigating measures. Based on the results of the evaluation, a preliminary preferred design was presented to the public and technical agencies along with the documented environmental inventories. The culmination of Phase 3—the *Recommended Alternative Design Concept*—resulted in the confirmation of the preliminary preferred design, taking into consideration input and comments received from the public and review agencies.

5.1 Design Criteria – Proposed Standards

The development of the alternative design concepts were based on a number of design criterion which ensured that each alternative would be developed to prevailing standards. *Design Criteria* are established local, provincial, and national standards and procedures that guide the establishment of roadway layouts, alignments, geometry, and dimensions for specified types of roadways in certain defined conditions. The principal design criteria for roadways are traffic volume, design speed, functional classification, the physical characteristics of vehicles, the classification of vehicles, and the percentage of various vehicle classification types that use the roadway. In the case of Guelph Line, the present conditions of the roadway were determined as a factor of the various design criteria. Then, based on prevailing provincial and national standards, current design standards were defined, and compared to the present roadway criteria, culminating with the Proposed Standards for the future Guelph Line. The proposed standards also took into account currently established Halton Region standards for regional arterial road designs.

The Design Standards employed in the development of the alternative design concepts are provided in **Table 5-1**. The design standards were approved by Halton Region and include a list of noted annotations which further define the various attributes of the design criterion. The table includes a listing of current provincial and national prevailing design standards for the Ministry of Transportation (MTO) and the Transportation Association of Canada (TAC) along with the proposed standards for each design criteria attribute.

Table 5-1: Design Criteria
Guelph Line (Regional Road 1) Transportation Corridor Improvements
1 Kilometre North of Derry Road (Regional Road 7) to Conservation Road

Attribute	Present Conditions	Design Standards		Proposed Standards
		MTO	TAC	
Classification	Rural Arterial Undivided	RAU 80	RAU 80	RAU 80
Design Speed	60 to >70 km/hr [1]	80 km/h	80 km/h	80 km/h [16]
Posted Speed	60 km/hr	60 to 80 km/h	N/A	60 km/h [16]
No. of Lanes	2	N/A	N/A	2
Minimum Stopping Sight Distance	No obstructions	135 m [3]	115 to 140 m [7]	135 m
Minimum Radius (max e 6%)	140 m	250 m	250 m	250 m
Maximum Grades	7.0% (in Northern Section)	6 to 8 %	4 %	6 %
Minimum Grades	0.2% (flat)	0.5 % [4]	0 % [8]	0.5 %
Vertical Curves (Min K)				
Crest	~25	35	24 to 36	35
Sag	~25	30	25 to 32 [9]	30
Lane Widths				
Through (TL)	3.65 m± [2]	3.5 m	3.5 to 3.7 m [10]	3.65 m [17]
Left turn		3.25 m [5]	3.3 m [11]	3.50 m
Left adj. to median		3.0 m [5]	3.0 m [12]	3.25 m
Right turn		3.25 m [5]	3.3 m [13]	3.50 m
Superelevation	Varies	6 % (maximum)	7 % (maximum) [14]	6 % (maximum)
Flush Median	N/A	1.0 m	1.0 to 4.0 m	0 to 2.0 m
Shoulder Widths	1.0 m Paved Shoulder	2.5 m [6]	2.5 to 3.0 m [15]	2.5 m (1.0 m Paved and 1.5 m Granular)[17]
Right-of-Way	Varies from 20 to 26 m	26 to 40 m	20 to 45 m	35 m [17]

Notes:

[1] Design speed is based on current roadway geometry provided by the topographic survey.
[2] The shoulder width varies from 0 m to approximately 0.5 m. Shoulder grades vary from flat to 15%.
[3] Minimum (rounded) stopping sight distance on level grade wet pavements.
[4] Desirable minimum grades are 0.5 %; Absolute minimum grades are 0.3 %.
[5] Minimum acceptable width.
[6] Minimum width for pavement support: 0.5 m paved shoulder or 1.0 m granular shoulder.
[7] Stopping sight distance for automobiles and trucks with anti-lock braking systems on level grade wet pavement.
[8] Level grades (i.e. 0 %) are acceptable on uncurbed (i.e. rural) roadways provided that the roadway is adequately crowned, snow does not interfere with surface drainage, and ditches have positive drainage.
[9] Based on “headlight control” criteria for non-illuminated roadways.
[10] Based on an undivided arterial roadway classification carrying an anticipated future Design Hour traffic volume of in the range of 450 vehicles per hour or greater.

[11] Left-turn lane not adjacent to a median are generally the same as the adjacent lane width or 0.2 m less, but not less than 3.3 m.
[12] Left-turn lane adjacent to a raised or painted median are either the same width as the adjacent lane or 0.2 m less, but not less than 3.0 m wide.
[13] The width of the right turn lane may be reduced from the through lane dimension by 0.2 m, but the width must not fall below 3.3 m.
[14] Pavement cross-slope for resurfacing.
[15] Based on an undivided arterial roadway classification carrying an anticipated future Design Hour traffic volume of in the range of 450 vehicles per hour or greater.
[16] 85th percentile speed is 78 km/h based on spot speed survey measured on Guelph Line (Regional Road 1) between Derry Road (Regional Road 7) and Conservation Road (formerly Steeles Avenue) on April 30, 2008. The total volume of vehicles was measured to be 6,400 during the 24-hour spot speed survey period. 60 km/h posted speed set at 20 km/hr below design speed based on the 85th percentile speed consistent with adjacent sections of Guelph Line.
[17] Based on Halton Region Transportation Master Plan (HTMP), June 2004. Shoulders to have full depth granular structure

5.2 Development of Alternative Design Concepts

The development of the alternative design concepts were based on the Preferred Alternative Planning Solution, incorporating the findings of the various technical investigations and analyses and relevant input received from technical agencies and the public as follows:

Technical Investigations and Analyses

- Traffic Operations and Safety Review (Collision Analysis)
- Drainage and Stormwater Management Review
- Natural Environment Assessment
- Archaeological and Cultural Heritage Resource Assessment
- Noise Impact Assessment
- Geotechnical Investigation
- Access and Right-of-Way considerations (existing and future)
- Roadway Cross-section Elements
- Impacts to Existing/Future Utilities
- Impacts to Existing Residential/Commercial Properties
- Coordination with the Town of Milton
- Construction Timing and Costs

Public and Technical Agency Input

Summary of Public Input

- Potential snow drift hazards along the tangent section of Guelph Line, adjacent to the open field areas north of the S-bend, approximately two kilometres south of Conservation Road.

- The collection of water at low spots along the east side of Guelph Line (approximately 350 metres south of Conservation Road) surprising drivers during the summer months as unexpected ponding and as black ice during the winter months.
- Safety issues related to run-off-the road collisions and potential roadside hazards.

Summary of Technical Agency Input

- Comments provided by Conservation Halton (Refer to Appendix C).

5.2.1 Roadway Improvement Design Concepts – Mainline Section of Guelph Line

Roadway improvement design concepts included various alternatives for the improvement of the existing two lane rural road cross-section to meet Regional road standards. In each case, a two lane rural roadway cross-section was maintained for each of the improvement alternatives and included the following general concepts:

- "Do Nothing" Alternative;
- Symmetrical widening about the existing roadway centreline; and
- Symmetrical widening within the existing roadway right-of-way.

The "Do Nothing" Alternative was evaluated and documented along with the other alternatives. In the case of the "Do Nothing" alternative, no improvements or changes would be made to solve the identified problem or opportunity. This means that the problem would remain in the system. A decision to "Do Nothing" would typically be made when the costs of all other alternatives, both financial and environmental, significantly outweigh the benefits. The "Do Nothing" alternative may be implemented at any time during the design process, prior to the commencement of construction.

The following provides a general description of the alternative roadway improvement design concepts considered as part of the Environmental Assessment process for this study:

- **"Do Nothing" Alternative** – No improvements or changes would be made to solve the identified problem or opportunity—existing roadway remains in current state.

- **Alternative 1** – Maintain the current horizontal roadway alignment with a horizontal curve radius of 250 metres with a rural 2-lane road cross-section including 3.65 metre lanes and 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular).

- **Alternative 2** – Centre the roadway alignment within the existing right-of-way limits with a horizontal curve radius of 250 metres with a rural 2-lane road cross-section including 3.65 metre lanes and 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular).

- **Alternative 3** – Centre the roadway alignment within the existing right-of-way limits with a horizontal curve radius of 400 metres (larger radius curve proposed to be consistent with the existing horizontal curves within the Guelph Line corridor study area) with a rural 2-lane road cross-section including 3.65 metre lanes and 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular).

The roadway improvement alternatives for the mainline section of Guelph Line are illustrated in **Figures 5-1**, **5-2** and **5-3**. The mainline section extends from approximately one kilometre north of Derry Road (Regional Road 7) to about 1.2 kilometres south of Conservation Road.

5.2.2 Roadway Improvement Design Concepts – Northern Section of Guelph Line

Separate roadway improvement design concepts were also considered within the northern section of Guelph Line (south of Conservation Road) to improve the existing two lane road cross-section to meet Regional Road standards while minimizing potential impacts to existing Conservation Halton lands, rock outcrops, pond areas and utilities. The following two alternatives were considered as part of the Environmental Assessment process for this study:

- **Alternative 1-A** – A rural 2-lane road cross-section with 3.65 metre lanes and 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular). Guiderail protection would be installed as required to provide additional roadside protection for motorists.

- **Alternative 1-B** – An urban 2-lane road cross-section with 3.65 metre lanes and 1.0 metre paved shoulders with mountable concrete curb and gutter. Guiderail protection and retaining walls (near rock outcrops) would be installed as required to provide additional roadside protection for motorists. Areas adjacent to the existing ponds would be provided with natural earthen slopes beyond the roadway shoulder area.

Alternatives 1-A and 1-B were included as a "subset" of Alternatives 1 through 3 noted under Section 5.2.1 and were evaluated separately in order to determine which of the two alternatives 1-A or 1-B would be combined with either Alternative 1, 2 or 3 to be carried forward as the *Preliminary Preferred Design*.

The roadway improvement alternatives for the northern section of Guelph Line are illustrated in **Figures 5-1, 5-2** and **5-3**. The northern section is approximately 1.2 kilometres in length, extending south from Conservation Road.

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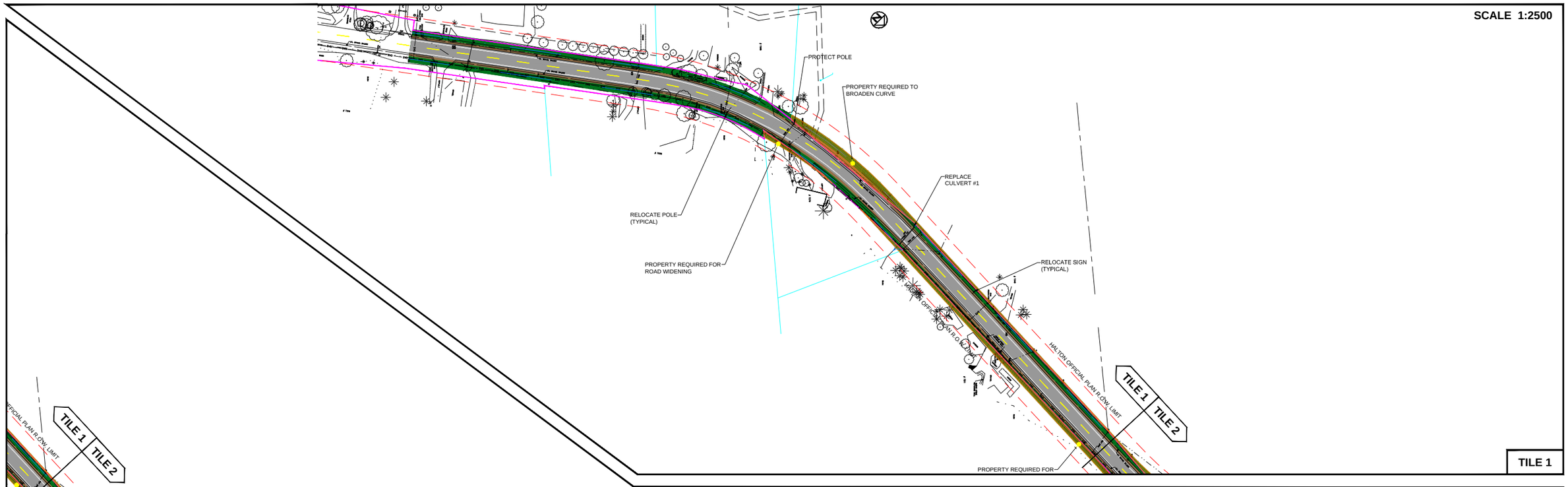
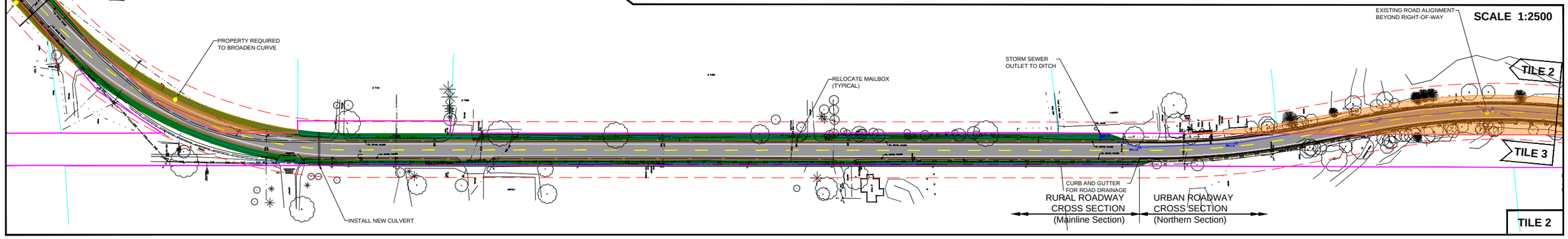


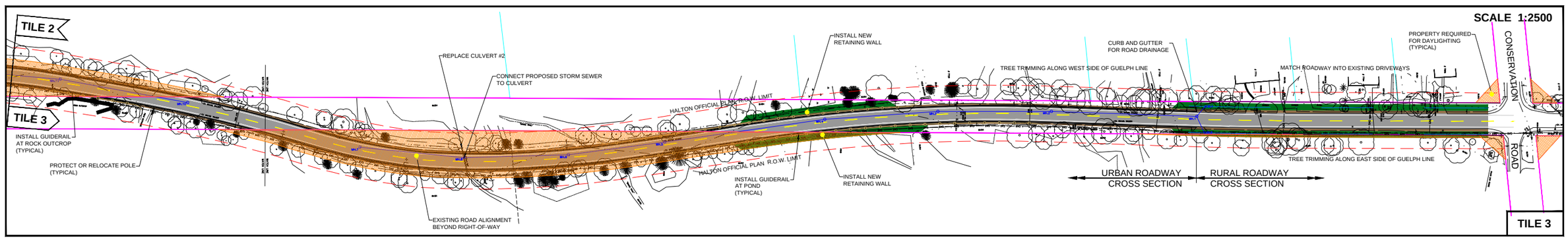
TILE 1

SCALE 1:2500



TILE 2

SCALE 1:2500



TILE 3

ALTERNATIVE DESIGN CONCEPTS 1 AND 1-B

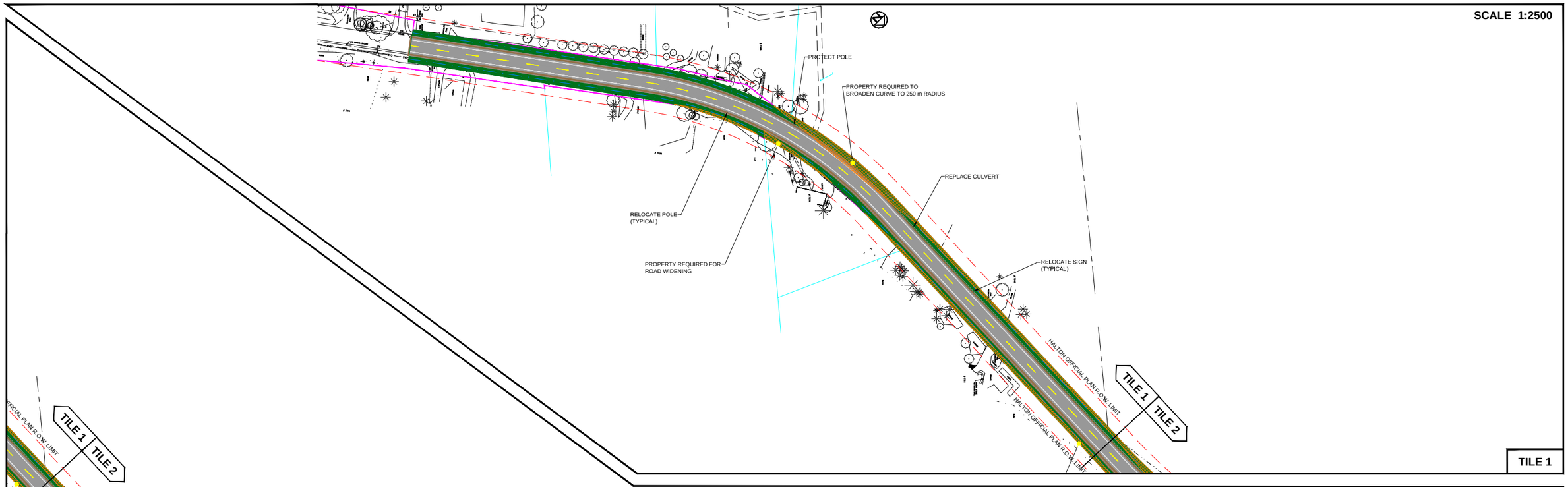
Alternative 1 (Mainline Section) - Rural Road Cross-section on Existing Horizontal Road Alignment
Alternative 1-B (Northern Section) - Urban Road Cross-section on Existing Horizontal Road Alignment

IR ASSOCIATES

Halton REGION

GUELPH LINE (REGIONAL ROAD 1)
1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD
CLASS ENVIRONMENTAL ASSESSMENT
NOVEMBER 2010

FIGURE 5-1



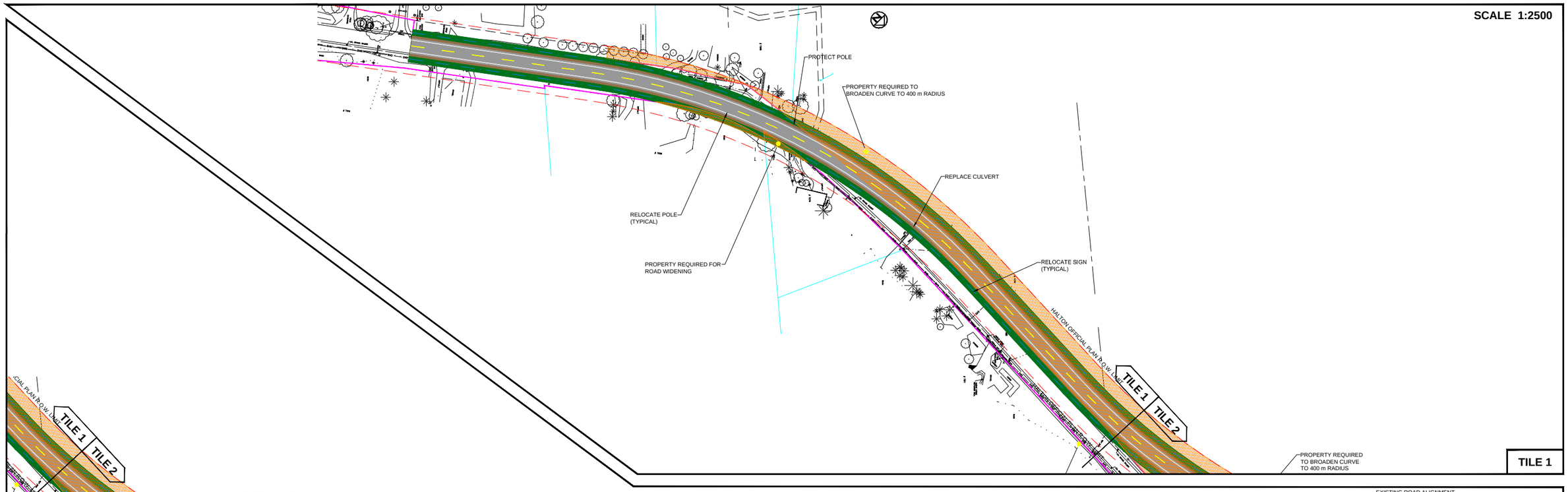
ALTERNATIVE DESIGN CONCEPTS 2 AND 1-A

Alternative 2 (Mainline Section) - Rural Road Cross-section Centred within Existing Right-of-Way Alignment
Alternative 1-A (Northern Section) - Rural Road Cross-section Centred within Existing Right-of-Way Alignment

GUELPH LINE (REGIONAL ROAD 1)
1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD
CLASS ENVIRONMENTAL ASSESSMENT
NOVEMBER 2010

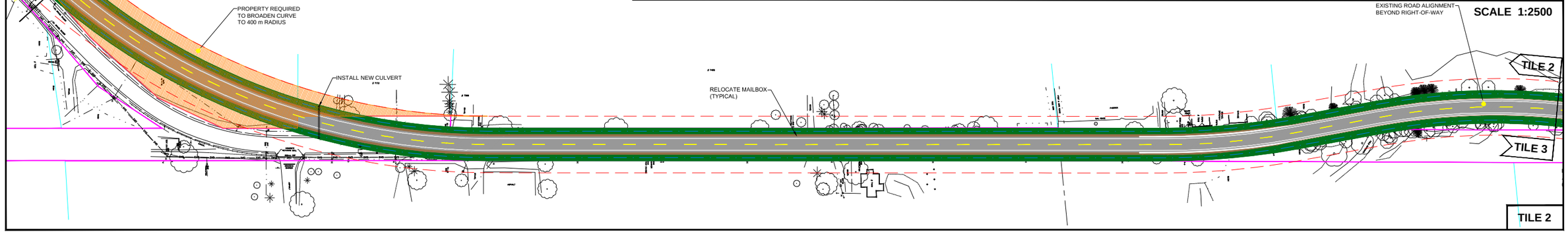
FIGURE 5-2

SCALE 1:2500



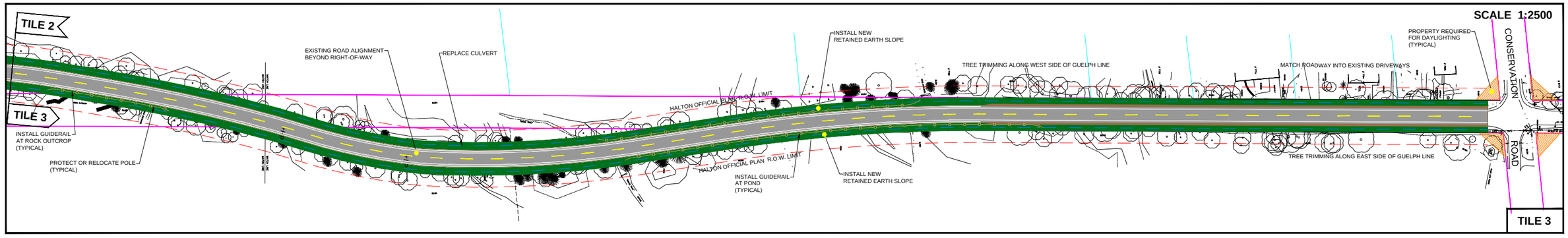
TILE 1

SCALE 1:2500



TILE 2

SCALE 1:2500



TILE 3

ALTERNATIVE DESIGN CONCEPTS 3 AND 1-A

Alternative 3 (Mainline Section) - Rural Road Cross-section Centred within Existing Right-of-Way Alignment
Alternative 1-A (Northern Section) - Rural Road Cross-section Centred within Existing Right-of-Way Alignment

IR ASSOCIATES

Halton REGION

**GUELPH LINE (REGIONAL ROAD 1)
1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD
CLASS ENVIRONMENTAL ASSESSMENT
NOVEMBER 2010**

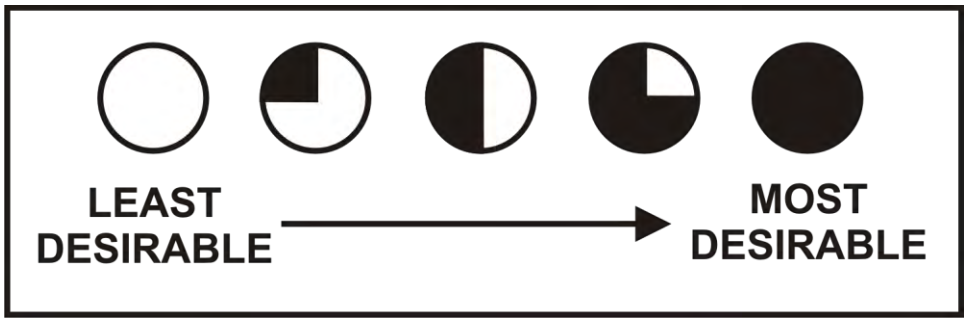
FIGURE 5-3

5.3 Net Effects Evaluation of Alternative Design Concepts

The alternative design concepts presented in Sections 5.2.1 and 5.2.2 were evaluated using the evaluation factors and criteria discussed in Section 4.3. The evaluation criteria represented potential impacts/improvements on the Technical, Socio-Economic, Natural and Cultural Environments. The Summary Net Effects evaluation of the roadway improvement design concepts for the Mainline and Northern sections of Guelph Line are presented in **Tables 5-2** and **Table 5-3,** respectively.

Tables 5-2 and 5-3 show the various "Evaluation Categories" along with a description of the evaluation criteria associated each category. The alternatives, including the "Do Nothing" Alternative, are defined and evaluated against the criteria for each category. A description of the evaluation results in terms of net impacts/improvements is provided for each grouping of evaluation criteria. The "range" for each evaluation category is defined according to Figure 5-4, ranging from "least desirable" to "most desirable".

Figure 5-4: Evaluation Category Range



Summary comments for each alternative are noted at the end of each table, indicating whether or not each alternative meets the stated objectives of the Problem Statement. Finally, a recommendation is provided for each alternative, noting whether the alternative is "Recommended" or "Not Recommended" to be carried forward as the Preferred Alternative Design Concept.

5.3.1 Net Effects Evaluation – Mainline Section of Guelph Line

The results of the net effects evaluation for the Mainline section of Guelph Line indicated that the "Do Nothing Alternative" did not meet the objectives of the Problem Statement while Alternatives 1 through 3 all met the Problem Statement objectives. The following describes the background associated with the recommendations for each alternative.

"Do Nothing" Alternative – Not Recommended

In the case of the "Do Nothing" Alternative, there would be no improvements to the roadway structure including the surface, base, and subbase allowing the road to continue to deteriorate over time. The roadway geometrics (i.e. the current horizontal/vertical alignments and roadway cross-section) would remain in their current substandard state with a deficient 140 metre horizontal curve and narrow shoulders. There would be no overall improvements to safety, including the provision for active transportation modes. Finally, there would be no improvements to the existing drainage system including the implementation of roadside ditches and the replacement of undersized roadway cross culverts to sufficiently accommodate stormwater runoff.

*Alternative 1 (Centred on Existing Roadway Alignment) – **Recommended***

Alternative 1 is the recommend alternative design concept as this alternative provides for a number of improvements while minimizing the degree of impact on the surrounding natural and physical environments at the lowest cost. This alternative meets the objectives of the Problem Statement through improvements to the roadway structure, geometrics and roadway cross-section. Substandard horizontal curves at the existing S-bend are replaced with a minimum horizontal curve radius of 250 metres (80 km/hr design speed) and the current rural roadway cross-section is improved to Regional standards with 3.65 metre lane widths and 2.5 metre partially paved shoulders (1 metre paved; 1.5 metres granular). The overall safety performance of the roadway is improved along with the provision for active transportation modes (i.e. cycling and pedestrians) with the partially paved shoulder. New drainage ditches adjacent to the roadway will ensure proper roadway drainage and help improve water quality via the grassed ditches and vegetated roadway embankments. In addition, the existing roadway cross culverts will be replaced with larger, higher capacity culverts to ensure proper drainage under the roadway from west to east without modifying the present drainage patterns.

There will be minimal impacts to the natural environment (vegetation, wildlife, aquatic ecology and groundwater) since the road improvements will extend very little beyond the existing roadway shoulders with the addition of the new 2.5 metre shoulders and drainage ditches. There will be some additional impacts near the S-bend where approximately 350 metres of linear frontage on the east side (~0.07 hectares) and 480 metres of linear frontage on the west side (~0.13 hectares) of Guelph Line will be required to accommodate the larger 250 metre radius curve. Existing utilities will be minimally impacted within this section of Guelph Line with the anticipated relocation of less than five Hydro/Bell poles and associated lines through the S-bend location.

In terms of the socio-economic environment, there are no impacts anticipated for local area uses (community/public/institutional/facility land uses), official or other planning initiatives, or to current noise and vibration levels. During construction, it is anticipated that there will be some

temporary impacts during construction activities and existing driveway throats will be redefined to match into the new roadway alignment. Adverse effects to the cultural environment may include minor impacts to existing cultural heritage landscapes (i.e. mature tree lines) and minor disturbances to areas considered to possess "archaeological potential" directly adjacent to the existing roadway and within the existing roadway right-of-way limits. The primary area of impact is considered to be near the area of the existing S-bend with the broadening of the current 140 metre radius curve to an ultimate 250 metre radius configuration.

As **Alternative 1** scored significantly higher than Alternatives 2 and 3, it was carried forward as part of the *Preferred Alternative Design Concept*.

Alternative 2 (Centred within Existing Roadway Right-of-Way Limits) – Not Recommended

Although Alternative 2 met the objectives of the Problem Statement—provided similar benefits to Alternative 1—it was not recommended as the preferred alternative due to the higher impacts of this alternative on the Technical, Natural, Socio-economic, and Cultural environments. Alternative 2 scored lower in light of additional impacts created through the realignment of the roadway within the existing right-of-way limits. The horizontal realignment will require additional property to accommodate the roadway through the S-bend—approximately 250 metres of linear frontage on the east side (~0.05 hectares) and 470 metres of linear frontage on the west side (~0.2 hectares) of Guelph Line. In addition, the roadway realignment will require the relocation of existing Hydro/Bell poles and approximately 600 metres of gas main and will have further impacts to driveways and properties. Alternative 2 has a higher estimated construction cost than Alternative 1.

In terms of the natural environment, Alternative 2 will impact existing vegetation near the S-bend location due to the horizontal alignment shift. Since the alignment would be shifted to the east, there would be potentially higher impacts as they relate to noise and vibration for certain residents, residential and rural land uses, existing cultural heritage landscapes, and archaeological resources making up part of the socio-economic and cultural environments.

Alternative 3 (Centred within Existing Roadway Right-of-Way Limits) – Not Recommended

As in Alternatives 1 and 2, Alternative 3 meets the objectives of the Problem Statement, providing greater benefits in some cases from a technical perspective; however, with the implementation of a larger 400 metre horizontal radius at the S-bend this alternative scored lower due to other environmental impacts. The larger radius would be consistent with driver expectations throughout the Guelph Line corridor as the remaining curves within the study area are also 400 metres or greater, exceeding a design speed of 80 km/hr, thereby improving the overall safety performance of the roadway for motorists, cyclists and pedestrians. Drawbacks of implementing the larger radius curve include greater impacts to existing driveways, utilities, and properties. Approximately 100 metres of linear frontage on the east side (~0.03 hectares) and

550 metres of linear frontage on the west side (~0.85 hectares) of Guelph Line would be needed to accommodate the roadway realignment at a higher construction cost than either Alternative 1 or 2.

Adverse natural environmental effects of this alternative include a higher degree of impact on vegetation near the S-bend location in addition to road widening impacts due to horizontal alignment changes. Additional impacts on wildlife, aquatic ecology, and stormwater in the form of new ditching would be realized to accommodate the roadway realignment. For the most part, impacts to the socio-economic and cultural environments would be similar to those under Alternative 2 with the exception of increased impacts on land uses/property and on existing cultural heritage landscapes.

5.3.2 Net Effects Evaluation – Northern Section of Guelph Line

The results of the net effects evaluation for the Northern section of Guelph Line indicated that both Alternative 1-A and 1-B met the Problem Statement objectives. The overall scoring of each alternative proved to be similar with Alternative 1-A scoring higher in the socio-economic category and Alternative 1-B scoring higher in both the technical and natural environment categories with each alternative scoring equally under the cultural environment category. The following describes the background associated with the recommendations for each alternative.

Alternative 1-A – (Rural Roadway Cross-Section) – Not Recommended

In the Technical category, Alternative 1-A had more benefits associated with the wider 2.5 metre shoulder width and rural cross-section in the form of improved traffic flows, increased safety performance (additional area for pedestrians and cyclists), and a better refuge for vehicles and maintenance activities. However, the increased shoulder width requirements of the rural cross-section would impact existing utilities including the gas main currently buried within existing shoulder area. Potential impacts also included the need to remove existing rock outcrops to accommodate the shoulders and the provision of barrier protection between the roadway shoulder and rock surface. Finally, the rural cross-section would impact the existing pond areas slightly more than an urban cross-section due to the need to widen further resulting in the toe of slope possibly reaching further out into the pond area.

From a natural environmental perspective, Alternative 1-A would introduce more impacts to the surrounding environment including vegetation and aquatic ecology impacts due to the wider shoulder width requirements and through stormwater runoff via roadside ditches (i.e. open channel flow system). Overall, the impacts on the natural environment for Alternative 1-A were slightly greater than those of Alternative 1-B. In contrast to Alternative 1-B, this alternative had slightly less impact on the socio-economic environment from an aesthetic point of view due to the more natural look of a rural roadway cross-section with drainage ditches versus the more urban feel of concrete curb and gutter. Alternative 1-A was deemed to have no impacts on

existing built heritage features or archaeological resources in the area. The estimated construction cost for this alternative was similar to that of Alternative 1-B, with the cost of the wider cross-section and need to remove existing rock outcrop areas negating the cost of the urban cross-section with storm sewer installation.

Alternative 1-B – (Urban Roadway Cross-Section) – ***Recommended***

In the Technical category, Alternative 1-B had less benefits associated with the narrower one metre shoulder width and urban cross-section in the form of somewhat less improved traffic flows and safety performance for pedestrians and cyclists. However, the narrower shoulder width of the urban cross-section would enable existing utilities to remain intact and allow the existing rock outcrops to remain in place (barrier protection may be required at certain locations). The impacts to the pond areas would be less than that for Alternative 1-A due to the narrower footprint of the urban cross-section being less intrusive. Natural earthen slopes adjacent to the pond areas would be provided beyond the roadway shoulder area as part of this alternative.

From a natural environmental perspective, Alternative 1-B represents less impacts to the surrounding environment, including vegetation and aquatic ecology impacts, due to the narrower shoulder width requirements and the capture of stormwater runoff via a storm sewer system (i.e. closed pipe flow system). Overall, the impacts on the natural environment for Alternative 1-B were slightly less than those of Alternative 1-A. In contrast to Alternative 1-A, this alternative had slightly more impact on the socio-economic environment from an aesthetic and emergency response point of view. This is due to the narrower urban roadway cross-section taking away from the rural feel of the environment and limited shoulder space provided for emergency service vehicles. Alternative 1-B was deemed to have no impacts on existing built heritage features or archaeological resources in the area. In terms of stormwater flows adjacent to the existing pond areas, the roadway is the highpoint at this location with the eastern wetlands draining south to the existing culvert and the western wetlands draining to the west away from the roadway. Minimal impact to the drainage pattern is anticipated given the change to the surface drainage will be minor. The effect of the storm sewer installation as it relates to potential groundwater flows could be mitigated if required. The estimated construction cost for this alternative was similar to that of Alternative 1-A, with the cost of the urban cross-section and storm sewer installation negating the cost of the wider cross-section and need to remove existing rock outcrop areas. As **Alternative 1-B** scored slightly higher than Alternative 1-A, it was carried forward as part of the *Preferred Alternative Design Concept*.

Table 5-2: Summary Net Effects Evaluation (Mainline Section)
1 Kilometre North of Derry Road to 1.2 Kilometres South of Conservation Road
Guelph Line Transportation Corridor Improvements Class Environmental Assessment

Evaluation Categories	Evaluation Criteria	ALTERNATIVE DESIGN CONCEPTS (Guelph Line Mainline)			
		"Do Nothing" Alternative	**Alternative 1**	**Alternative 2**	**Alternative 3**
		No improvements or changes would be made to solve the identified problem or opportunity—existing roadway remains in current state	Maintain current horizontal roadway alignment with a minimum horizontal curve radius of 250 metres and a rural road cross-section including 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 250 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 400 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular

TECHNICAL	• Capacity and Level of Service
	• Safety
	• Access
	• Active Transportation
	• (e.g., Pedestrians and Cyclists)
	• Geometric Standards
	• Structural (i.e. Pavement)
	• Utility Relocations
	• Construction and Property Costs
	• Construction Staging
		• No improvements for existing:
		  ○ Vertical/horizontal alignments
		  ○ Overall safety performance of the roadway corridor
		  ○ Existing access to adjacent lands
		  ○ Active Transportation modes
		• No utility impacts
		• No construction and property cost or construction staging required
			• Provides improvements for existing:
			  ○ Roadway geometrics
			  ○ Safety performance improvements with the addition of 2.5 metre partially paved shoulders on each side of the roadway
			  ○ Slightly modified access to adjacent lands with improved roadway/driveway sightlines
			  ○ Accommodation and increased safety of cyclists/pedestrians
			  ○ Roadway surface with little impact beyond the current roadway width
			• Approximately 0.2 hectares of additional property required
			• Minimal impacts to adjacent properties during reconstruction
				• Provides improvements for existing:
				  ○ Roadway geometrics
				  ○ Safety performance improvements with the addition of 2.5 metre partially paved shoulders on each side of the roadway
				  ○ Slightly modified access to adjacent lands with improved roadway/driveway sightlines
				  ○ Accommodation and increased safety of cyclists/pedestrians
				  ○ Roadway surface with little impact beyond the current roadway width
				• Additional reconstruction beyond that required for Alternative 1 due to location of horizontal alignment at S-bends
				• Approximately 0.25 hectares of additional property required
				• Some impacts to adjacent properties during reconstruction
					• Provides improvements for existing:
					  ○ Roadway geometrics (400 metre radius horizontal curve to be consistent with the existing Guelph Line horizontal roadway alignment)
					  ○ The 400 metre radius is consistent with driver expectations throughout the corridor as other existing horizontal curves are 400 metres or greater
					  ○ Safety performance improvements with the addition of 2.5 metre partially paved shoulders on each side of the roadway Access to adjacent lands
					  ○ Slightly modified access to adjacent lands with improved roadway/driveway sightlines
					  ○ Accommodation and increased safety of cyclists/pedestrians
					  ○ Roadway surface with little impact beyond the current roadway width
					• Extensive reconstruction

Table 5-2: Summary Net Effects Evaluation (Mainline Section)
1 Kilometre North of Derry Road to 1.2 Kilometres South of Conservation Road
Guelph Line Transportation Corridor Improvements Class Environmental Assessment

Evaluation Categories	Evaluation Criteria	ALTERNATIVE DESIGN CONCEPTS (Guelph Line Mainline)			
		"Do Nothing" Alternative	**Alternative 1**	**Alternative 2**	**Alternative 3**
		No improvements or changes would be made to solve the identified problem or opportunity—existing roadway remains in current state	Maintain current horizontal roadway alignment with a minimum horizontal curve radius of 250 metres and a rural road cross-section including 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 250 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 400 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular
					beyond that required for Alternative 1 and 2 due to location of horizontal alignment at S-bends Approximately 0.88 hectares of additional property required • Major impacts to properties during reconstruction including the S-bend locations due to the larger 400 metre radii
	Evaluation Category Score				
NATURAL ENVIRONMENT	• Effects on Vegetation • Effects on Wildlife • Effects on Aquatic Ecology • Stormwater Management • Effects on Groundwater Resources • Natural Hazards	• No impacts to existing vegetation, wildlife and aquatic ecology • No stormwater management quantity or quality improvements • No impacts to groundwater resources • No natural hazard impacts anticipated	• Minimal impacts on vegetation, wildlife and aquatic ecology due to roadway widening and drainage ditch installation • New drainage ditches along both sides of the roadway (also provides for water quality improvements) • New catch basins and storm sewer system in northern section to capture roadway stormwater runoff • Three existing cross culverts to be replaced with larger culverts • No natural hazard impacts anticipated. Potential	• Additional impacts on vegetation, wildlife and aquatic ecology near S-bend location in addition to road widening impacts due to horizontal alignment changes • New drainage ditches along both sides of the roadway (also provides for water quality improvements) • New catchbasins and storm sewer system in northern section to capture roadway stormwater runoff • Three existing cross culverts to be replaced with larger culverts	• Higher degree of impact on vegetation, wildlife and aquatic ecology near S-bend location in addition to road widening impacts due to horizontal alignment changes • New drainage ditches along both sides of the roadway (also provides for water quality improvements) • New catchbasins and storm sewer system in northern section to capture roadway stormwater runoff • Three existing cross culverts to be replaced with larger culverts

Table 5-2: Summary Net Effects Evaluation (Mainline Section)
1 Kilometre North of Derry Road to 1.2 Kilometres South of Conservation Road
Guelph Line Transportation Corridor Improvements Class Environmental Assessment

Evaluation Categories	Evaluation Criteria	ALTERNATIVE DESIGN CONCEPTS (Guelph Line Mainline)			
		"Do Nothing" Alternative	**Alternative 1**	**Alternative 2**	**Alternative 3**
		No improvements or changes would be made to solve the identified problem or opportunity—existing roadway remains in current state	Maintain current horizontal roadway alignment with a minimum horizontal curve radius of 250 metres and a rural road cross-section including 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 250 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 400 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular
			construction erosion impacts will be addressed through temporary erosion and sedimentation control measures	• No natural hazard impacts anticipated. Potential construction erosion impacts will be addressed through temporary erosion and sedimentation control measures	• No natural hazard impacts anticipated. Potential construction erosion impacts will be addressed through temporary erosion and sedimentation control measures.
	Evaluation Category Score				
SOCIO-ECONOMIC ENVIRONMENT	• Land Use • Effects on Official Plans and other planning initiatives (e.g., Greenbelt Plan and Niagara Escarpment Plan) • Effects on business access/operations • Effects on residential and rural land uses • Potential property requirements • Noise effects • Aesthetics • Emergency access	• No impacts to existing land use, business access/operations, and residential/rural land uses • No property required • No noise impacts beyond current levels • No improvements to the aesthetic nature of the roadway corridor or adjacent landscapes • No improvements to potential emergency response times	• No impacts to existing land use, business access/operations, and residential/rural land uses (Some temporary impacts during construction activities and driveway throats to be redefined to match into roadway) • Approximately 350 metres of linear frontage on the east side (~0.07 hectares) and 480 metres of linear frontage on the west side (~0.13 hectares) to accommodate S-bend • Negligible change in noise levels—no alignment shift; no significant increase in traffic volumes • Improvements include wider shoulders, and vertical alignment geometric	• No impacts to existing land use, business access/operations, and residential/rural land uses (Some temporary impacts during construction activities and driveway throats to be redefined to match into roadway) • Approximately 250 metres of linear frontage on the east side (~0.05 hectares) and 470 metres of linear frontage on the west side (~0.2 hectares) to accommodate S-bend • Negligible change in noise levels—alignment shifts less than 0.5 metres to the east; no significant increase in traffic volumes • Improvements include wider shoulders, and vertical	• No impacts to existing land use, business access/operations, and residential/rural land uses (Some temporary impacts during construction activities and driveway throats to be redefined to match into roadway) • Approximately 100 metres of linear frontage on the east side (~0.03 hectares) and 550 metres of linear frontage on the west side (~0.85 hectares) to accommodate S-bend • Negligible change in noise levels—alignment shifts less than 0.5 metres to the east; no significant increase in traffic volumes • Improvements include wider shoulders, and vertical

Table 5-2: Summary Net Effects Evaluation (Mainline Section)
1 Kilometre North of Derry Road to 1.2 Kilometres South of Conservation Road
Guelph Line Transportation Corridor Improvements Class Environmental Assessment

Evaluation Categories	Evaluation Criteria	ALTERNATIVE DESIGN CONCEPTS (Guelph Line Mainline)			
		"Do Nothing" Alternative	**Alternative 1**	**Alternative 2**	**Alternative 3**
		No improvements or changes would be made to solve the identified problem or opportunity—existing roadway remains in current state	Maintain current horizontal roadway alignment with a minimum horizontal curve radius of 250 metres and a rural road cross-section including 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 250 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 400 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular
			improvements including roadside ditches and landscaping at S-bend • Some improvements to potential emergency access/response times due to improved roadway geometrics	alignment geometric improvements including roadside ditches and landscaping at S-bend • Some improvements to potential emergency access/response times due to improved roadway geometrics	alignment geometric improvements including roadside ditches and landscaping at S-bend • Some improvements to potential emergency access/response times due to improved roadway geometrics
	Evaluation Category Score				
CULTURAL ENVIRONMENT	• Effects on Built Heritage Features • Effects on Archaeological Resources	• No impacts on existing cultural heritage features or archaeological resources	• Potential for minor impacts to existing cultural heritage landscapes (i.e. mature tree lines) • Potential for minor disturbance to areas considered to possess "archaeological potential" adjacent to the existing roadway and within the existing roadway right-of-way limits (primarily near S-bend location) potentially requiring an Archaeological Stage II study	• Potential for impacts to existing cultural heritage landscapes (i.e. mature tree lines and at S-bend location) • Potential for additional disturbance to areas considered to possess "archaeological potential" adjacent to the existing roadway and within the existing roadway right-of-way limits (primarily near S-bend location) potentially requiring an Archaeological Stage II study	• Potential for impacts to existing cultural heritage landscapes (i.e. mature tree lines and at S-bend location) • Potential for additional disturbance to areas considered to possess "archaeological potential" adjacent to the existing roadway and within the existing roadway right-of-way limits (primarily near S-bend location) potentially requiring an Archaeological Stage II study
	Evaluation Category Score				
SUMMARY COMMENTS		• **Does not meet the**	• **Meets the objectives of the**	• **Meets the objectives of the**	• **Meets the objectives of the**

Table 5-2: Summary Net Effects Evaluation (Mainline Section)
1 Kilometre North of Derry Road to 1.2 Kilometres South of Conservation Road
Guelph Line Transportation Corridor Improvements Class Environmental Assessment

Evaluation Categories	Evaluation Criteria	ALTERNATIVE DESIGN CONCEPTS (Guelph Line Mainline)			
		"Do Nothing" Alternative	**Alternative 1**	**Alternative 2**	**Alternative 3**
		No improvements or changes would be made to solve the identified problem or opportunity—existing roadway remains in current state	Maintain current horizontal roadway alignment with a minimum horizontal curve radius of 250 metres and a rural road cross-section including 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 250 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 400 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular
		objectives of the Problem Statement: ○ No improvements to the structural adequacy of the roadway; ○ No improvements to the roadway geometrics and roadway cross-section (i.e. the current horizontal/vertical alignments and narrow 3.3 metre cross-section with narrow shoulders will remain); ○ No overall improvements to safety including provisions for active transportation modes; and ○ No drainage improvements (i.e. current lack of roadside ditches, and in some cases, undersized culverts will remain)	**Problem Statement:** ○ Improves the structural adequacy of the roadway; ○ Improves the roadway geometrics and roadway cross-section (i.e. vertical/horizontal alignment improvements, 3.65 metre lane widths, and 2.5 metre partially paved shoulders); ○ Improves the overall safety performance of the roadway including provisions for active transportation modes (wider lanes and shoulders) and shoulder refuge areas for vehicles; ○ Drainage improvements include defined roadside ditches and larger culverts; ○ Minor impacts to utilities; ○ Minimal impacts to the natural environment with no significant changes to the existing drainage pattern; and ○ Minor impacts anticipated for the Socio-economic and Cultural Environments	**Problem Statement:** ○ Improves the structural adequacy of the roadway; ○ Improves the roadway geometrics and roadway cross-section (i.e. vertical/horizontal alignment improvements, 3.65 metre lane widths, and 2.5 metre partially paved shoulders); ○ Improves the overall safety performance of the roadway including provisions for active transportation modes (wider lanes and shoulders) and shoulder refuge areas for vehicles; ○ Drainage improvements include defined roadside ditches and larger culverts; ○ Minimal impacts to the natural environment with no significant changes to the existing drainage pattern; ○ Greater impacts to existing utilities, residential properties, and higher construction cost; and ○ Greater impacts anticipated for the Natural,	**Problem Statement:** ○ Improvements to the structural adequacy of the roadway; ○ Improves the roadway geometrics and roadway cross-section (i.e. vertical/horizontal alignment improvements, 3.65 metre lane widths, and 2.5 metre partially paved shoulders); ○ Improves driver expectations near S-bend with larger 400 metre radius more in line with larger horizontal curves throughout the corridor; ○ Improves the overall safety performance of the roadway including provisions for active transportation modes (wider lanes and shoulders) and shoulder refuge areas for vehicles; ○ Drainage improvements include defined roadside ditches and larger culverts; ○ Greater impacts to the natural environment near S-bend with no significant changes to the existing

Table 5-2: Summary Net Effects Evaluation (Mainline Section)
1 Kilometre North of Derry Road to 1.2 Kilometres South of Conservation Road
Guelph Line Transportation Corridor Improvements Class Environmental Assessment

Evaluation Categories	Evaluation Criteria	ALTERNATIVE DESIGN CONCEPTS (Guelph Line Mainline)			
		"Do Nothing" Alternative	**Alternative 1**	**Alternative 2**	**Alternative 3**
		No improvements or changes would be made to solve the identified problem or opportunity—existing roadway remains in current state	Maintain current horizontal roadway alignment with a minimum horizontal curve radius of 250 metres and a rural road cross-section including 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 250 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular)	Centre roadway alignment within the existing right-of-way limits and provide a minimum curve radius of 400 metres while maintaining a rural road cross-section with 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metres granular
				Socio-economic and Cultural Environments	drainage pattern; and ○ Greatest impacts to existing utilities, residential properties, and higher construction cost; and ○ Greatest impacts anticipated for the Natural, Socio-economic and Cultural Environments
RECOMMENDATION		Not Recommended	**RECOMMENDED**	Not Recommended	Not Recommended

Table 5-3: Summary Net Effects Evaluation (Northern Section)
Conservation Road to 1.2 Kilometres Southerly
Guelph Line Transportation Corridor Improvements Class Environmental Assessment

Evaluation Categories	Evaluation Criteria	ALTERNATIVE CROSS-SECTION DESIGN CONCEPTS (Northern Section of Guelph Line)	
		Alternative 1-A	**Alternative 1-B**
		Provide a **rural roadway** cross-section including 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved) with guiderail protection where required through the northern section of the study area	Provide an **urban roadway** cross-section including 3.65 metre lanes, 1.0 metre paved shoulders with curb and gutter, guiderail protection, and retaining walls where required through the northern section of the study area
TECHNICAL	• Capacity and Level of Service • Safety • Access • Active Transportation • (e.g., Pedestrians and Cyclists) • Geometric Standards • Structural (i.e. Pavement) • Utility Relocations • Construction and Property Costs • Construction Staging	• Safety performance improvements with the addition of 2.5 metre partially paved shoulders (1.0 metre partially paved) on both sides of the roadway which will provide additional space for cyclists and pedestrians • Improved roadway surface with some impact beyond the current roadway width (i.e. ditch side slopes would match into existing ground without requiring additional “cuts/fills” where possible) • No additional property required • May require additional traffic control if any significant amount of rock cuts are required	• Safety performance improvements with the addition of 2.5 metre partially paved shoulders (1.0 metre partially paved) on both sides of the roadway which will provide additional space for cyclists and pedestrians • Improved roadway surface with less impact beyond the current roadway width (i.e. installation of retaining walls may be necessary to minimize impacts to existing ponds and/or rock outcrops) • No additional property required • Installation of urban cross-section and possibly retaining walls as required will reduce the amount/size of rock cuts • Installation of storm sewer will require lane closures
	Evaluation Category Score		
NATURAL ENVIRONMENT	• Effects on Vegetation • Effects on Wildlife • Effects on Aquatic Ecology • Stormwater Management • Effects on Groundwater Resources • Natural Hazards	• Some impacts on vegetation due to roadway widening and drainage ditch/roadway shoulder installation • Some impacts on aquatic ecology during construction • Rural cross-section will allow for sheet flow runoff to drainage ditches • No natural hazard impacts anticipated. Potential construction erosion impacts will be addressed through temporary erosion and sedimentation control measures	• Minimal impacts on vegetation due to roadway widening and curb and gutter installation • Minimal impacts on aquatic ecology during construction • Urban cross-section will allow for directed flow runoff to drainage ditches further south • No natural hazard impacts anticipated. Potential construction erosion impacts will be addressed through temporary erosion and sedimentation control measures
	Evaluation Category Score		
SOCIO-ECONOMIC ENVIRONMENT	• Land Use • Effects on Official Plans and other planning initiatives (e.g., Greenbelt Plan and Niagara Escarpment Plan) • Effects on business access/operations • Effects on residential and rural land uses	• Wider shoulders and formalized drainage ditches • Total additional property required is approximately 0.045 hectares for daylighting	• Wider shoulders and formalized drainage ditches • Total additional property required is approximately 0.045 hectares for daylighting

Table 5-3: Summary Net Effects Evaluation (Northern Section)
Conservation Road to 1.2 Kilometres Southerly
Guelph Line Transportation Corridor Improvements Class Environmental Assessment

Evaluation Categories	Evaluation Criteria	ALTERNATIVE CROSS-SECTION DESIGN CONCEPTS (Northern Section of Guelph Line)	
		Alternative 1-A	**Alternative 1-B**
		Provide a **rural roadway** cross-section including 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved) with guiderail protection where required through the northern section of the study area	Provide an **urban roadway** cross-section including 3.65 metre lanes, 1.0 metre paved shoulders with curb and gutter, guiderail protection, and retaining walls where required through the northern section of the study area
	• Potential property requirements • Noise and vibration effects • Aesthetics • Emergency access		
	Evaluation Category Score		
CULTURAL ENVIRONMENT	• Effects on Built Heritage Features • Effects on Archaeological Resources	• No impacts to existing built heritage features • No impacts to existing archaeological resources	• No impacts to existing built heritage features • No impacts to existing archaeological resources
	Evaluation Category Score		
SUMMARY COMMENTS		• **Meets the objectives of the Problem Statement:** ○ Improves the structural adequacy of the roadway; ○ Improves the roadway cross-section (i.e. 2.5 metre partially paved shoulders with toe of slope tie-in to existing ground); ○ Improves the overall safety performance of the roadway including provisions for active transportation modes (i.e. wider shoulders); ○ Drainage improvements include defined drainage ditches and larger roadway cross culverts; ○ No significant changes to the existing drainage pattern; ○ Improves stormwater quality and quantity control; ○ Greater impacts to utilities; ○ Greater impacts to the Natural Environment (i.e. vegetation impacts due to wider road platform, particularly in the northern section of the study area) ○ Minor impacts anticipated for the Socio-economic Environment with additional property required; and ○ Some impact to Conservation Halton lands within north section of roadway.	• **Meets the objectives of the Problem Statement:** ○ Improves the structural adequacy of the roadway; ○ Improves the roadway cross-section (i.e. 3.65 metre lane widths, and 1.0 metre paved shoulders with curb and gutter and retaining wall adjacent to creek area); ○ Improves the overall safety performance of the roadway including provisions for active transportation modes (i.e. wider shoulders); ○ Drainage improvements include defined drainage ditches, storm sewer system and larger roadway cross culverts ○ No significant changes to the existing drainage pattern; ○ Improves stormwater quality and quantity control; ○ Minor impacts to utilities; ○ Some impacts to the Natural Environment (i.e. vegetation impacts); ○ Minor impacts anticipated for the Socio-economic Environment with some additional property required; and ○ Minor impact to Conservation Halton lands within north section of roadway.

Table 5-3: Summary Net Effects Evaluation (Northern Section)
Conservation Road to 1.2 Kilometres Southerly
Guelph Line Transportation Corridor Improvements Class Environmental Assessment

Evaluation Categories	Evaluation Criteria	ALTERNATIVE CROSS-SECTION DESIGN CONCEPTS (Northern Section of Guelph Line)	
		Alternative 1-A	**Alternative 1-B**
		Provide a **rural roadway** cross-section including 3.65 metre lanes, 2.5 metre partially paved shoulders (1.0 metre paved) with guiderail protection where required through the northern section of the study area	Provide an **urban roadway** cross-section including 3.65 metre lanes, 1.0 metre paved shoulders with curb and gutter, guiderail protection, and retaining walls where required through the northern section of the study area
RECOMMENDATION		Not Recommended	**RECOMMENDED**

5.4 Preferred Roadway Improvement Design Alternative

The Preferred Roadway Improvement Design Alternative includes a combination of **Alternative 1** and **Alternative 1-B** as determined through the evaluation process and discussed in Sections 5.2 and 5.3. The key features of the Preferred Roadway Improvement Design Alternative include the following:

- A combination of 2-lane rural (Mainline Section) and urban (Northern Section) cross-sections with 3.65 metre travel lanes throughout the length of the study area (slight roadway widening on horizontal curves to accommodate larger vehicles). Barrier protection and/or retaining walls to be provided as required near rock outcrop and pond areas.

- 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metre granular) with formalized drainage ditches for the mainline section of the study area and 1.0 metre paved shoulders with mountable curb and gutter in the northern section, south of Conservation Road.

- The future horizontal roadway alignment is maintained along the current centreline roadway alignment with vertical alignment improvements provided as required to prevailing standards to improve overall sight distance. Improvements to the horizontal alignment near the existing S-bend location to improve the existing radius from 140 metres to 250 metres to meet current geometric standards for an 80 km/hr design speed.

- Replacement of three existing drainage culverts along Guelph Line with three larger higher capacity culverts to improve drainage conditions and to provide improved passage for native species.

- Minimal impacts to the overall Natural, Socio-Economic and Cultural Environments while meeting prevailing Regional roadway standards.

- Additional property is required near the S-bend location to accommodate the larger horizontal radius curves.

The Preferred Roadway Improvement Design Alternative is illustrated in **Figure 5-5A** through **Figure 5-5G**. Typical roadway cross-sections for the Preferred Roadway Improvement Design Alternative for the Mainline and Northern (rock outcrop and pond areas) sections of Guelph Line are provided in **Figure 5-6**.

SCALE 1:1000

PROTECT POLE

PROPERTY REQUIRED TO BROADEN CURVE

REPLACE CULVERT #1

RELOCATE POLE (TYPICAL)

PROPERTY REQUIRED FOR ROAD WIDENING

HALTON OFFICIAL PLAN R.O.W. LIMIT

LEGEND

- PROPOSED ASPHALT
- PROPOSED GRANULAR
- PROPOSED BOULEVARD
- PROPOSED PROPERTY REQUIREMENTS
- PROPOSED DITCH
- EXISTING PROPERTY LINE
- PROPOSED CURB AND GUTTER
- MH.1 PROPOSED STORM SEWER AND MAINTENANCE HOLE

PREFERRED ALTERNATIVE DESIGN

Alternative 1 (Mainline Section) - Rural Road Cross-section on Existing Horizontal Road Alignment
Alternative 1-B (Northern Section) - Urban Road Cross-section on Existing Horizontal Road Alignment

IR ASSOCIATES

Halton REGION

**GUELPH LINE (REGIONAL ROAD 1)
1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD
CLASS ENVIRONMENTAL ASSESSMENT
NOVEMBER 2010**

FIGURE 5-5A

SCALE 1:1000

REPLACE CULVERT #1

RELOCATE SIGN (TYPICAL)

PROPERTY REQUIRED TO BROADEN CURVE

HALTON OFFICIAL PLAN R.O.W. LIMIT

HALTON OFFICIAL PLAN R.O.W. LIMIT

PROPERTY REQUIRED FOR ROAD WIDENING

LEGEND

PROPOSED ASPHALT	PROPOSED BOULEVARD	PROPOSED DITCH	PROPOSED CURB AND GUTTER
PROPOSED GRANULAR	PROPOSED PROPERTY REQUIREMENTS	EXISTING PROPERTY LINE	PROPOSED STORM SEWER AND MAINTENANCE HOLE (MH.1)

PREFERRED ALTERNATIVE DESIGN

Alternative 1 (Mainline Section) - Rural Road Cross-section on Existing Horizontal Road Alignment
Alternative 1-B (Northern Section) - Urban Road Cross-section on Existing Horizontal Road Alignment

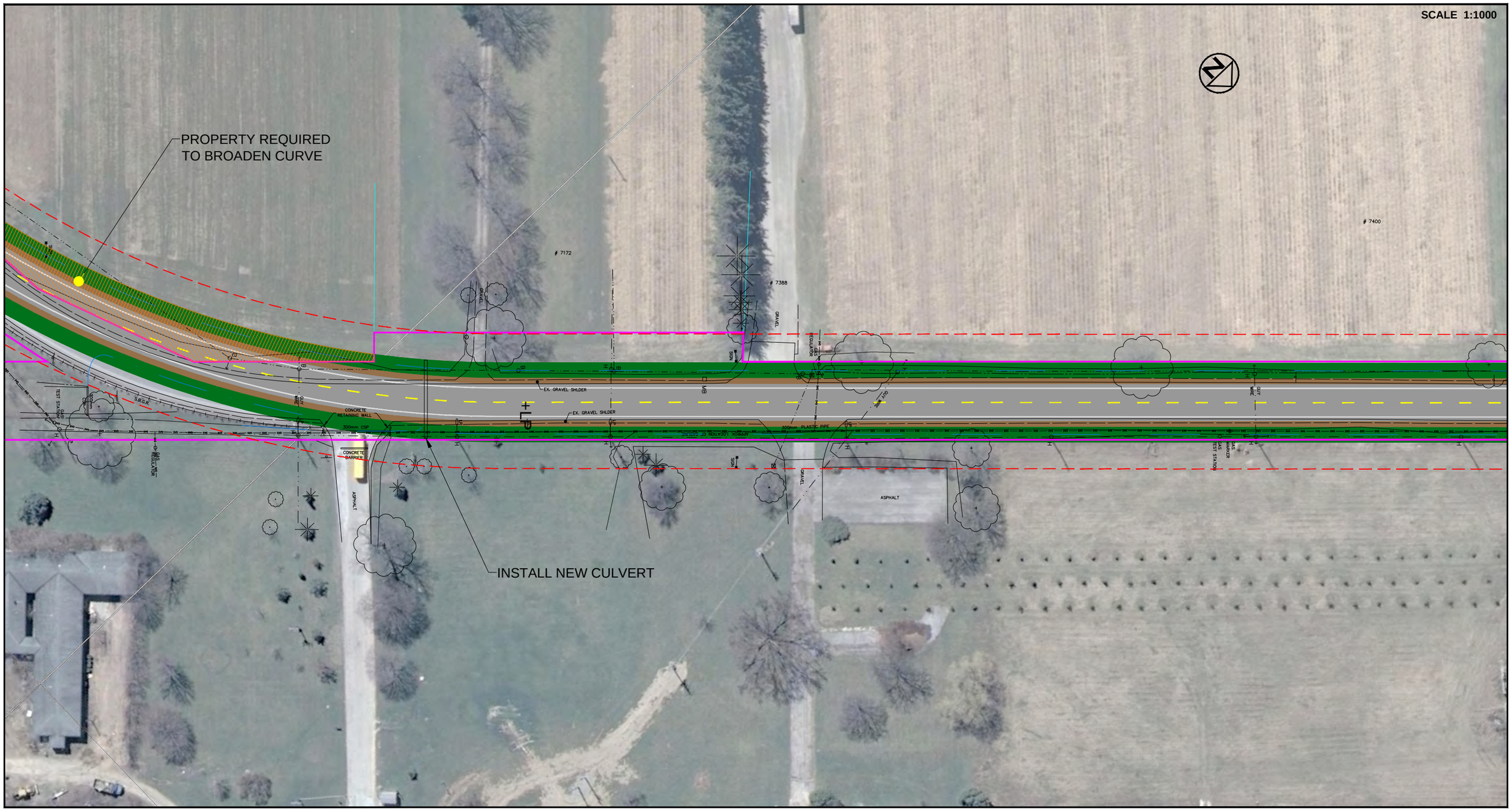
IR ASSOCIATES

Halton REGION

**GUELPH LINE (REGIONAL ROAD 1)
1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD
CLASS ENVIRONMENTAL ASSESSMENT
NOVEMBER 2010**

FIGURE 5-5B

SCALE 1:1000



LEGEND

- PROPOSED ASPHALT
- PROPOSED BOULEVARD
- PROPOSED DITCH
- PROPOSED CURB AND GUTTER
- PROPOSED GRANULAR
- PROPOSED PROPERTY REQUIREMENTS
- EXISTING PROPERTY LINE
- MH.1 PROPOSED STORM SEWER AND MAINTENANCE HOLE

PREFERRED ALTERNATIVE DESIGN

Alternative 1 (Mainline Section) - Rural Road Cross-section on Existing Horizontal Road Alignment
Alternative 1-B (Northern Section) - Urban Road Cross-section on Existing Horizontal Road Alignment

IR ASSOCIATES

Halton REGION

**GUELPH LINE (REGIONAL ROAD 1)
1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD
CLASS ENVIRONMENTAL ASSESSMENT
NOVEMBER 2010**

FIGURE 5-5C

SCALE 1:1000

RELOCATE MAILBOX
(TYPICAL)

STORM SEWER
OUTLET TO DITCH

CURB AND GUTTER
FOR ROAD DRAINAGE

RURAL ROADWAY
CROSS SECTION
(Mainline Section)

URBAN ROADWAY
CROSS SECTION
(Northern Section)

LEGEND

- PROPOSED ASPHALT
- PROPOSED BOULEVARD
- PROPOSED DITCH
- PROPOSED CURB AND GUTTER
- PROPOSED GRANULAR
- PROPOSED PROPERTY REQUIREMENTS
- EXISTING PROPERTY LINE
- PROPOSED STORM SEWER AND MAINTENANCE HOLE (MH.1)

PREFERRED ALTERNATIVE DESIGN

Alternative 1 (Mainline Section) - Rural Road Cross-section on Existing Horizontal Road Alignment
Alternative 1-B (Northern Section) - Urban Road Cross-section on Existing Horizontal Road Alignment

**GUELPH LINE (REGIONAL ROAD 1)
1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD
CLASS ENVIRONMENTAL ASSESSMENT
NOVEMBER 2010**

FIGURE 5-5D

SCALE 1:1000

EXISTING ROAD ALIGNMENT
BEYOND RIGHT-OF-WAY

INSTALL GUIDERAIL
AT ROCK OUTCROP
(TYPICAL)

PROTECT OR RELOCATE POLE
(TYPICAL)

MH.13
MH.12
MH.11
MH.10
MH.7

ROCK OUTCROP
EX. GRAVEL SHLDER
MATCH LINE
MATCH LINE

LEGEND

PROPOSED ASPHALT	PROPOSED BOULEVARD	PROPOSED DITCH	PROPOSED CURB AND GUTTER
PROPOSED GRANULAR	PROPOSED PROPERTY REQUIREMENTS	EXISTING PROPERTY LINE	MH.1 PROPOSED STORM SEWER AND MAINTENANCE HOLE

PREFERRED ALTERNATIVE DESIGN

Alternative 1 (Mainline Section) - Rural Road Cross-section on Existing Horizontal Road Alignment
Alternative 1-B (Northern Section) - Urban Road Cross-section on Existing Horizontal Road Alignment

IR ASSOCIATES
Halton REGION

**GUELPH LINE (REGIONAL ROAD 1)
1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD
CLASS ENVIRONMENTAL ASSESSMENT
NOVEMBER 2010**

FIGURE 5-5E

SCALE 1:1000

REPLACE CULVERT #2

CONNECT PROPOSED STORM SEWER TO CULVERT

INSTALL NEW EARTH SLOPE

HALTON OFFICIAL PLAN R.O.W. LIMIT

HALTON OFFICIAL PLAN R.O.W. LIMIT

INSTALL GUIDERAIL AT POND (TYPICAL)

INSTALL NEW EARTH SLOPE

EXISTING ROAD ALIGNMENT BEYOND RIGHT-OF-WAY

LEGEND

	PROPOSED ASPHALT		PROPOSED BOULEVARD		PROPOSED DITCH		PROPOSED CURB AND GUTTER
	PROPOSED GRANULAR		PROPOSED PROPERTY REQUIREMENTS		EXISTING PROPERTY LINE	MH.1	PROPOSED STORM SEWER AND MAINTENANCE HOLE

PREFERRED ALTERNATIVE DESIGN

Alternative 1 (Mainline Section) - Rural Road Cross-section on Existing Horizontal Road Alignment
Alternative 1-B (Northern Section) - Urban Road Cross-section on Existing Horizontal Road Alignment

IR ASSOCIATES

Halton REGION

**GUELPH LINE (REGIONAL ROAD 1)
1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD
CLASS ENVIRONMENTAL ASSESSMENT
NOVEMBER 2010**

FIGURE 5-5F

SCALE 1:1000

CURB AND GUTTER
FOR ROAD DRAINAGE

TREE TRIMMING ALONG WEST SIDE OF GUELPH LINE

MATCH ROADWAY INTO EXISTING DRIVEWAYS

PROPERTY REQUIRED
FOR DAYLIGHTING
(TYPICAL)

CONSERVATION ROAD

TREE TRIMMING ALONG EAST SIDE OF GUELPH LINE

URBAN ROADWAY
CROSS SECTION

RURAL ROADWAY
CROSS SECTION

LEGEND

- PROPOSED ASPHALT
- PROPOSED BOULEVARD
- PROPOSED DITCH
- PROPOSED CURB AND GUTTER
- PROPOSED GRANULAR
- PROPOSED PROPERTY REQUIREMENTS
- EXISTING PROPERTY LINE
- MH.1 — PROPOSED STORM SEWER AND MAINTENANCE HOLE

PREFERRED ALTERNATIVE DESIGN

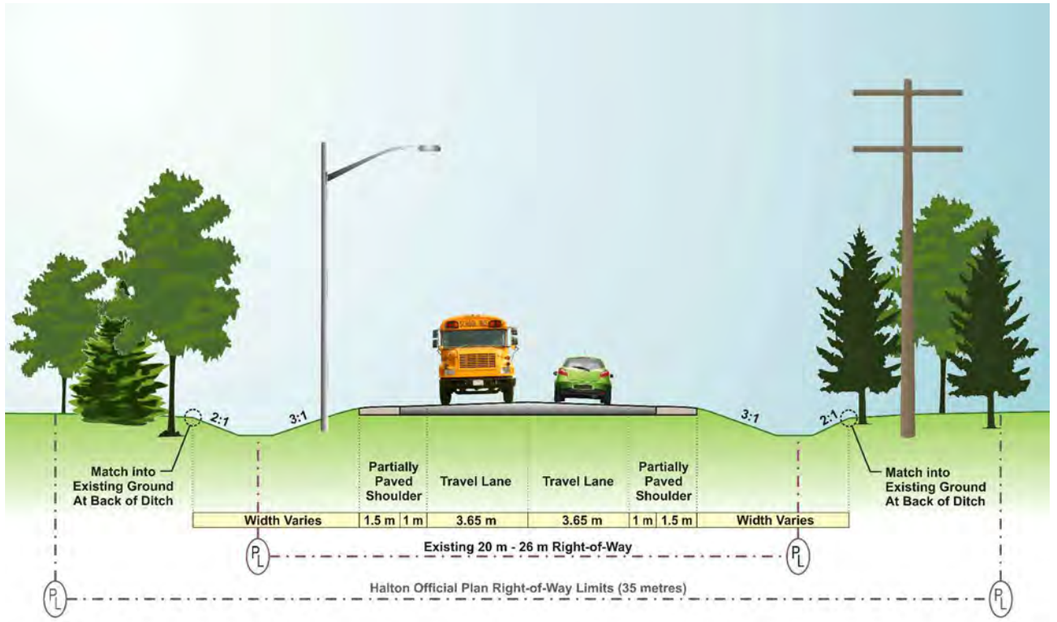
Alternative 1 (Mainline Section) - Rural Road Cross-section on Existing Horizontal Road Alignment
Alternative 1-B (Northern Section) - Urban Road Cross-section on Existing Horizontal Road Alignment

IR ASSOCIATES

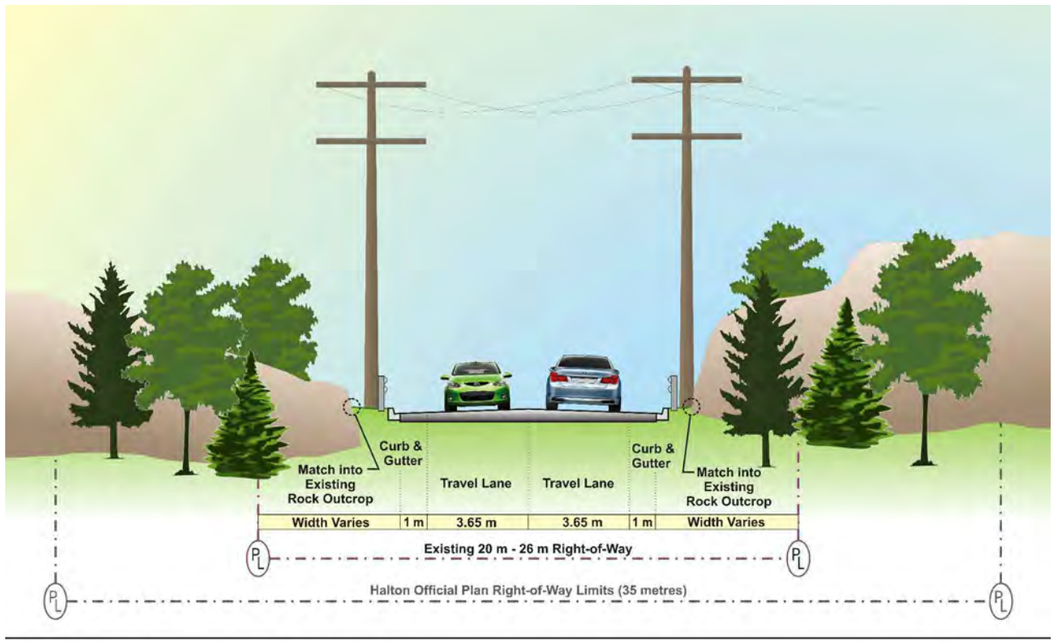
Halton REGION

**GUELPH LINE (REGIONAL ROAD 1)
1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD
CLASS ENVIRONMENTAL ASSESSMENT
NOVEMBER 2010**

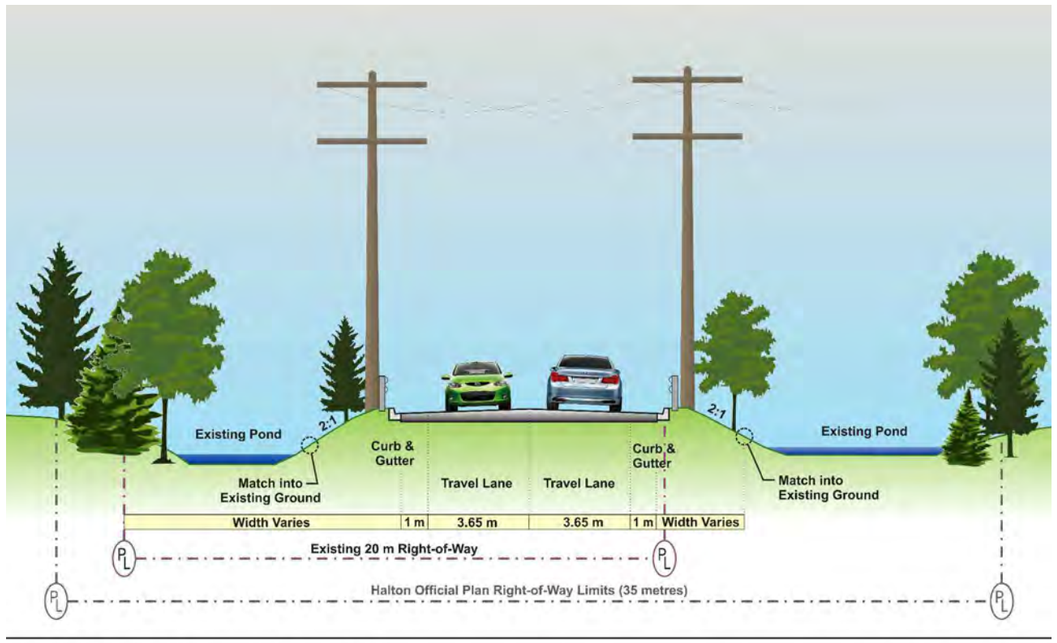
FIGURE 5-5G



Guelph Line (Regional Road 1)
Typical Rural Roadway Cross-Section (Alternative 1)



Guelph Line (Regional Road 1)
Typical Urban Roadway Cross-Section at Rock Outcrop Location (Alternative 1-B)



Guelph Line (Regional Road 1)
Typical Urban Roadway Cross-Section at Pond Location (Alternative 1-B)

PREFERRED ALTERNATIVE DESIGN CONCEPT

Typical Cross-Sections
(Mainline and Northern Sections)

GUELPH LINE (REGIONAL ROAD 1)
1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD
CLASS ENVIRONMENTAL ASSESSMENT
NOVEMBER 2010

FIGURE 5-6

6. DESCRIPTION OF PREFERRED DESIGN

This section provides a discussion of the Preferred Roadway Design Improvements for Guelph Line (Regional Road 1) from one kilometre north of Derry Road (Regional Road 7) to Conservation Road, including the technical elements and refinements associated with the preliminary design as proposed. The information presented in Section 6 should also be reviewed in conjunction with Sections 2, 4 and 5 of the ESR which describes the Class EA process followed to define the project. While changes may occur during the detail design stage, any changes should not alter the intent of the recommended undertaking or its components. During detail design, there will be further consultation with technical agencies including but not limited to Conservation Halton, Ministry of the Environment, the Town of Milton, utilities and affected property owners.

The preliminary plan, profile and typical cross-sections for Guelph Line from one kilometre north of Derry Road to Conservation Road were developed based on the technical and public consultation input received throughout the Class EA process. *Preliminary Design Plates* of the recommended undertaking, comprised of 11 sheets, are provided in **Figures 6-1 (A to J)** and **6-2**. The preliminary design extends for approximately 2.4 kilometres from one kilometre north of Derry Road (Regional Road 7) to just south of the Conservation Road intersection.

The recommended undertaking for the Guelph Line Transportation Corridor Improvements includes the following:

- The horizontal centerline alignment of Guelph Line generally follows the existing centerline alignment with slight modifications near the existing S-bend location to accommodate larger 250 metre radius curves, replacing the existing 140 metre radius curves;
- The vertical centerline alignment of Guelph Line will generally be maintained with a minimum grade of 0.6 percent and a maximum grade of 6.3 percent;
- 3.65 metre travel lanes throughout the length of the study area (there will be a slight widening of the travel lanes on the horizontal curves to accommodate larger vehicles);
- 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metre granular) with formalized drainage ditches for the mainline section of the study area from approximately one kilometre north of Derry Road (Regional Road 7) to about 1.2 kilometres south of Conservation Road and from Conservation Road to approximately 0.2 kilometres south of Conservation Road;
- 1.0 metre paved shoulders with mountable curb and gutter in the northern section of Guelph Line from approximately 1.2 kilometres south of Conservation Road to 0.2 kilometres south of Conservation Road;

- Installation of guiderail protection and retaining walls as required to provide additional roadside protection for road users;
- Accommodation of active transportation modes (cyclists and pedestrians) through the provision of a 1.0 metre partially paved shoulder on both sides of the roadway throughout the study area;
- Stormwater management provisions with the installation of new drainage ditches along both sides of the roadway within the rural section and the provision of a storm sewer system within the urban section;
- Replacement of existing roadway cross culverts with higher capacity culverts and the addition of one new cross culvert;
- Relocation of existing Hydro/Bell poles to accommodate road realignment at the S-bend and at other locations as required to accommodate the wider rural cross-section;
- 0.29 hectares of property is required to accommodate the larger 250 metre radius curves at the S-bend location; and
- Provision of daylighting triangles at the intersection of Guelph Line and Conservation Road.

6.1 Major Features of the Preferred Roadway Improvement Design

6.1.1 Design Criteria

Currently, Guelph Line maintains a posted speed limit of 60 km/hr within the study area. The proposed geometrical standards for the roadway improvements for Guelph Line are provided in **Table 6-1**.

Table 6-1: Geometric Standards

Attribute	Proposed Standards
Classification	RAU 80
Design Speed	80 km/h
Posted Speed	60 km/h
No. of Lanes	2
Minimum Stopping Sight Distance	135 m
Minimum Radius (max e 6%)	250 m
Maximum Grades	6 %

Table 6-1: Geometric Standards

Attribute	Proposed Standards
Minimum Grades	0.5 %
Vertical Curves (Min K)[9] - Crest - Sag	 35 30
Through Lane Width	3.65 m
Superelevation	6 % (maximum)
Shoulder Widths	2.5 m (1.0 m partially paved and 1.5 m granular)
Basic Right-of-Way Width Official Plan Right-of-Way Width	Varies 35 m

6.1.2 Typical Cross-Section

Figure 6-2 includes the typical proposed cross-sections developed for improving the existing roadway within the Guelph Line corridor. The following provides a summary description of the typical cross-section attributes for the two distinct sections (rural mainline and urban northern sections) of Guelph Line. It should be noted that the right-of-way limits indicated are the nominal right-of-way limits and are subject to change based on the sloping requirements at cut and fill locations.

Mainline Section – 1 kilometre north of Derry Road to 1.2 kilometres south of Conservation Road and Conservation Road to 0.2 kilometres south of Conservation Road

- 2 – 3.65 metre lanes
- 2.5 metre partially paved shoulders (1.0 metre paved; 1.5 metre granular)
- Rural cross-section (ditches) on both sides
- ±20 metre right-of-way

[9] K values are proposed geometric standards. Actual K values will closely match existing conditions to minimize cut/fill quantities.

Northern Section – 1.2 kilometres south of Conservation Road to 0.2 kilometres south of Conservation Road

- 2 – 3.65 metre lanes
- 1.0 metre paved shoulders
- Urban cross-section (mountable curb and gutter) on both sides
- ±20 metre right-of-way

6.1.3 Alignment and Grade

Guelph Line will generally follow the existing centreline horizontal alignment with slight modifications near the existing S-bend location to accommodate larger 250 metre radius curves, replacing the existing 140 metre radius curves. The alignment will shift at the S-bend location encompassing 140 metres from Station 1+200 to Station 1+340 and 220 metres from Station 1+520 to Station 1+740. Traveling north from the S-bend location, the alignment follows the existing centreline horizontal alignment through several broad curves ranging from a 375 metre radius to a 1,000 metre radius near Conservation Road.

The vertical alignment is designed to match as closely as possible with the existing roadway vertical alignment to minimize cut/fill quantities. Vertical curves will also be close to existing with a minimum K value of 25. The maximum grade for the proposed Guelph Line road profile is 6.3 percent.

6.1.4 Intersections

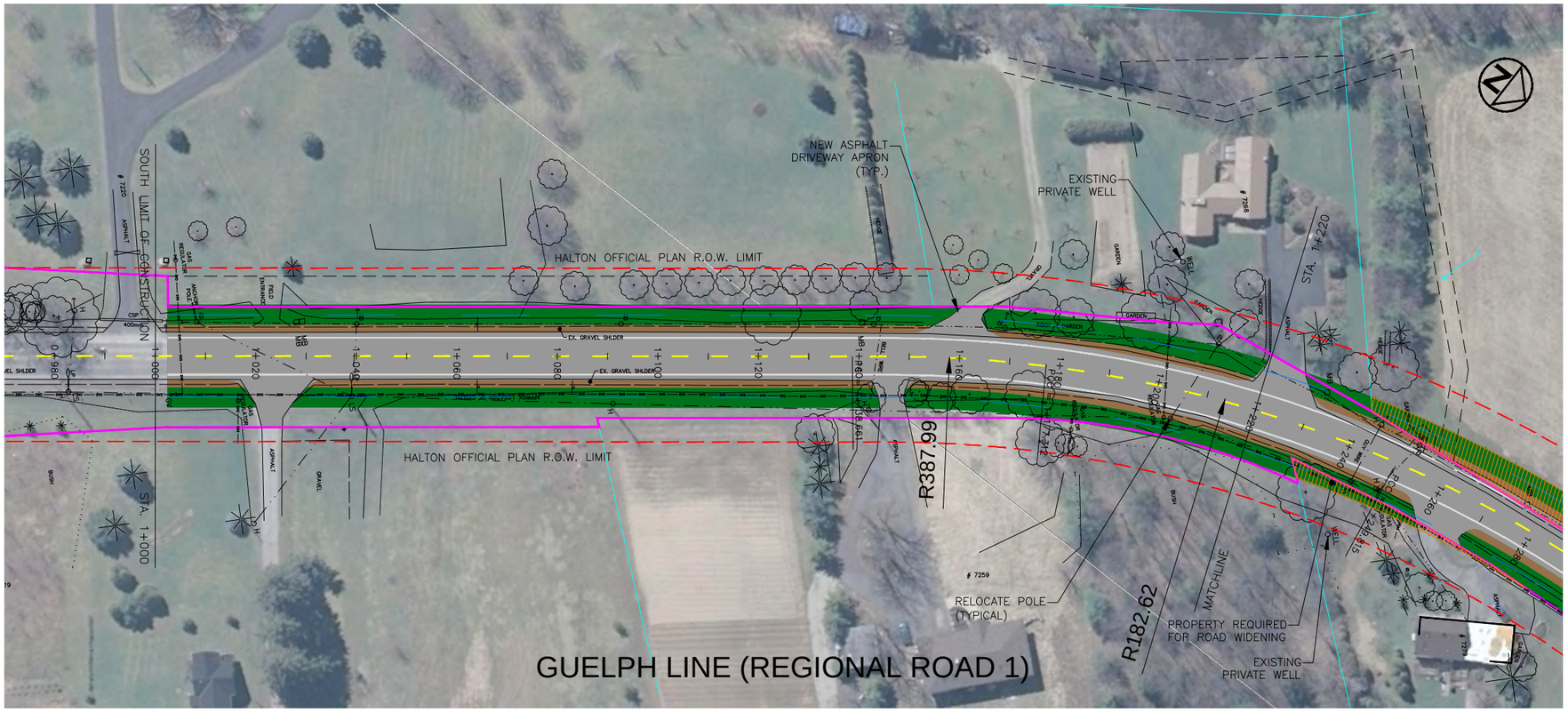
The existing intersection at Guelph Line and Conservation Road will remain in place in its current state with the proposed Guelph Line rural cross-section transitioning into the intersection south of Conservation Road. The proposed asphalt and shoulders will match into the locations and grades of the existing curve returns at the south side of the intersection. There are no planned modifications for the intersection as part of this study. Daylighting (sight) triangles will be added to each quadrant of the intersection to ensure unobstructed driver visibility (sight distance) at the intersection of the two roads. All existing obstructions will be removed to provide stopping sight distance and pedestrian safety. The sight triangles will be a minimum of 15 metres by 15 metres as indicated in the Regional Official Plan.

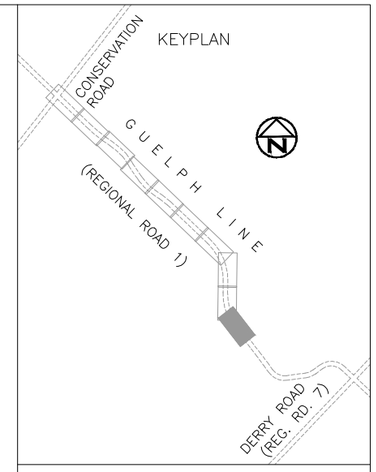
6.1.5 Entrances

The existing entrances along Guelph Line will be maintained. The entrance grades will be reviewed and confirmed during the detail design stage. Driveway treatments and surfaces will be replaced with equivalent or superior materials. For granular entrances, it is recommended to install hard surface driveway aprons. This will help ensure that granular materials are kept from accumulating on the traveled portion of the roadway. Since the proposed road profile is very similar to the existing road profile, existing access grades and the road top asphalt grade will be matched close to existing conditions. Where the roadway is shifted horizontally (which may shorten the existing driveway), the adjacent driveway shall be graded to no more than a six percent slope. This may require grading on private property and would be shown on the detailed design drawings.

6.1.6 Provisions for Cyclists and Pedestrians

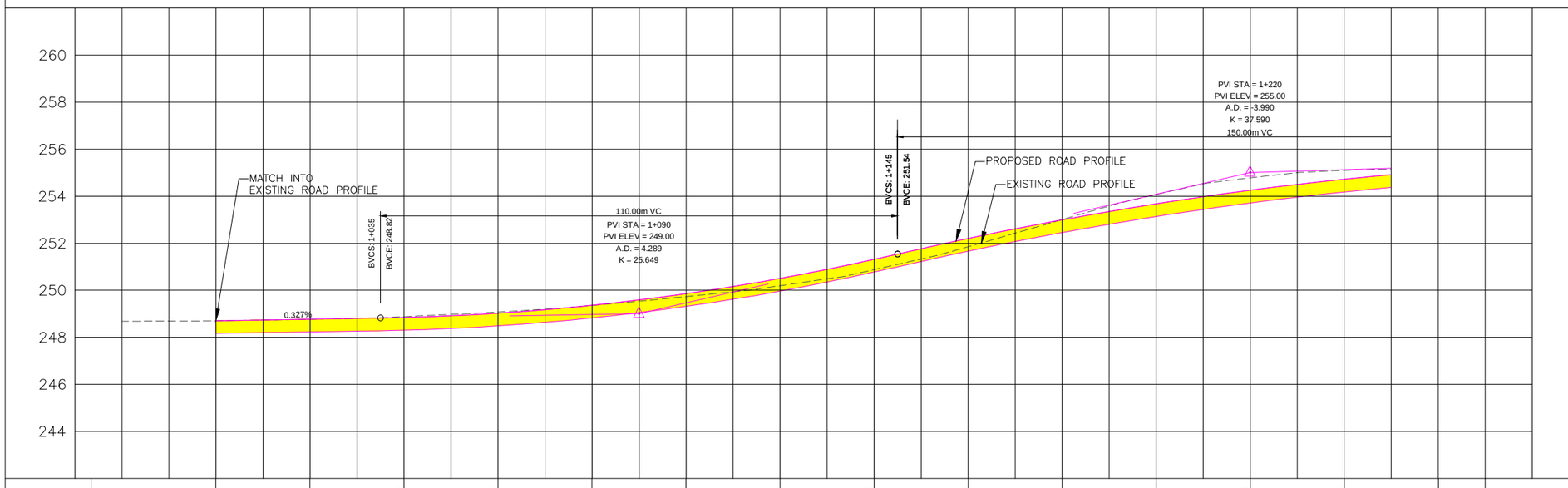
There is currently no dedicated cycling or pedestrian facilities located along Guelph Line within the study area limits. The provision of a 1.0 metre partially paved shoulder on both sides of the roadway throughout the study area will be provided to meet active transportation needs in accordance with the Regional Official Plan.





LEGEND

- PROPOSED ASPHALT
- PROPOSED GRANULAR
- PROPOSED BOULEVARD
- PROPOSED PROPERTY REQUIREMENTS
- PROPOSED DITCH
- EXISTING PROPERTY LINE
- PROPOSED CURB AND GUTTER
- PROPOSED STORM SEWER AND MAINTENANCE HOLE (MH.1)



℄ ELEVATIONS	248.71 / 249.706	248.77 / 248.771	248.88 / 248.842	249.08 / 249.024	249.36 / 249.362	249.73 / 249.856	250.19 / 250.586	250.88 / 251.313	251.85 / 252.201	253.01 / 252.991	254.07 / 253.675	254.78 / 254.252	255.10 / 254.723	255.18 / 255.087	℄ ELEVATIONS
CHAINAGE	1+000		1+040		1+080		1+120		1+160		1+200		1+240		CHAINAGE

Nº	Date	By	REVISIONS	MANU	CAD

Design		Ch'kd	Date: NOVEMBER 2010
Drawn		Ch'kd	
Scale Horiz. / Vert.			References

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Field Notes

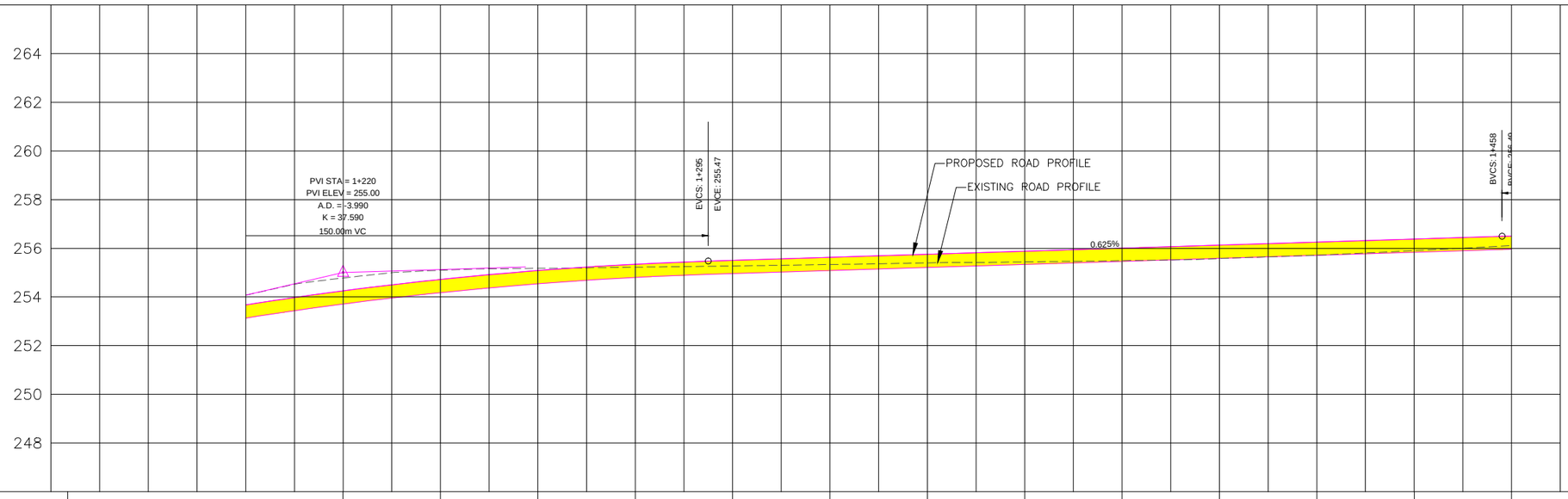
R. J. Burnside & Associates

Halton Region

PROPOSED PLAN AND PROFILE GUELPH LINE (REGIONAL ROAD 1)

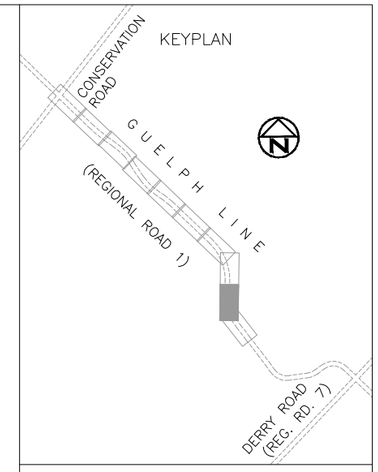
FROM 1 KILOMETRE NORTH OF DERRY ROAD (REGIONAL ROAD 7) TO CONSERVATION ROAD

Consultant File Nº	Regional Drawing Nº
FIGURE 6–1A	
CONTRACT Nº RR–09–024	Drawing Nº SHEET 1 OF 11



℄ ELEVATIONS	253.675	254.78 / 254.252	255.10 / 254.723	255.18 / 255.087	255.22 / 255.346	255.27 / 255.500	255.33 / 255.825	255.40 / 255.750	255.44 / 255.875	255.49 / 256.000	255.58 / 256.125	255.71 / 256.250	255.91 / 256.375	256.11	℄ ELEVATIONS
CHAINAGE		1+200		1+240		1+280		1+320		1+360		1+400		1+440	CHAINAGE

KEYPLAN



LEGEND

- PROPOSED ASPHALT
- PROPOSED GRANULAR
- PROPOSED BOULEVARD
- PROPOSED PROPERTY REQUIREMENTS
- PROPOSED DITCH
- EXISTING PROPERTY LINE
- PROPOSED CURB AND GUTTER
- MH.1 PROPOSED STORM SEWER AND MAINTENANCE HOLE

№	Date	By	REVISIONS	MANU	CAD

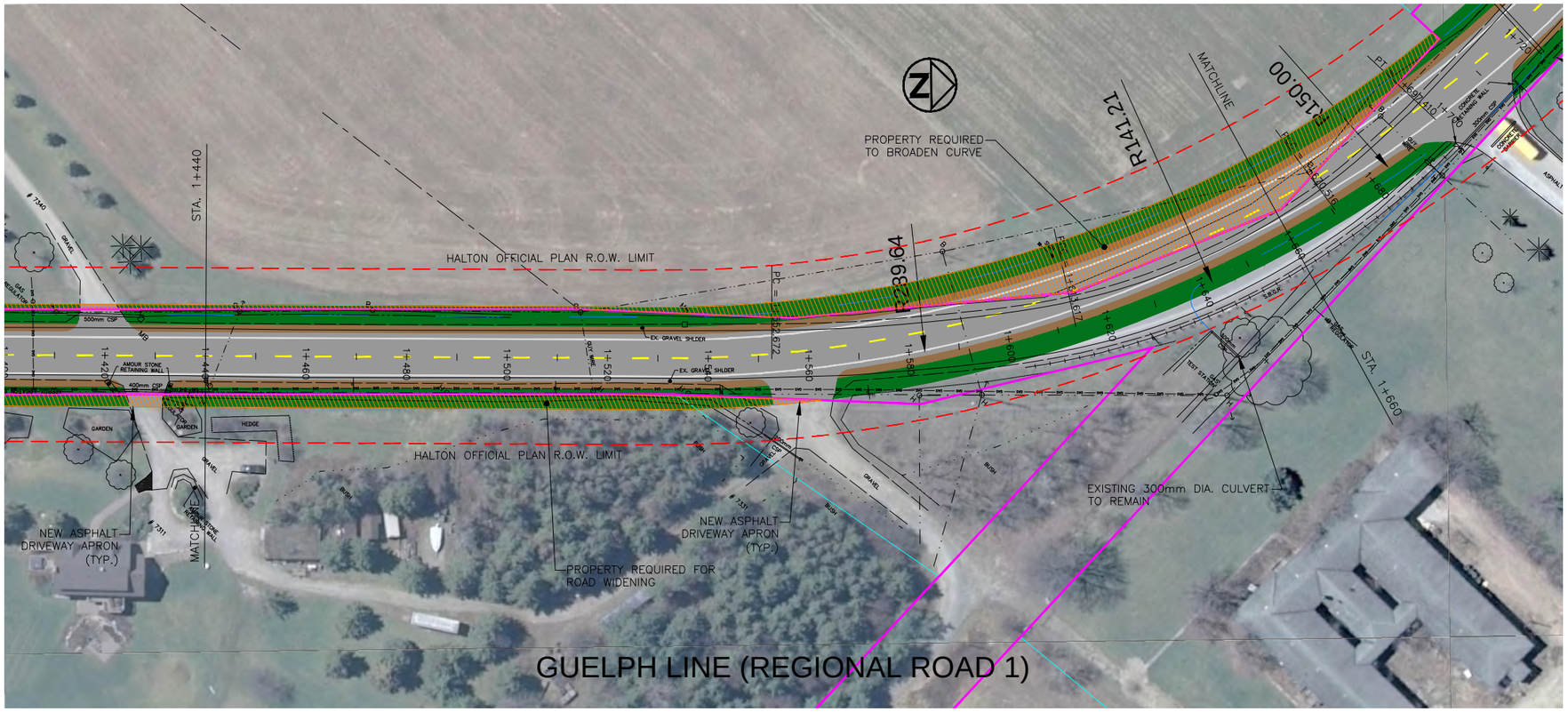
Design		Ch'kd		Date NOVEMBER 2010
Drawn		Ch'kd		
Scale Horiz. / Vert.				References
APPROVALS				Field Notes
Municipal				
Regional				
Director, Engineering Services				
Manager, Design Services				

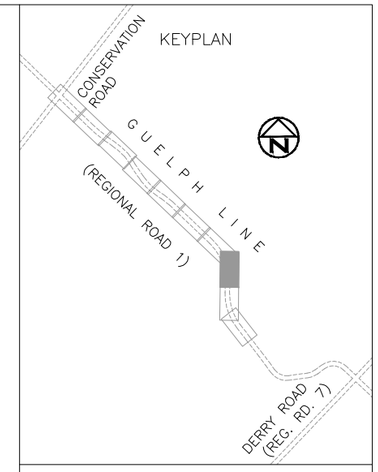
Halton REGION

PROPOSED PLAN AND PROFILE GUELPH LINE (REGIONAL ROAD 1)

FROM 1 KILOMETRE NORTH OF DERRY ROAD (REGIONAL ROAD 7) TO CONSERVATION ROAD

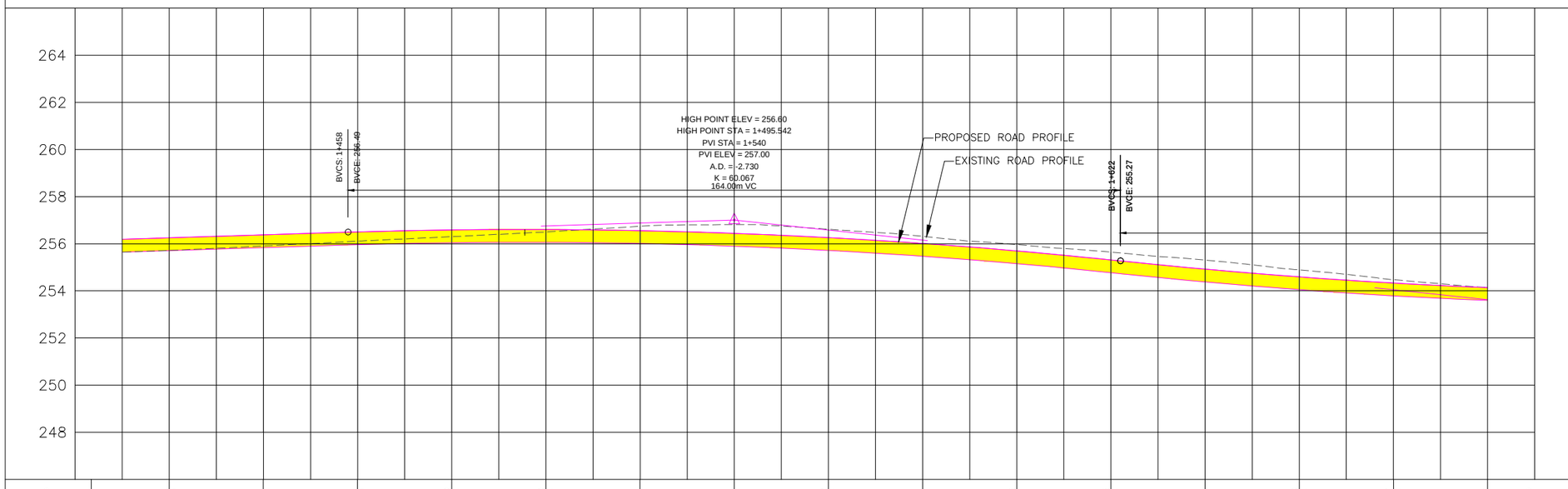
Consultant File №	Regional Drawing №
FIGURE 6-1B	
CONTRACT №	Drawing №
RR-09-024	SHEET 2 OF 11





LEGEND

- PROPOSED ASPHALT
- PROPOSED GRANULAR
- PROPOSED BOULEVARD
- PROPOSED PROPERTY REQUIREMENTS
- PROPOSED DITCH
- EXISTING PROPERTY LINE
- PROPOSED CURB AND GUTTER
- PROPOSED STORM SEWER AND MAINTENANCE HOLE (MH.1)



℄ ELEVATIONS	255.71 256.250	255.91 256.375	256.11 256.500	256.30 256.585	256.50 256.603	256.74 256.555	256.81 256.440	256.62 256.259	256.31 256.011	255.96 255.697	255.65 255.315	255.31 254.922	254.89 254.594	254.47 254.333	254.14	℄ ELEVATIONS
CHAINAGE	1+440		1+480		1+520		1+560		1+600		1+640		1+680			CHAINAGE

№	Date	By	REVISIONS	MANU	CAD

Design		Ch'kd	Date: NOVEMBER 2010
Drawn		Ch'kd	
Scale Horiz.			References
Vert.			

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Field Notes

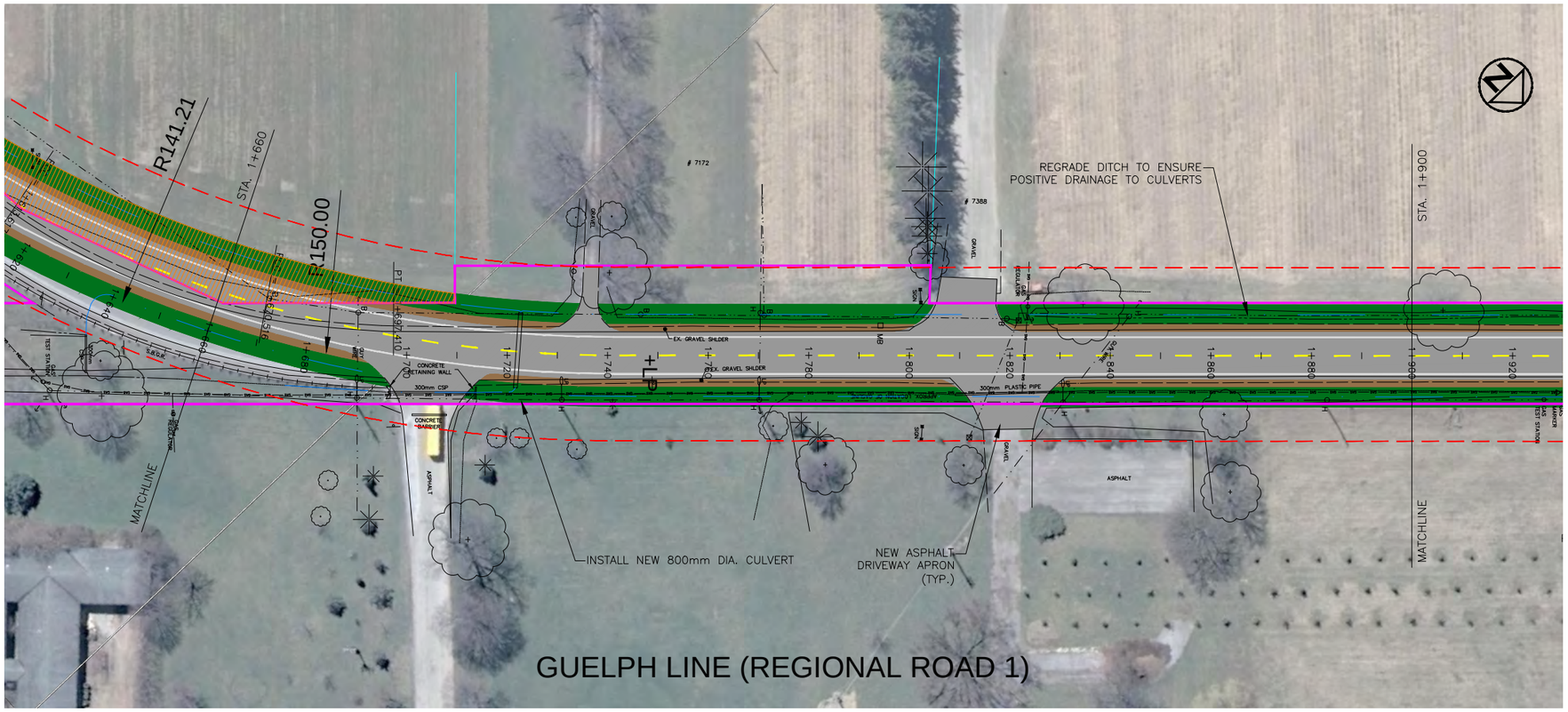
R. J. Burnside & Associates

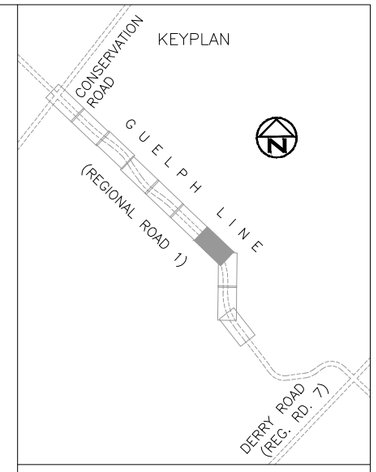
Halton REGION

PROPOSED PLAN AND PROFILE GUELPH LINE (REGIONAL ROAD 1)

FROM 1 KILOMETRE NORTH OF DERRY ROAD (REGIONAL ROAD 7) TO CONSERVATION ROAD

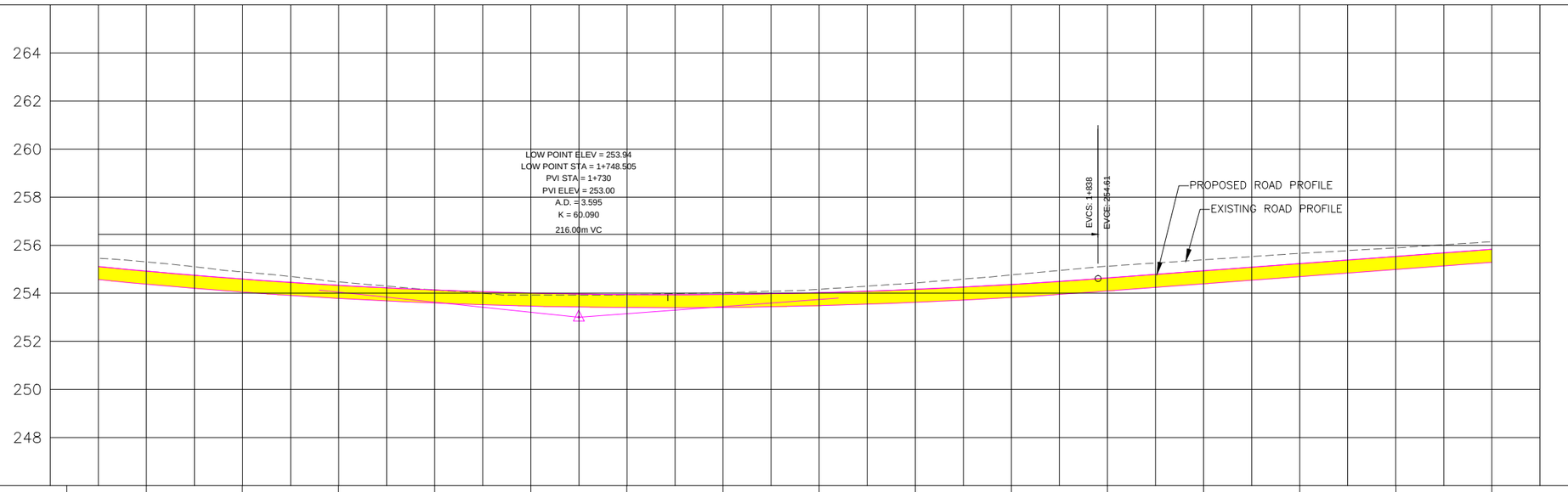
Consultant File №	Regional Drawing №
FIGURE 6-1C	
CONTRACT №	Drawing №
RR-09-024	SHEET 3 OF 11





LEGEND

- PROPOSED ASPHALT
- PROPOSED GRANULAR
- PROPOSED BOULEVARD
- PROPOSED PROPERTY REQUIREMENTS
- PROPOSED DITCH
- EXISTING PROPERTY LINE
- PROPOSED CURB AND GUTTER
- PROPOSED STORM SEWER AND MAINTENANCE HOLE (MH.1)



℄ ELEVATIONS	255.31 254.922	254.89 254.594	254.47 254.333	254.14 254.138	253.93 254.010	253.94 253.948	254.03 253.953	254.17 254.025	254.43 254.163	254.76 254.367	255.13 254.638	255.39 254.936	255.66 255.234	255.89 255.532	℄ ELEVATIONS
CHAINAGE	1+640		1+680		1+720		1+760		1+800		1+840		1+880		CHAINAGE

NO	Date	By	REVISIONS	MANU	CAD

Design		Ch'kd	Date NOVEMBER 2010
Drawn		Ch'kd	
Scale Horiz. / Vert.			References

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

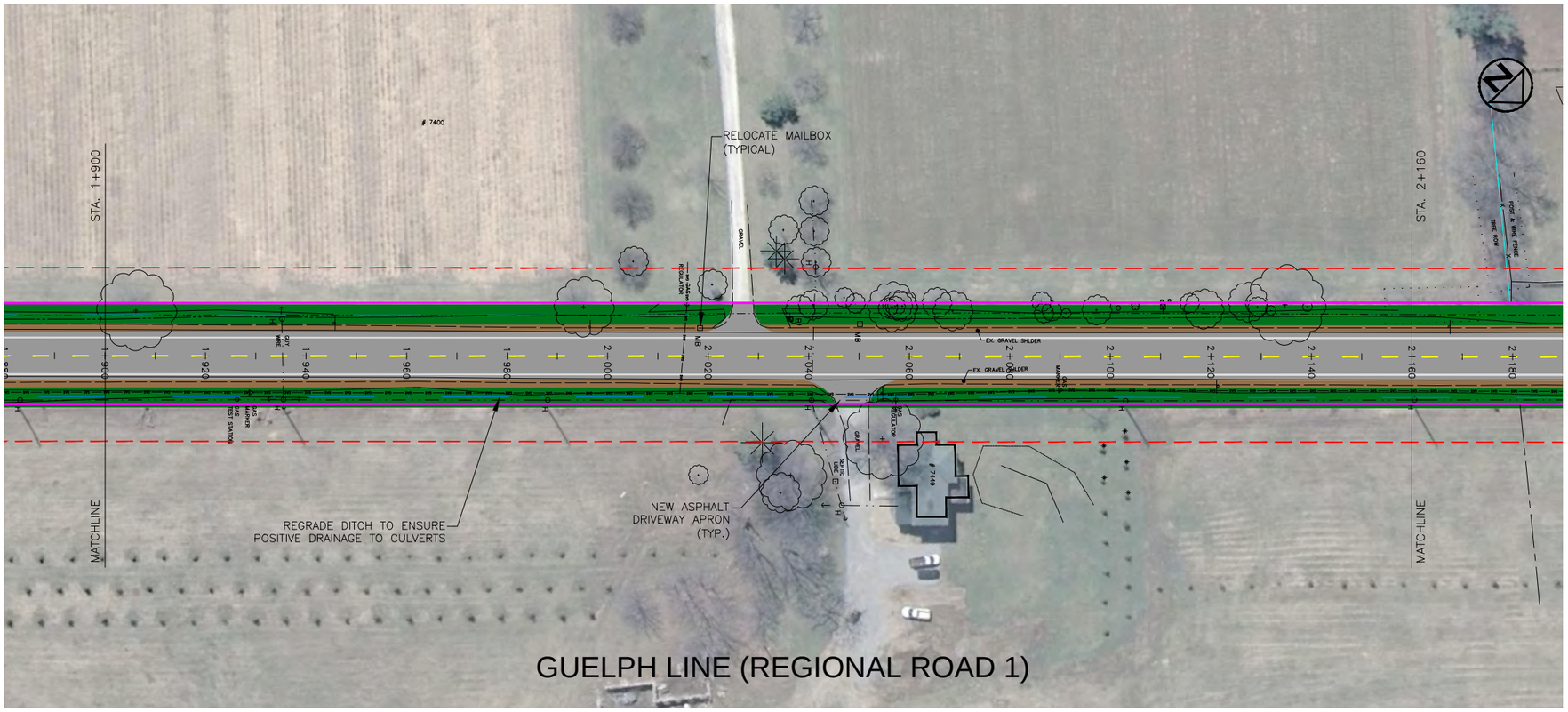
Field Notes

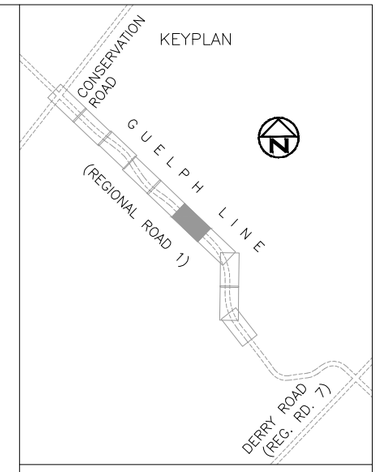
Halton REGION

PROPOSED PLAN AND PROFILE GUELPH LINE (REGIONAL ROAD 1)

FROM 1 KILOMETRE NORTH OF DERRY ROAD (REGIONAL ROAD 7) TO CONSERVATION ROAD

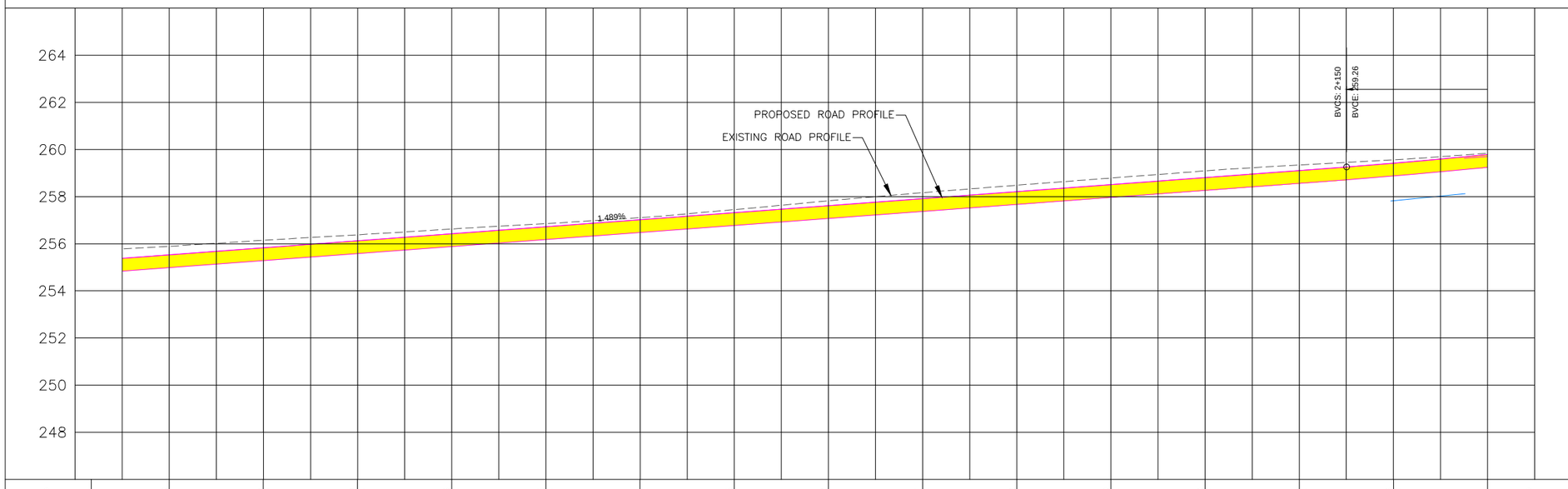
Consultant File NO	Regional Drawing NO
FIGURE 6-1D	
CONTRACT NO	Drawing NO
RR-09-024	SHEET 4 OF 11





LEGEND

- PROPOSED ASPHALT
- PROPOSED GRANULAR
- PROPOSED BOULEVARD
- PROPOSED PROPERTY REQUIREMENTS
- PROPOSED DITCH
- EXISTING PROPERTY LINE
- PROPOSED CURB AND GUTTER
- PROPOSED STORM SEWER AND MAINTENANCE HOLE (MH.1)



℄ ELEVATIONS	255.89 255.532	256.15 255.830	256.38 256.128	256.63 256.426	256.85 256.723	257.11 257.021	257.45 257.319	257.62 257.617	258.17 257.915	258.48 258.213	258.79 258.511	259.09 258.809	259.34 259.106	259.56 259.413	259.84	℄ ELEVATIONS
CHAINAGE	1+920		1+960		2+000		2+040		2+080		2+120		2+160			CHAINAGE

NO	Date	By	REVISIONS	MANU	CAD

Design		Ch'kd		Date NOVEMBER 2010
Drawn		Ch'kd		
Scale Horiz. Vert.				References

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

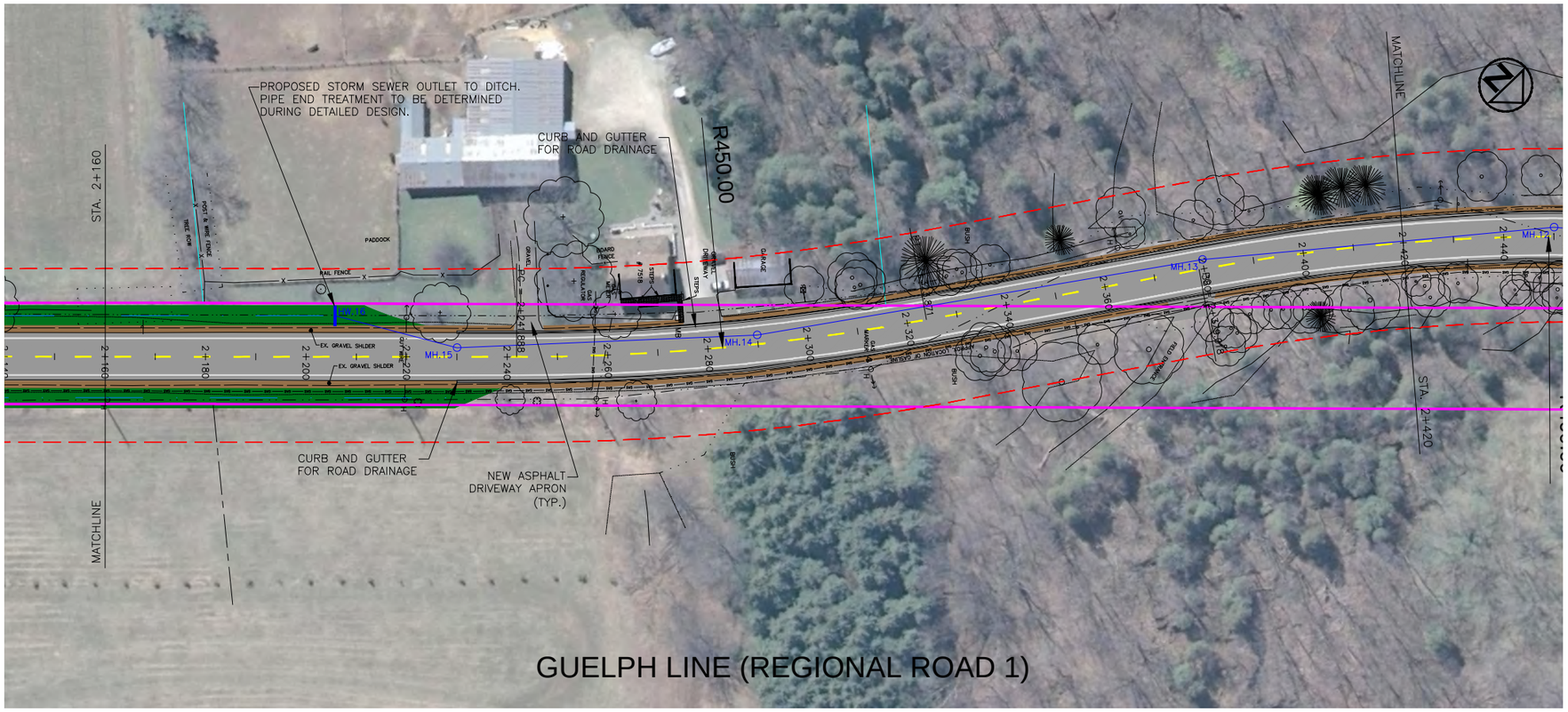
Field Notes

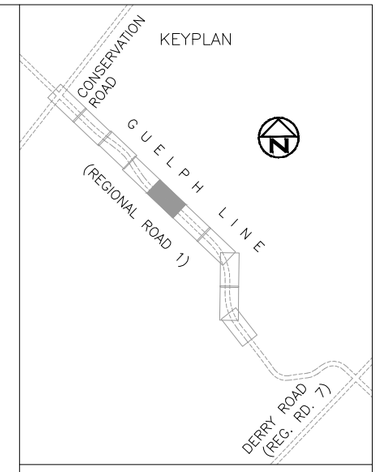
Halton REGION

PROPOSED PLAN AND PROFILE GUELPH LINE (REGIONAL ROAD 1)

FROM 1 KILOMETRE NORTH OF DERRY ROAD (REGIONAL ROAD 7) TO CONSERVATION ROAD

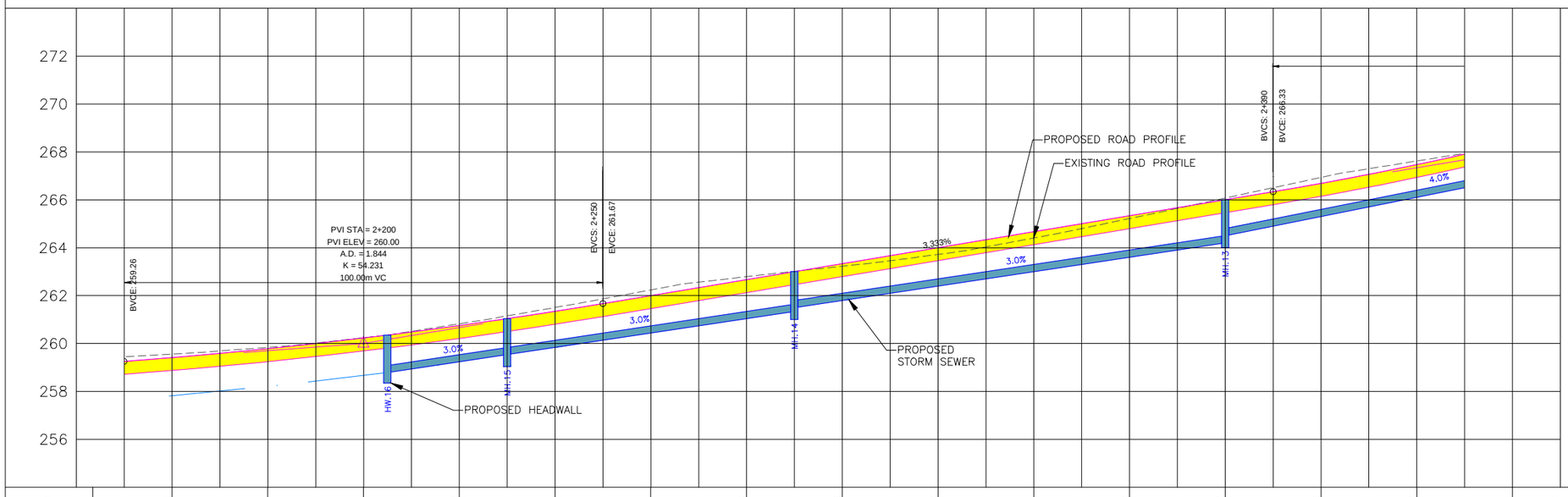
Consultant File NO	Regional Drawing NO
FIGURE 6–1E	
CONTRACT NO	Drawing NO
RR–09–024	SHEET 5 OF 11





LEGEND

- PROPOSED ASPHALT
- PROPOSED GRANULAR
- PROPOSED BOULEVARD
- PROPOSED PROPERTY REQUIREMENTS
- PROPOSED DITCH
- EXISTING PROPERTY LINE
- PROPOSED CURB AND GUTTER
- MH.1 — PROPOSED STORM SEWER AND MAINTENANCE HOLE



℄ ELEVATIONS	259.56 259.413	259.84 259.785	260.24 260.230	260.82 260.750	261.51 261.343	262.24 262.000	262.79 262.667	263.23 263.333	263.72 264.000	264.41 264.667	265.22 265.333	266.07 266.000	266.93 266.681	267.62 267.465	℄ ELEVATIONS
CHAINAGE	2+160		2+200		2+240		2+280		2+320		2+360		2+400		CHAINAGE

№	Date	By	REVISIONS	MANU	CAD

Design		Ch'kd	
Drawn		Ch'kd	
Scale Horiz.			
Vert.			

Date: NOVEMBER 2010

References

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Field Notes

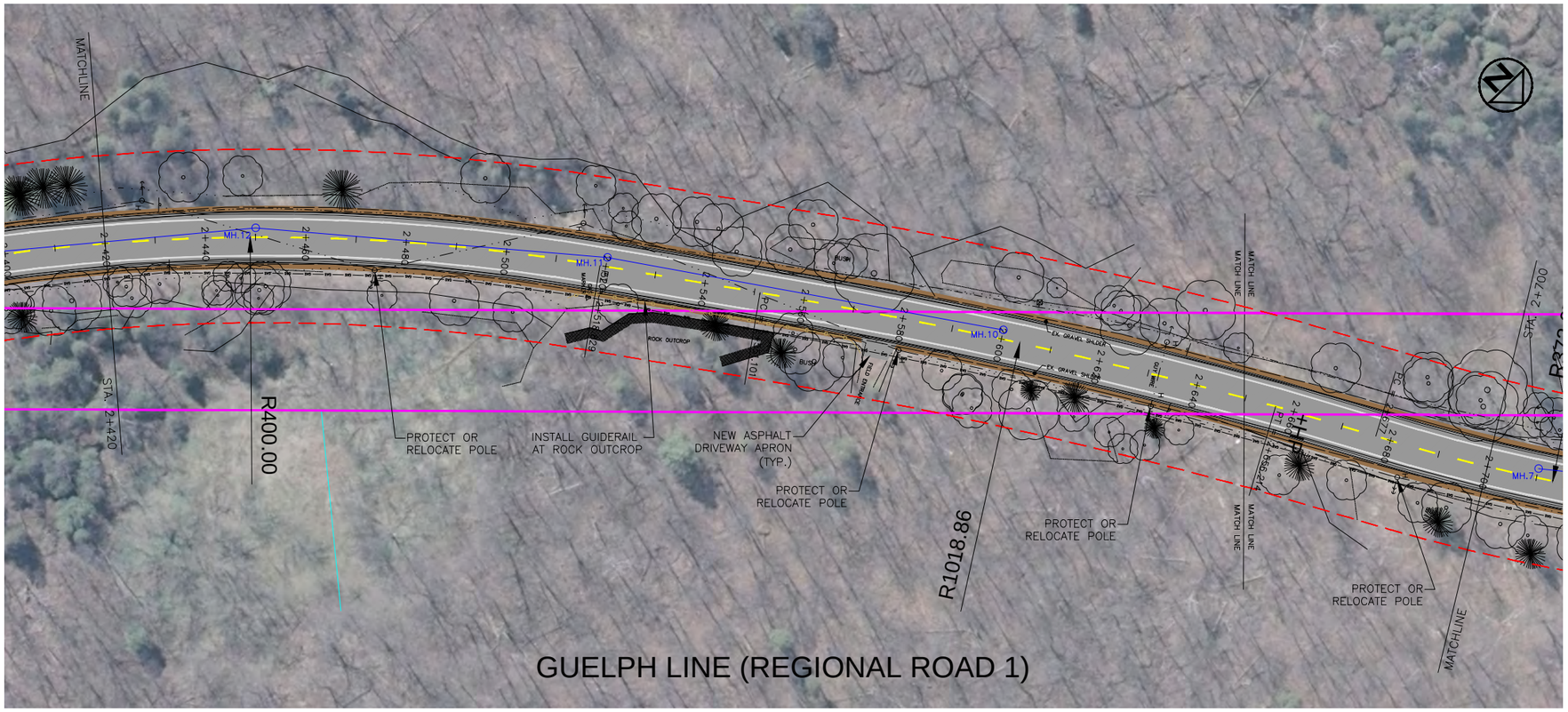
R. J. BURNSIDE & ASSOCIATES

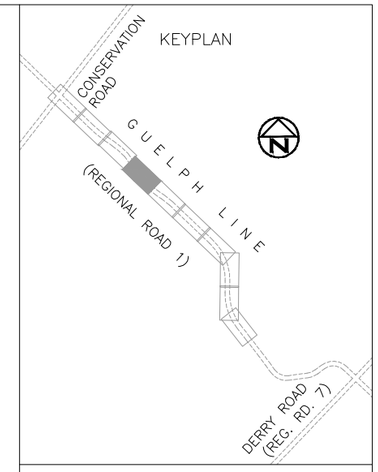
Halton REGION

PROPOSED PLAN AND PROFILE GUELPH LINE (REGIONAL ROAD 1)

FROM 1 KILOMETRE NORTH OF DERRY ROAD (REGIONAL ROAD 7) TO CONSERVATION ROAD

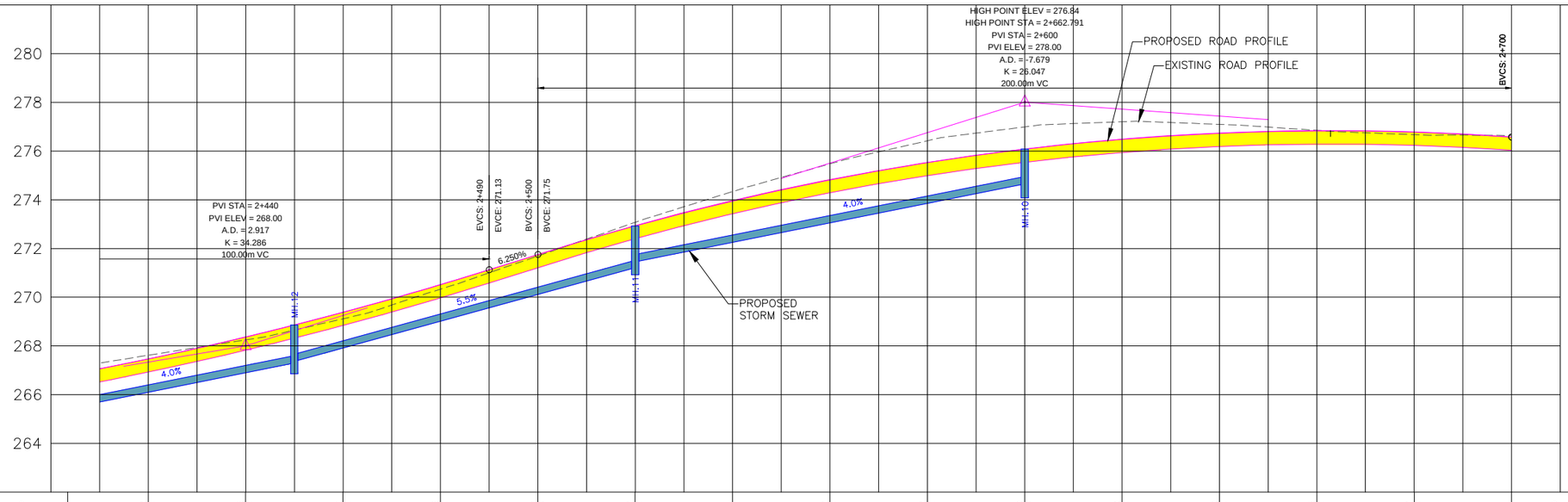
Consultant File №	Regional Drawing №
FIGURE 6-1F	
CONTRACT №	Drawing №
RR-09-024	SHEET 6 OF 11





LEGEND

- PROPOSED ASPHALT
- PROPOSED GRANULAR
- PROPOSED BOULEVARD
- PROPOSED PROPERTY REQUIREMENTS
- PROPOSED DITCH
- EXISTING PROPERTY LINE
- PROPOSED CURB AND GUTTER
- MH.1 — PROPOSED STORM SEWER AND MAINTENANCE HOLE



℄ ELEVATIONS	267.62 / 267.465	268.25 / 268.365	269.12 / 269.381	270.33 / 270.515	271.69 / 271.750	273.07 / 272.923	274.34 / 273.943	275.47 / 274.809	276.42 / 275.521	276.99 / 276.080	277.20 / 276.486	277.09 / 276.738	276.85 / 276.836	276.67 / 276.780	℄ ELEVATIONS
CHAINAGE	2+440		2+480		2+520		2+560		2+600		2+640		2+680		CHAINAGE

№	Date	By	REVISIONS	MANU	CAD

Design		Ch'kd		Date: NOVEMBER 2010
Drawn		Ch'kd		
Scale: Horiz. / Vert.				References

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Field Notes

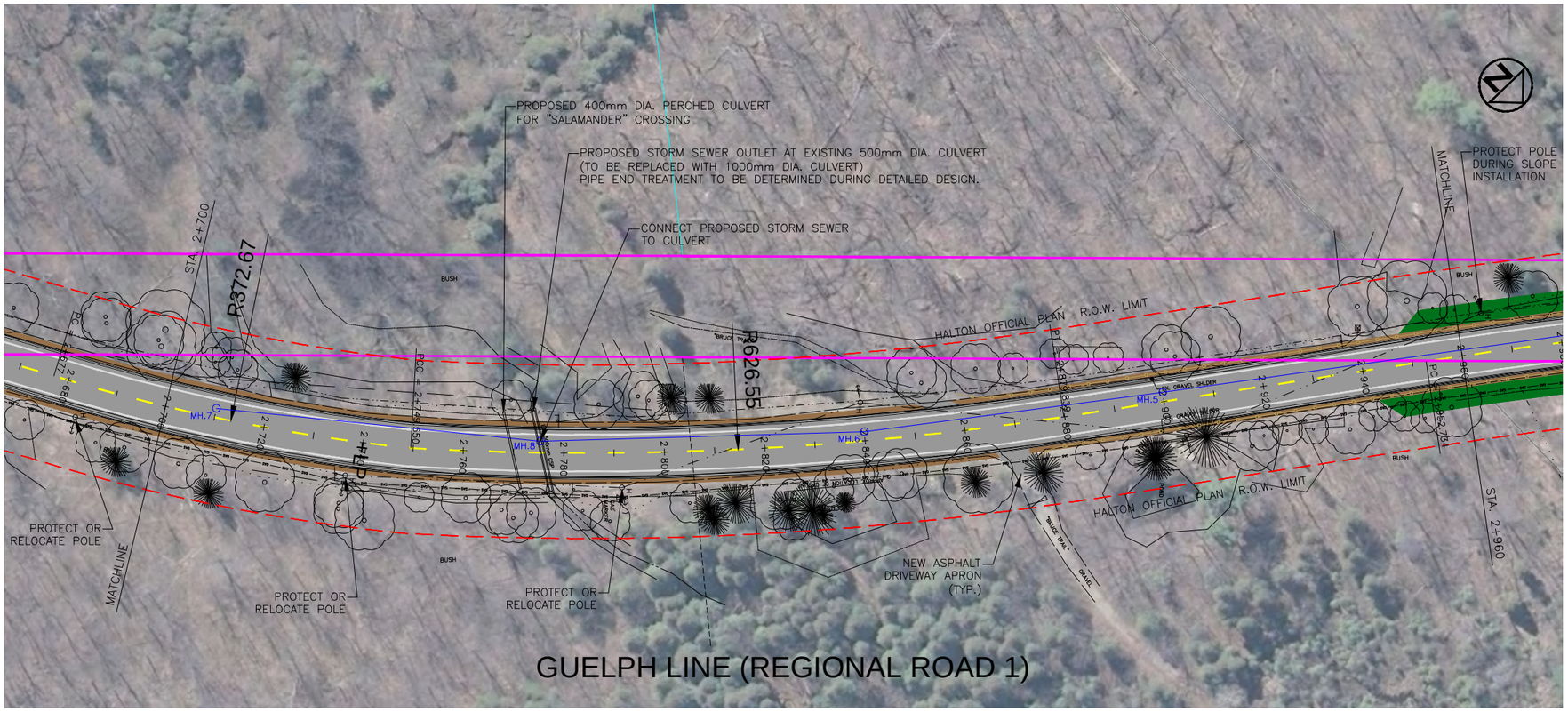
R.J. Burnside & Associates

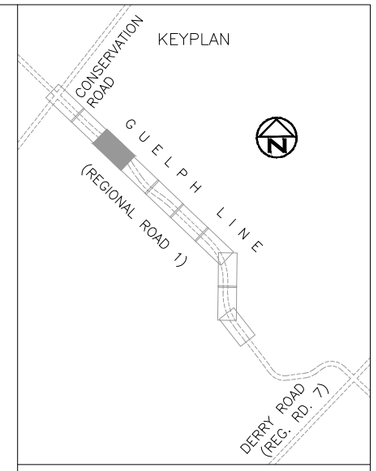
Halton Region

PROPOSED PLAN AND PROFILE GUELPH LINE (REGIONAL ROAD 1)

FROM 1 KILOMETRE NORTH OF DERRY ROAD (REGIONAL ROAD 7) TO CONSERVATION ROAD

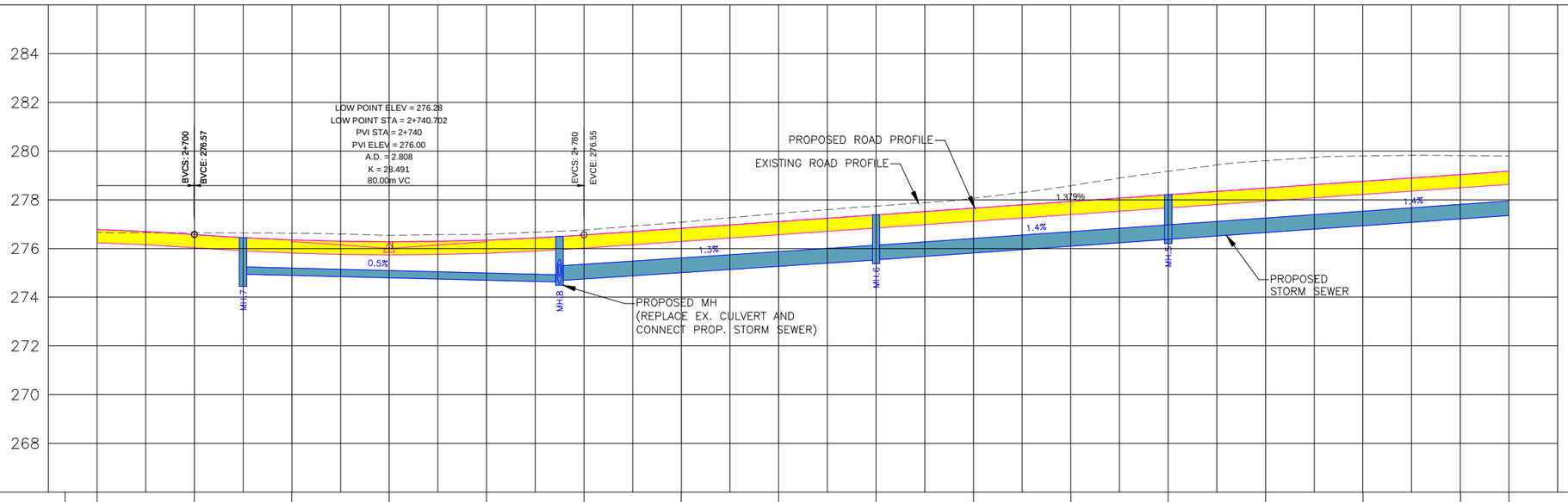
Consultant File №	Regional Drawing №
FIGURE 6-1G	
CONTRACT №	Drawing №
RR-09-024	SHEET 7 OF 11





LEGEND

- PROPOSED ASPHALT
- PROPOSED GRANULAR
- PROPOSED BOULEVARD
- PROPOSED PROPERTY REQUIREMENTS
- PROPOSED DITCH
- EXISTING PROPERTY LINE
- PROPOSED CURB AND GUTTER
- MH.1 — PROPOSED STORM SEWER AND MAINTENANCE HOLE



℄ ELEVATIONS	276.67 / 276.780	276.64 / 276.571	276.63 / 276.356	276.54 / 276.281	276.58 / 276.346	276.76 / 276.552	277.08 / 276.828	277.44 / 277.403	277.74 / 277.379	278.06 / 277.655	278.58 / 277.931	279.17 / 278.207	279.60 / 278.483	279.80 / 278.759	279.81 / 279.034	℄ ELEVATIONS
CHAINAGE	2+680		2+720		2+760		2+800		2+840		2+880		2+920		2+960	CHAINAGE

№	Date	By	REVISIONS	MANU	CAD

Design		Ch'kd	
Drawn		Ch'kd	

Date: NOVEMBER 2010

Scale: Horiz. / Vert.

References

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

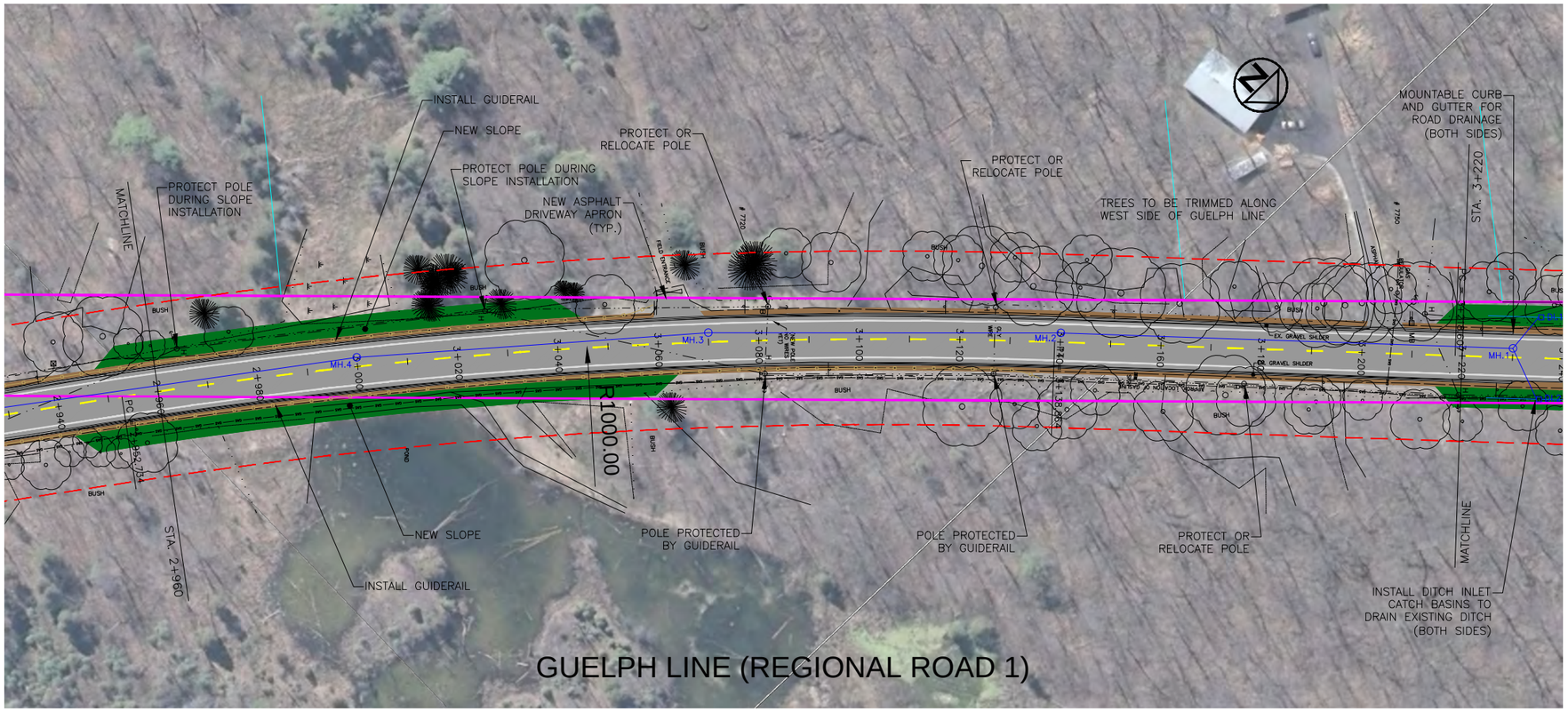
Field Notes

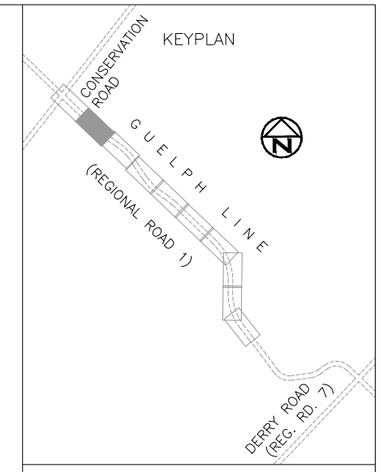
Halton REGION

PROPOSED PLAN AND PROFILE GUELPH LINE (REGIONAL ROAD 1)

FROM 1 KILOMETRE NORTH OF DERRY ROAD (REGIONAL ROAD 7) TO CONSERVATION ROAD

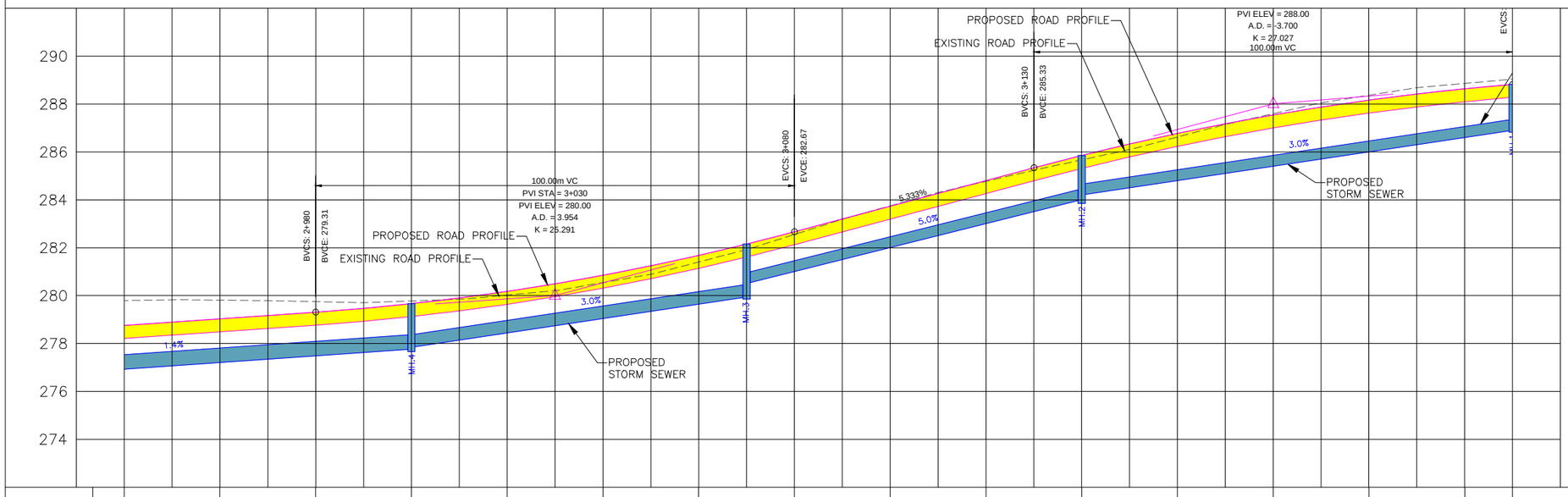
Consultant File №	Regional Drawing №
FIGURE 6-1H	
CONTRACT №	Drawing №
RR-09-024	SHEET 8 OF 11





LEGEND

- PROPOSED ASPHALT
- PROPOSED GRANULAR
- PROPOSED BOULEVARD
- PROPOSED PROPERTY REQUIREMENTS
- PROPOSED DITCH
- EXISTING PROPERTY LINE
- PROPOSED CURB AND GUTTER
- MH.1 PROPOSED STORM SEWER AND MAINTENANCE HOLE



℄ ELEVATIONS	279.80 278.759	279.81 279.034	279.75 279.310	279.78 279.665	280.02 280.176	280.54 280.850	281.41 281.679	282.55 282.667	283.75 283.733	284.77 284.800	285.67 285.848	286.62 286.767	287.60 287.538	288.36 288.160	288.86 288.635	℄ ELEVATIONS
CHAINAGE	2+960			3+000			3+040			3+080			3+120		3+160	3+200	CHAINAGE

NO	Date	By	REVISIONS	MANU	CAD

Design		Ch'kd	
Drawn		Ch'kd	
Scale Horiz.			
Vert.			

Date: NOVEMBER 2010

References

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

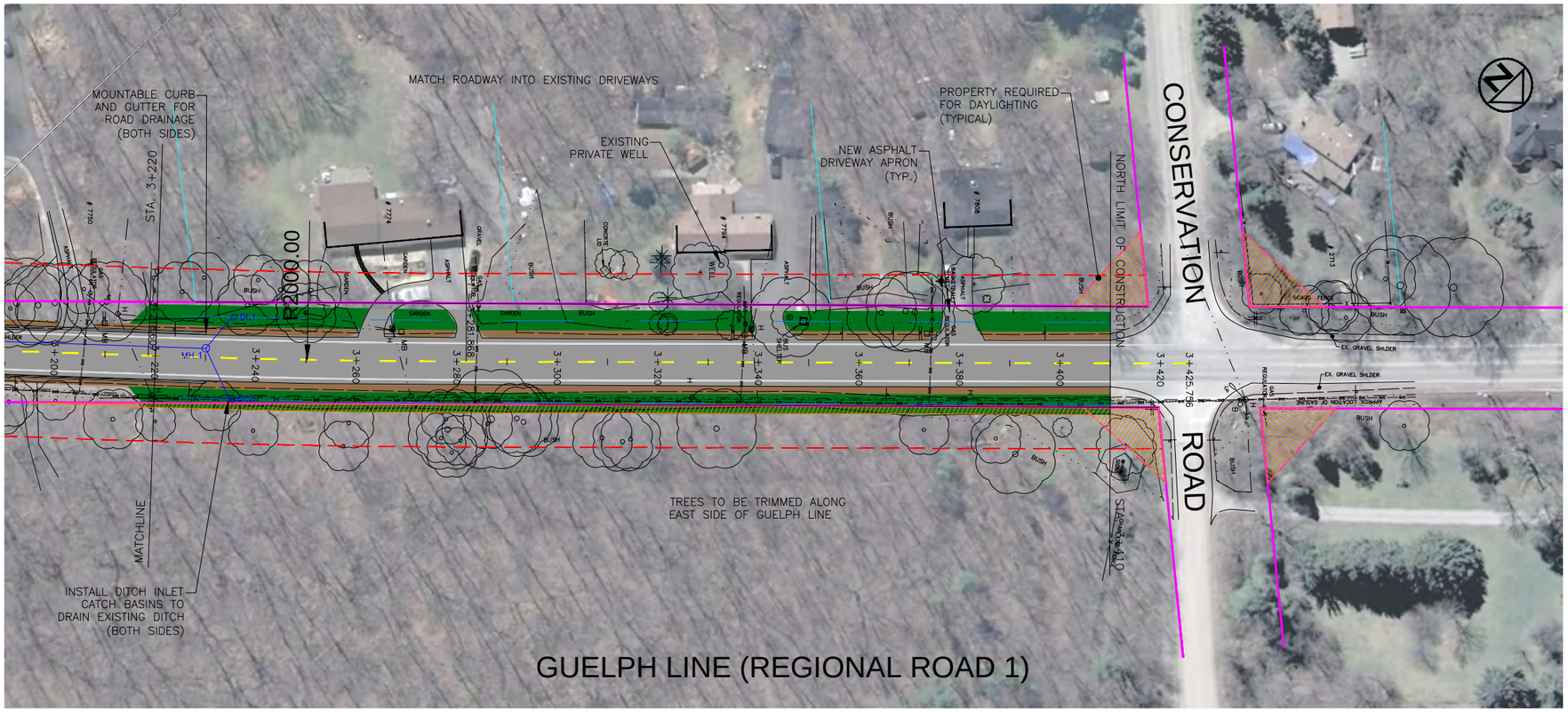
Field Notes

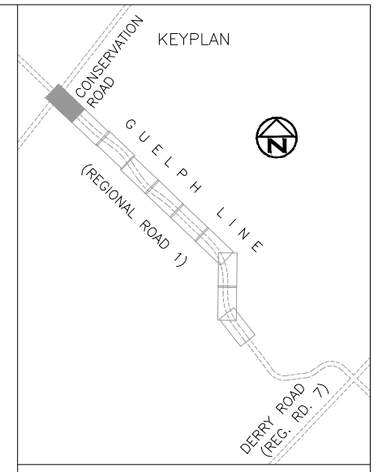
Halton REGION

PROPOSED PLAN AND PROFILE GUELPH LINE (REGIONAL ROAD 1)

FROM 1 KILOMETRE NORTH OF DERRY ROAD (REGIONAL ROAD 7) TO CONSERVATION ROAD

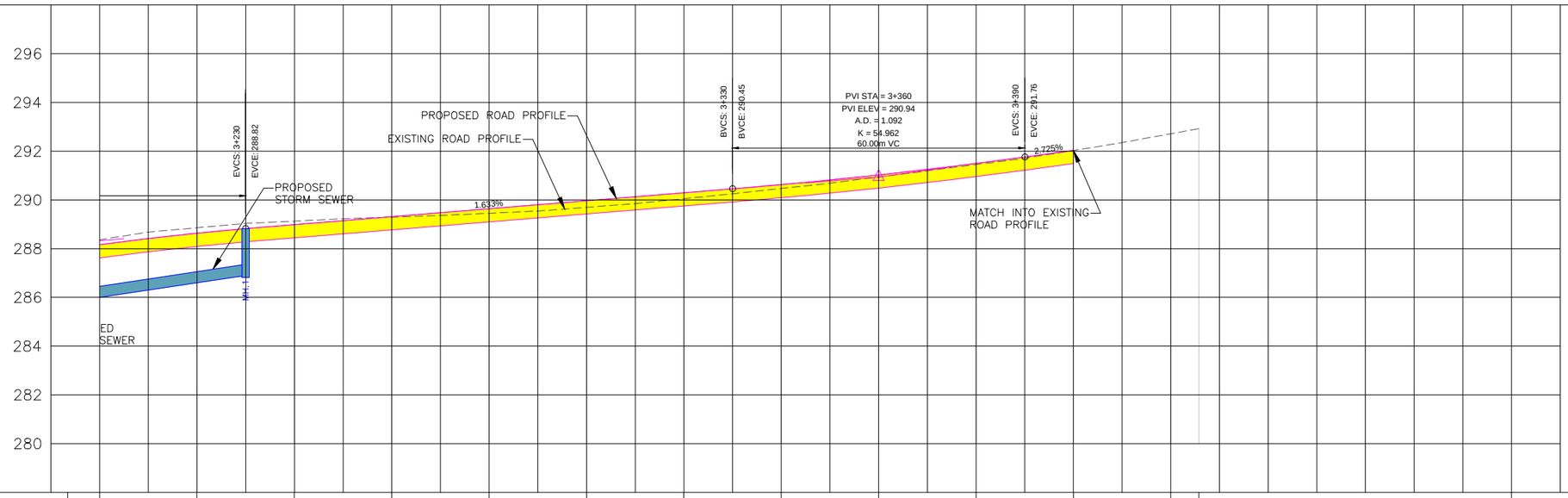
Consultant File NO	Regional Drawing NO
FIGURE 6-11	
CONTRACT NO	Drawing NO
RR-09-024	SHEET 9 OF 11





LEGEND

- PROPOSED ASPHALT
- PROPOSED GRANULAR
- PROPOSED BOULEVARD
- PROPOSED PROPERTY REQUIREMENTS
- PROPOSED DITCH
- EXISTING PROPERTY LINE
- PROPOSED CURB AND GUTTER
- MH.1 PROPOSED STORM SEWER AND MAINTENANCE HOLE



℄ ELEVATIONS	288.36 288.160		288.86 288.635		289.13 288.980		289.29 289.307		289.45 289.633		289.69 289.960		290.05 290.287	
	290.47 290.622		290.94 291.022		291.45 291.494		292.03 292.030		292.71		292.92			℄ ELEVATIONS
CHAINAGE	3+200		3+240		3+280		3+320		3+360		3+400			CHAINAGE

NO	Date	By	REVISIONS	MANU	CAD

Design		Ch'kd	
Drawn		Ch'kd	
Scale Horiz.			
Vert.			

Date: NOVEMBER 2010

References

APPROVALS

Municipal

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Director, Engineering Services

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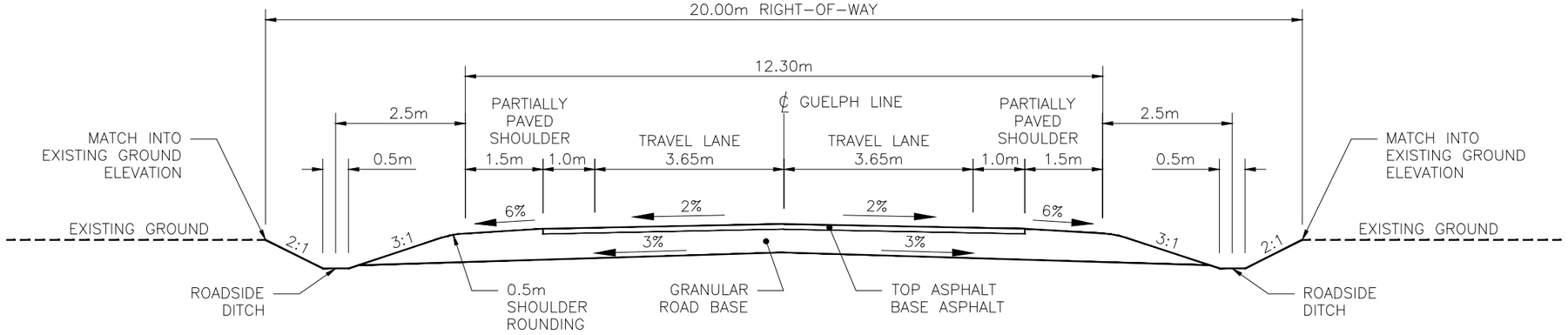
Halton REGION

PROPOSED PLAN AND PROFILE GUELPH LINE (REGIONAL ROAD 1)

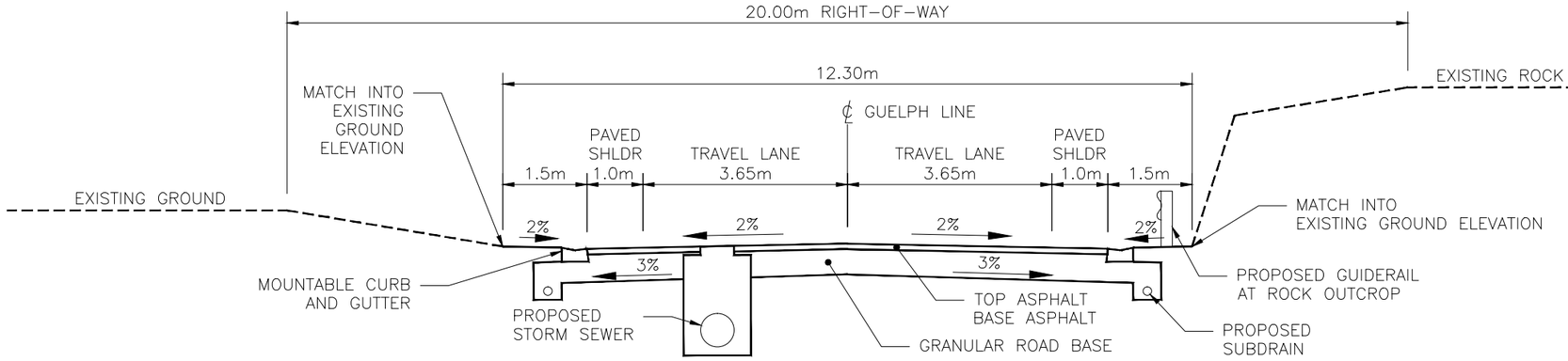
FROM 1 KILOMETRE NORTH OF DERRY ROAD (REGIONAL ROAD 7) TO CONSERVATION ROAD

Consultant File NO FIGURE 6–1J	Regional Drawing NO
CONTRACT NO RR–09–024	Drawing NO SHEET 10 OF 11



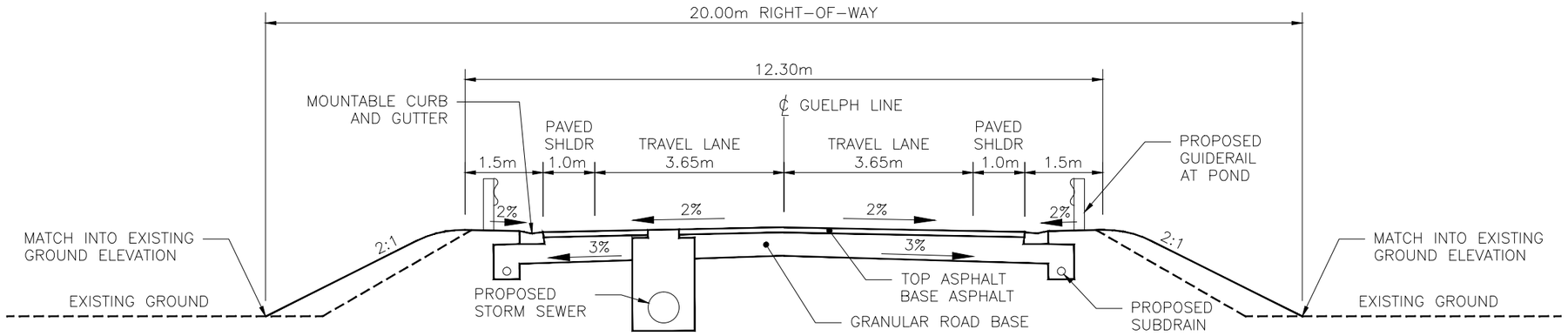
GUELPH LINE TYPICAL RURAL ROADWAY CROSS-SECTION

STATION 1+000 to 2+230
STATION 3+230 to 3+410



GUELPH LINE TYPICAL URBAN ROADWAY CROSS-SECTION

STATION 2+230 to 3+230



GUELPH LINE TYPICAL URBAN ROADWAY CROSS-SECTION

STATION 2+860 to 3+140

NO	Date	By	REVISIONS	MANU	CAD

Design		Ch'kd		Date NOVEMBER 2010
Drawn		Ch'kd		
Scale Horiz.				References
Vert.				

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Field Notes

Halton REGION

TYPICAL CROSS-SECTIONS
GUELPH LINE (REGIONAL ROAD 1)
FROM 1 KILOMETRE NORTH OF
DERRY ROAD (REGIONAL ROAD 7)
TO CONSERVATION ROAD

Consultant File NO FIGURE 6-2	Regional Drawing NO
CONTRACT NO RR-09-024	Drawing NO SHEET 11 OF 11

6.1.7 Drainage and Stormwater Management

The drainage and storm water management strategy for Guelph Line improvements is based on ultimately directing stormwater runoff to roadside drainage ditches that conveys runoff to two separate roadway watercourse crossings. The drainage within the study area generally flows from north to south. Runoff within the proposed urban section (northern section) of Guelph Line will be collected via ditch inlets and catch basins and conveyed through a storm sewer system to roadside drainage ditches in the south. The existing drainage ditches in the southern section (mainline section) will be regraded to provide improved drainage. Further details of the drainage system are discussed in Sections 6.1.7.3 and 6.1.7.4.

As part of the stormwater review, the existing storm drainage areas were determined. The proposed drainage areas are anticipated to remain the same as the existing drainage areas. Additional details on the drainage reaches are provided in Section 6.1.7.1. No stormwater diversions are expected. Culverts will be replaced where the existing structure is deficient either hydraulically, structurally or does not meet current minimum size criteria. Additional details related to the culvert replacements are provided in Section 6.1.7.2. Throughout the urban and semi-urban sections, storm sewers will be provided to capture the roadway runoff and direct it to the grassed swale located on the south side of Guelph Line. Additional details regarding the proposed storm sewer system are provided in Section 6.1.7.3.

Controlling the post stormwater flow quantities to pre stormwater flow quantities will not be an issue since the existing roadway will not be widened beyond its current two-lane configuration. Quantity control will therefore not be required as there is no major increase in impervious area. Localized lane/shoulder widening is considered to be insignificant in terms of generating additional stormwater flows. The need for formal stormwater management facilities is not anticipated within the study area; however, it is recommended that minor stormwater management controls be investigated during the detail design stage. All drainage design flow criteria will follow the Ministry of Transportation Directive B-100.

Stormwater quality control will be incorporated where feasible through enhanced grassed swales as discussed in Section 6.1.7.4.

6.1.7.1 Drainage Reaches

The study area was divided into several drainage reaches from the south to the north limit of the study. The proposed drainage system for each reach is detailed as follows:

Mainline Section (Station 1+000 to Station 2+200)

This 1.2 kilometre section of roadway consists of a rural cross section. Runoff from the roadway and adjacent properties is conveyed through roadside grassed ditches on each side of the roadway, which will aid in the treatment of runoff water. There is an existing culvert at Station 1+340 which drains the ditch flows from the west side onto private property to the east. There may also be a culvert at Station 1+720 which may have been originally installed to drain the fields from the east to the west side of the roadway. Based on field investigations and discussions with the land owners, this culvert may no longer be in use. There is evidence to suggest that the farm operations on both sides of the roadway have altered the drainage patterns in the area such that the properties now drain away from Guelph Line and no longer requires a cross culvert. Further analysis will be required during the detailed design stage to determine the extent of the drainage and if the culvert will need to be replaced with a larger size culvert. At the north limit of this section, the roadway begins an ascent and the proposed storm sewers from the northern section will outlet to the roadside ditches at Station 2+200.

Northern Section (Station 2+200 to 3+425)

This 1.23 kilometre section of roadway consists of primarily an urban cross section. From Station 2+230 to Station 3+230, concrete curb and gutter will be constructed to capture the roadway runoff. The most northerly 0.2 kilometre section of roadway (Station 3+230 to Station 3+425) will maintain a rural cross section with open ditches. There is an existing culvert at Station 2+780, which drains from the east to the west side. At Station 3+000, there is a pond on both sides of the roadway with the easterly pond being the larger of the two. While it seems that the ponds are interconnected, the easterly pond drains to the east and eventually to the culvert at Station 2+780 and the west pond drains to the south where the flows from the ponds converge downstream of the culvert at Station 2+780.

Two sections of storm sewers are proposed. For the northerly system (Station 2+710 to 3+230), the external drainage areas at the north will drain to a pair of ditch inlet catchbasins at Station 3+240. Catchbasins within the curb and gutter section will collect the roadway runoff and convey them through a storm sewer with pipe sizes ranging from 300mm to 600mm diameter. A maintenance hole over the culvert at Station 2+780 will outlet the storm sewer flows. For the southerly system (Station 2+210 to 2+600), the runoff will be collected by catchbasins within the curb and gutter section and will convey the runoff through a storm sewer with pipe sizes ranging from 300mm to 450mm diameter. The outlet will be at a headwall located in the west side road ditch at Station 2+210.

The overall drainage reaches for the various tributaries within the study area are noted in Table 6-2, sized in hectares.

6.1.7.2 Culverts

Existing culverts, located within the Guelph Line study area, will be replaced as shown in **Table 6-2**. The culverts are listed by location, tributary drainage area, proposed culvert diameter and estimated length. Presently, the existing culverts are located as follows:

- Existing 400 mm diameter CSP at Station 1+340 (between #7279 and #7311 Guelph Line), approximately 14 metres in length;
- Existing 300 mm diameter CSP near Station 1+640 (within the original road allowance), approximately 7.5 metres in length; and
- Existing 500 mm diameter CSP at Station 2+780 (south of the Bruce Trail Crossing), approximately 16.5 metres in length will be replaced with a 1,000 mm diameter pipe.

Table 6-2: Proposed Culverts

Existing Culvert Location	Tributary Drainage Area (Hectares)	Culvert Diameter (Millimetres)	Estimated Culvert Length (Metres)
Station 1+340 (to replace existing 400 mm diameter culvert)	1.4	600	16
Station 1+640 (to remain in place)	Existing	300	Existing
Station 1+720 (install new culvert, if required)	66.1	800	16
Station 2+780 (to replace existing 500 mm diameter culvert)	92.7	1000	18

6.1.7.3 Storm Sewers

Preliminary storm sewer design flows for the 5-year storm event were calculated using the Rational Method and the Town of Milton rainfall intensity with a time of concentration of ten minutes. Preliminary pipe slopes follow the proposed road grade, which is very close to the existing road grade, in order to reduce the amount of required rock excavation. The storm sewers were set to a minimum cover depth of 1.2 metres for frost protection.

Table 6-3 summarizes the proposed storm sewer system including the drainage section, location from maintenance hole (MH) to maintenance hole, the length/grade, and the pipe diameter.

Table 6-3: Preliminary Storm Sewer Design Summary

Drainage Section	Location (MH to MH)	Length and Grade (m at %)	Diameter (mm)
Northerly Section (Station 2+710 to 3+230)	1 – 2	90 at 3.0	450
	2 – 3	70 at 5.0	450
	3 – 4	70 at 3.0	525
	4 – 5	100 at 1.4	600
	5 – 6	60 at 1.4	600
	6 – 8	65 at 1.3	600
	7 – 8	65 at 0.5	300
Outlet	8 outlets at 1,000 mm diameter culvert (replaces existing 500 mm diameter culvert)		
Southerly Section (Station 2+210 to Station 2+600)	10 – 11	80 at 4.0	300
	11 – 12	70 at 5.5	300
	12 – 13	70 at 4.0	300
	13 – 14	90 at 3.0	300
	14 – 15	60 at 3.0	300
	15 – 16	25 at 3.0	300
Outlet	15 outlets to headwall via west ditch		

The preliminary storm sewer design sheet and drainage area plan are included in **Appendix K**.

6.1.7.4 Drainage Ditches

Flat bottomed grassed swales and flat bottomed enhanced grassed swales were selected as the method of controlling stormwater within the proposed rural cross-section areas since the road drainage areas are relatively small in size and stormwater management ponds are not required.

The Ministry of the Environment's (MOE) *Storm Water Management Planning and Design Manual* (2003) identifies grassed swales as an appropriate measure for water quality enhancement for drainage areas less than two hectares in size provided that the peak flow

velocity for the 4-hour 25 millimetre Chicago storm event is not greater than 0.5 metres per second. In addition, the velocity generated by the 100 year design storm should not exceed 1.5 metres per second at which point rock protection should be provided to prevent erosion within the swales. The guideline results in a requirement for wide, flat swales for larger drainage areas and all grass swales must be evaluated under major system and minor system events to ensure that the swale can convey these storms effectively.

In addition to grassed swales and enhanced grassed swales the vegetated roadside embankment provides a substantial amount of treatment before the runoff enters the swale. The minimum recommended bottom width of the grassed swale is 0.75 metres. The widths of the enhanced swales will be greater, ranging typically from 1.0 metre up to 5.0 metres. The maximum width of the enhanced swale will be dictated by the available land within the designated road right-of-way.

6.1.7.5 Salt Management

Roadway embankments provide the same function as Vegetated Filter Strips (VFS) which have been demonstrated to be very effective in trapping sediments. Vegetated filter strips are best utilized adjacent to a buffer strip, watercourse or drainage swale since the discharge will be in the form of sheet flow, making it difficult to convey the stormwater downstream in a normal conveyance system (swale or pipe).

VFSs have been found to be particularly effective in trapping contaminants under sheet flow conditions where runoff is conveyed through the grass. As runoff passes through the grass, velocities are reduced and sediment transport capabilities are diminished, resulting in high removal efficiency for sediments and attached pollutants. Although some removal of soluble pollutants contained in the overland flow can also be achieved due to infiltration on the vegetated strip, chlorides cannot be removed from the runoff. Chlorides will be carried in surface flow directly or infiltrated to the ground water, but will eventually discharge into to the stream flow as runoff. The use of salt as a de-icing agent during the winter season will follow the Region's *Salt Management Plan* (2003). The Salt Management Plan strives to minimize the amount of salt entering the environment by including best management practices (BMPs), and using new technologies to ensure its most effective use over the road system.

6.1.7.6 Considerations during Detail Design

The detailed assessment of impacts along Guelph Line will be refined through additional detailed impact assessments during the detail design stage and through further consultation with Conservation Halton and other agencies, as required. The following measures should be considered during the detailed design stage:

- Open bottom culverts for those watercourses that constitute direct fish habitat or for which the future rehabilitated condition will likely represent direct habitat and mitigation of potential groundwater disruptions; and
- The type of end-of-pipe treatment for the storm sewer outlet directed to the west ditch on Guelph Line (Station 2+200) should be further investigated to determine the required configuration needed to manage the stormwater discharge from the storm sewer to the grassed swale.

6.1.8 Geotechnical and Pavement

In 2007, Halton Region undertook a pavement evaluation for the rehabilitation of Guelph Line from Derry Road to Conservation Road (formerly Steeles Avenue)—a distance of approximately 3.5 kilometres. The pavement evaluation was undertaken to determine the existing condition of the in-situ pavement and subgrade materials, estimate the remaining life of the in-place pavement structure, identify potential rehabilitation options, and recommend a cost-effective pavement rehabilitation strategy.

At that time, the condition of the existing pavement was assessed to be in fair condition with localized poor areas. The ride quality was considered to be fair with few to intermittent bumps or depressions. The predominate distresses throughout this pavement section included longitudinal cracking in the wheel paths, transverse cracking, alligator cracking, and pavement rutting. Many of the older longitudinal cracks had been sealed. Localized areas of patching and rutting were noted within this pavement section. Refer to Section 3.6.5 and **Appendix J** for additional details on the findings of the pavement evaluation for Guelph Line.

Subsequent to the completion of the pavement design report, the resurfacing of Guelph Line was completed in the summer of 2008. The resurfacing addressed immediate concerns with respect to the current poor condition of the roadway. The existing pavement surface was pulverized to a 200 mm depth and an expanded asphalt pavement design was utilized within the rural sections of Guelph Line, including the provision of a 1.0 metre paved shoulder, as follows:

- 50 mm Overlay (SP 12.5FC1 Surface Course)
- 150 mm Expanded Asphalt
- 50 mm Granular A for shoulders

The existing granular base was retained. As part of the detail design, it is recommended that a detailed geotechnical investigation of the roadway be undertaken within the study area to determine the need for additional pavement rehabilitation requirements.

6.1.9 Utilities

The following summarizes the required utility modifications within the study area based on a review of the recommended plan. It is anticipated that the overhead hydro, Bell and Cable TV cables within the existing Guelph Line right-of-way will remain in place with the exception of the following:

- At the S-bend location (Station 1+200 to Station 1+740), there are several poles that will require relocation due to the shifted road alignment;
- Within the urban northern section, several poles may require relocation. The poles within this section have been upgraded or replaced recently. To avoid further relocation, it is recommended that guiderail be installed to protect the poles where feasible;
- There is an existing gas main buried along the east side of Guelph Line through the entire study area. Within the urban northern section, the gas line is located in proximity to the existing edge of asphalt and may need to be relocated to accommodate the urban section. The exact location of the gas main should be confirmed during the detail design process and in order that necessary adjustments can be undertaken to either accommodate the existing main location or begin the process of the main location. The gas company may desire to replace or upgrade their gas main as part of their regular scheduled maintenance program. Coordination with the gas company will be important to ensure no disruption of service.

Early coordination with all utility companies during the detail design will help reduce delays during the detailed design process.

6.1.10 Illumination

It is anticipated that the existing partial illumination located just north of the S-bend (east side of Guelph Line) and at the intersection of Conservation Road will be retained.

6.1.11 Property Requirements

A minor amount of property is required to accommodate the reconfiguration of the existing 140 metre radius curves to 250 metre radius curves at the S-bend location toward the south limits of the study area. Property will be required on both the east and west sides of the roadway to accommodate minor portions of the roadway surface and primarily to accommodate the proposed roadside ditches. Property is also required to accommodate daylighting at the intersection of Guelph Line and Conservation Road. The extent of the property requirements are indicated on **Figure 6.1**.

The proposed property requirements will form the basis for property purchases from the affected property owners by Halton Region subsequent to the Environmental Assessment Approval. It should be noted that the proposed property requirements shown in Figure 6.1 are preliminary only and should be reviewed and confirmed during the detail design stage.

6.1.12 Temporary Traffic Conditions

Guelph Line is a major arterial roadway, and as such, any potential traffic disruptions during construction will need to be minimized. Since the existing roadway profile is generally being maintained, it is anticipated that through traffic will continue to use the existing roadway platform as Guelph Line is improved. During periods of construction, a single lane of traffic should be maintained in accordance with the procedures and requirements as set out in the Ontario Traffic Manual Book 7 – Temporary Conditions. Outside of the construction periods, two lanes of traffic should be maintained at all times where feasible.

The contractor will supply traffic management and construction staging plans prior to the start of construction, including a Traffic Protection Plan as required. Construction staging and traffic control plans should be cognizant of the need to maintain access for emergency vehicles at all times without undue delay.

6.1.13 Construction Timing

Roadway improvements for Guelph Line (Regional Road 1) from one kilometre north of Derry Road (Regional Road 7) to Conservation Road are anticipated to begin in 2015 as identified in the current 10-year Regional Capital Budget.

6.1.14 Preliminary Cost Estimate

A preliminary construction cost estimate was prepared as part of this study. The construction cost estimate for this study is based on preliminary estimated quantities, and unit prices provided by Halton Region and the consultant. The cost estimate includes preliminary cost estimates for Roadworks and Drainage, Structures (retaining walls), Landscaping/Mitigation, Electrical, Utilities and Services, Contingency and Engineering, and Property for the mainline and northern sections of the study area as well as the total estimated costs. The preliminary cost estimate is summarized in **Table 6-4**. The complete preliminary cost estimate is provided in **Appendix L**.

Table 6-4: Preliminary Cost Estimate Summary[10]

Item	Guelph Line Mainline Section	Guelph Line Northern Section	Totals
Length (m)	1,230	1,190	2,420
Improvement Type	2-lane Rural Cross-Section	2-lane Urban Cross-Section	
A. Roadworks and Drainage	$771,876	$1,496,830	$2,268,707
Reconstruction Costs	$43,241	$41,835	$85,076
Subtotal (Item A)	**$815,117**	**$1,538,665**	**$2,353,783**
B. Structures	$0	$207,550	$207,550
C. Landscaping/Mitigation	$27,090	$26,210	$53,300
D. Electrical	$0	$0	$0
E. Utilities and Services	$101,865	$98,552	$200,417
Subtotal (Items A to E)	**$944,072**	**$1,870,977**	**$2,815,050**
20% Contingency	$188,814	$374,195	$563,010
15% Engineering	$169,933	$336,776	$506,709
F. Property	$473,740	$99,766	$573,506
Local Municipality Items	$0	$0	$0
Total	**$1,776,559**	**$2,681,714**	**$4,458,275**

[10] Estimated costs in Table 6-4 are shown as rounded values.

7. POTENTIAL ENVIRONMENTAL EFFECTS, MITIGATION MEASURES AND COMMITMENTS TO FUTURE WORK

This section of the ESR describes the potential effects on the environment (both positive and negative) as a result of the undertaking and the mitigation measures and commitments made to either minimize or offset those effects. The actions taken to reduce the effects of the undertaking on the environment are referred to as "Mitigating Measures". The monitoring program developed during the planning process (to be carried out during construction) is also described.

7.1 Transportation

The proposed roadway improvements within the Guleph Line corridor as described in *Section 6* support the transportation goals and objectives of Halton Region following the direction of the Halton Region Official Plan and Transportation Master Plan. The associated fundamental benefits of the improvements include the following:

- Upgrading Guelph Line to Regional standards with geometric improvements and the provision of wider shoulders allowing for an improved roadway structure and alignment with the accommodation of active transportation modes (cycling and pedestrians);
- Provision of roadside drainage ditches and sewers to improve both drainage quality and quantity controls; and
- Increasing the overall safety of the corridor, potentially reducing the overall number and severity of collisions.

7.2 Natural Environment

7.2.1 Potential Impact Assessment and Mitigation Measures

It is anticipated that the Guelph Line roadway improvements will be accommodated within the existing right-of-way wherever possible which will minimize changes to the current road footprint and potentially reduce impacts on the adjacent lands and natural heritage features and functions. The preferred design alternative incorporates potential geometric restrictions based on the location of the existing residences, wetlands, natural areas, and watercourses.

The two culvert crossings are 400 mm and 500 mm diameter corrugated steel pipes (CSPs) and do not meet the hydraulic requirements to convey the 25-year storm design event. In addition, a third drainage area does not have a roadway cross culvert (or it could not be located). This drainage area is approximately 66.1 hectares in size. Although there would typically be significant runoff generated from an area of this size it is suspected that because of the sandy

soils and the presence of fractured bedrock at the surface the drainage from this area does not travel on surface. Notwithstanding the foregoing, it is recommended that a properly sized culvert be provided at this location.

7.2.1.1 Fisheries and Aquatic Ecosystems

The unnamed tributary of Limestone Creek provides indirect fish habitat. As discussed in Section 3.1.2, the tributary and culvert at Guelph Line is a convergence of multiple unnamed tributaries with potential coldwater, coolwater and warmwater fisheries habitat. The watercourse is considered to be Type 2 coolwater habitat according to the BCWS (2002). Conservation Halton has confirmed that the main tributaries are designated as coldwater fisheries according to the most recent data. The conclusions of the field evaluations completed for this report and the information provided in the BCWS (2002) also suggest that these tributaries currently support and/or contribute to coldwater fishery, and that watercourse conditions are non-impaired/minimally impaired and the overall conditions of the Limestone Creek watershed can be maintained through appropriate land use management.

Based on the preferred design concept, there does not appear to be any requirement to alter the flow regime or channel orientation that allows water to move from north to south beneath Guelph Line. Culvert improvements on the unnamed tributary may improve overall water flow through this area. The extent to which the drainage is currently flowing within the ditches along Guelph Line will be maintained post construction. However, installation of the storm sewer will change where runoff discharges into the watercourse. Details regarding the exact length of the required culvert are needed in order to assess the potential impacts on the watercourse systems post-construction. In the event that Conservation Halton deems the culvert replacement to be a HADD to fish habitat, authorization may be required from the Department of Fisheries and Oceans. As well a permit will be required from Conservation Halton for any alteration to the watercourses under the Conservation Authority Act.

A summary of the potential impacts to the watercourse, wetland and adjacent woodland habitat is presented in **Table 7-1**. The proposed changes are primarily focused on the preferred design concept as the culvert replacement, curb and gutter requirements and minor tree clearing is consistent among the various design alternatives. The preferred design concept was selected in order to minimize the proposed road footprint beyond the existing road alignment.

Table 7-1:
Summary of Preferred Design Concept Work Proposed and Potential Impacts

Natural Heritage Feature	Existing Culvert/ Structure or Conditions	Habitat Type	Proposed Work Required	Potential Impact and/or Changes
Wetland adjacent to Guelph Line	• Wetland buffer limited to road shoulder and 2:1 gravelly vegetated slope to water's edge • Direct road runoff input into wetland	• Fish,amphibian, mammalian and vifaunal	• Earthen slope constructed at pond (east) and wetland (west) edge with a guardrail and curb and gutter • Urban cross-section	• Marginal loss of existing wetland edge vegetation and habitat (extent to be determined at detailed design) • Change in substrate • Potential sedimentation during construction noise disturbance through construction period • Loss of direct road drainage input
Tributary of Limestone Creek	• Stable channel with rocky substrate • 500 mm corrugated culvert	• Indirect fish, amphibian and benthic invertebrate	• Replace culvert with 1000 mm culvert • Add an additional 400 mm perched culvert for peak flows and dry crossing for salamanders • Curb and gutter to direct road runoff into channel • Urban cross-section	• No change to the upstream or downstream channel morphology • Potential sedimentation during construction • Potential increased flow capacity in culvert post-construction • Dry culvert for potential salamander crossing
Vernal Pools	• Breeding habitat for Jefferson	• Amphibians, insects, and	• No proposed changes beyond	• Potential reduction in

Table 7-1:
Summary of Preferred Design Concept Work Proposed and Potential Impacts

Natural Heritage Feature	Existing Culvert/ Structure or Conditions	Habitat Type	Proposed Work Required	Potential Impact and/or Changes
	salamander (SAR)	mammals	existing road footprint	direct road runoff into vernal pool
Woodlands	• ESA and Conservation lands • Mature canopy and diverse habitat for wildlife	• Avifaunal, mammals, amphibians	• Minor tree clearing along the eastern edge of the Crawford Lake Conservation woodland (200 m south of Conservation Road on east; 200-400 m south of Conservation Road on west)	• No change in woodland function or wildlife habitat • Temporary disturbance during construction

Installation of an earthen slope on the north and south sides of Guelph Line abutting the PSW in combination with the minor widening will incur a small unsubstantial loss of wetland as the newly constructed slope will be functionally equivalent and likely more stable than the existing granular slope. Once installed, the slope can be planted with native vegetation, as well as, plantings at the water's edge to increase the shade potential in this area. The curb and gutter will minimize erosion and runoff directly into the PSW, redirecting the runoff into the downstream watercourse crossing Guelph Line. Potential impacts and habitat loss in the PSW associated with the slope can be addressed through additional plantings and habitat edge creation along the base of the slope. If required, a retaining wall can be constructed instead of the slope; however, this approach will minimize the potential for plantings and shade at the water's edge.

Harmful alteration to fish habitat can be reduced through appropriate construction practices and through use of bioengineering strategies for bank stabilization. The following mitigation measures will further assist in reducing a potential HADD to fish habitat:

- All work areas should be delineated with construction fencing to restrict the equipment and construction from potentially sensitive areas;
- All in-water construction activities should be implemented in the permitted time period to ensure that spawning fish and spawning habitat, eggs and fry are protected through the critical period. No work should occur in the water between September 15th to June 30th in any calendar year or as determined by the review agencies;
- Heavy equipment should be limited to stable areas and away from potentially soft banks;

- All culvert extensions should be countersunk to the depth of the existing culvert and backfilled with native material;
- All work should be completed under low flow and dry conditions and work areas should be isolated from flows during the construction phase;
- Fish should be removed from any area that may be isolated during the construction phase and released in the watercourse beyond the work area; and
- Best management practices related to materials storage, machinery operation and the movement of earth should be implemented during construction

Although, the mitigation strategies detailed above will assist in reducing the potential harm to fish habitat, replacement of the culvert will not likely result in a loss to fish habitat. As such, compensation should not be required.

7.2.1.2 Stormwater Management and Erosion and Sedimentation Control

Currently, the stormwater from Guelph Line enters the unnamed watercourse and PSW via direct runoff where there is no roadside ditch and through indirect discharge flowing along portions of a highly vegetated roadside ditch. The proposed road improvements will increase the amount of impermeable surface throughout the study reach. The preferred alternative design concept incorporates the installation of a storm sewer and curb and gutter collection system. The captured run-off will be discharged directly into the unnamed tributary at the existing Guelph Line crossing. The preferred design concept calls for the replacement of the existing culvert and connection of the proposed storm sewer. Runoff will be prevented from entering the PSW and sensitive species at risk habitats. However, redirection of the runoff directly into the tributary may negatively impacting water quality. A combination of engineered works and natural drainage attenuation on the downstream outlet portion of the watercourse may be effective in treating the excess storm water (Refer to Section 6.1.7.6).

Increased erosion due to the exposure of soil is common through the construction phase, resulting in increased suspended sediments, which can have detrimental effects on the watercourse(s) if conveyed by surface water runoff. Suspended and deposited sediment can have negative impacts on amphibian breeding pools, fish, fish habitat, and spawning areas. As well, increased sediment loads can result in changes in the channel equilibrium that may translate into downstream problems. For these reasons it is important that erosion and sediment control practices are clearly established and practiced throughout the construction phases to minimize the construction-related impacts on aquatic habitats and water quality. Temporary erosion and sedimentation control measures may include, but are not limited to the following:

- Soils exposure time should be kept to a minimum;
- Silt fencing should be installed along the stream margins in areas of soil disturbance to minimize disturbance of these areas and restricted dumping of waste/fill materials in a potential erosion zone;
- Use of an erosion control blanket in areas of soil disturbance should be used to provide slope protection and stabilization; seeding, sodding, and mulching material can also be effective if applied appropriately; and
- In sensitive areas associated with the riparian buffers, the placement of the vegetation mats of native materials is effective at reducing erosion while quickly establishing stability to the bank

Long-term strategies that control the overland flows, such as vegetated swales, rock checks and rip-rap linings in ditches can also be effective at controlling excessive sediments from reaching the watercourses and will provide continued maintenance of the fish habitat and water quality for the watercourses within the study limits.

All temporary measures should remain in place until the natural vegetation is established on any exposed soils. As well, measures aimed at establishing bank vegetation and improved riparian function should be incorporated into the design specifics for any portions of the watercourses that may require realignment. Provided that the erosion and sedimentation control strategies are established before construction begins, maintained throughout the construction phase and removed once the system is stable, there should only be minor effects on the surface water quality.

7.2.1.3 Terrestrial Ecosystems and Wildlife Habitat

There are no significant ecological changes anticipated as a result of the proposed road widening and improvements, and no rare, threatened or endangered plant species were identified directly within the proposed road improvements along Guelph Line. However, Jefferson Salamander (Ambystoma jeffersonianum) listed nationally and provincially as threatened, has been identified within the Crawford Lake PSW and ephemeral pool breeding habitat within ten metres of Guelph Line has also been confirmed by Conservation Halton. Installation of the retaining wall at the wetland will incur minimal loss of habitat for local flora and fauna and will have no impact on the breeding pool. Construction of a double perched culvert at the existing Guelph Line crossing may provide a secure corridor crossing for fauna within NAI 18 and 19.

Impacts to Jefferson Salamander and its habitat can be minimized through the following measures:

- Installation of silt fencing along the road side to prevent erosion and sedimentation into breeding pools during rain events;
- Storage of fill and spoil should be kept well away from Jefferson Salamander breeding habitats and secured using standard erosion control measures;
- Installation of a double perched culvert at the existing crossing may provide a secure crossing for all amphibians once roadway improvements are complete; the second 'dry' culvert should be placed beside and downstream of the 'wet' culvert used to convey water and perched at an elevation that is 15 centimetres higher than the upstream culvert; and
- Plantings at the inlet and outlet of both culverts should be done to provide cover and facilitate amphibian movement.

The presence of identified Species at Risk (SAR) within the study area may require a permit from OMNR under the Species at Risk Ontario (SARO) legislation. These species include Western Chorus Frog (Great Lakes), the Snapping Turtle and the Bobolink. Consultation with OMNR regarding the habitat requirements for these species is recommended through the detailed design phase to ensure that the final design meets the requirements of the SARO legislation and OMNR is confident that the habitat for SAR will not be altered.

Based on field assessments, trees within NAI 18 and 19 are 3 to 8 metres from the existing roadway. The preferred design concept suggests that some trees may require trimming to accommodate the widening and hydro pole relocation, as proposed no trees are targeted for removal. Trees along the edges of NAI 18 and 19 consist primarily of sugar maple, white cedar, ash, birch and white spruce. Should tree removal be required, removal should be done in phases as to not pre-stress the interior trees. Tree removal from the woodlot edge should not involve any heavy equipment to minimize damage to the remaining trees.

The Migratory Bird Convention Act is federal legislation that is intended to protect and conserve migratory birds—as populations and individual birds—and their nests. Under the legislation, the protection of migratory birds and their nesting sites is regulated and may impact the construction windows for this project, specifically avoid the spring months when most birds are nests. Should the construction require the removal of a tree, it should be verified prior to removal that the tree does not provide for migratory bird nesting habitat.

Additional details related to the natural environmental features are provided in the *Natural Sciences Report* contained in **Appendix G**.

7.2.2 Environmental Monitoring

Environmental monitoring would occur in response to the request of applicable agencies and stakeholders in association with the in-water works to ensure compliance with Fisheries Act authorization and permits from Conservation Halton. It is recommended that all interested parties be included in the detail design process as they pertain to the potential alteration of fish habitat prior to initiating the construction phase of this project.

Environmental monitoring is proposed to ensure that mitigation measures are implemented before and during construction and to ensure the effectiveness of the measures to reduce or eliminate adverse impacts. In this regard, a qualified Environmental Inspector will be assigned to oversee the environmental components of construction. It will be the responsibility of the Environmental Inspector to:

- Advise construction personnel on environmental matters;
- Schedule and conduct on-site inspections of the construction zone to ensure that best management practices are instituted and in compliance with current environmental legislation, regulations, standards and policies and are being adhered to during construction and that construction activities comply with the project permits and the Region's environmental policies; and
- Monitor mitigation measures to ensure their efficacy, respond to unanticipated problems and take corrective actions.

In the event that the Environmental Inspector identifies activities or actions that are either causing environmental harm or are in contravention of legislation, permits or Regional policy, the Environmental Inspector will report these activities to Regional Staff for further action.

Upon completion of construction, a final clean-up of the site will be completed and a post-construction environmental inspection will be undertaken one year after completion to confirm that disturbed areas have been restored to their original condition and that storm water management facilities are functioning.

7.3 Social Environment

In terms of the existing residential and business community, the proposed undertaking would maintain overall access from Guelph Line, provide accommodation for active transportation modes through the installation of partially paved shoulders, and potentially reduce the number and severity of collisions within the limits of the undertaking.

In terms of the general public, there is awareness and recognition of the Region's plans for roadway improvements within the Guelph Line corridor through the public consultation process.

The following are descriptions of those social environmental effects, the proposed mitigation measures and commitments that the Region will undertake to further work in addressing the effects.

7.3.1 Property Requirements and Access

Proposed access and property requirements are discussed in Section 6.1.5 and 6.1.11, respectively. Affected property owners will be consulted during the detail design stage to address mitigation measures, property purchase and additional project details, as required. Due to the minor amount of property that is required and at the more remote locations where the property is required to accommodate the roadway improvements (i.e. primarily away from residential access locations to Guelph Line), it is anticipated that mitigation measures for property impacts will be minor in nature.

7.3.2 Community/Recreation

As there are no existing community facilities within the limit of the undertaking potential impacts will be limited to the existing residential homes fronting Guelph Line. Residents will experience some disruption during the construction stage; however, these disruptions should be short-term, with access maintained at all times.

7.3.3 Noise

As part of an Environmental Assessment Study for a new or widened road, an assessment of potential noise impacts is required. The assessment is done in accordance with the Ministry of Transportation (MTO)/Ministry of the Environment (MOE) Noise Protocol.

For the purpose of assessing noise as part of a road expansion project, MTO defines a Noise Sensitive Area (NSA) as a noise sensitive land use with an outdoor living area, which includes:

- Single family house – typical backyard;
- Townhouse – typical backyard;
- Multiple unit buildings such as apartments with outdoor living areas for use by all occupants;
- Hospitals, nursing homes, where there are outdoor living areas for the patients.

Based on the MTO and MOE Noise Protocol, where a new or expanded roadway is proposed adjacent to a NSA, it is required that the future noise level with and without the facility be

compared. Where increases in noise levels are predicted, the following actions are recommended:

- 0 to 5 dBA increase – no action required; and
- Greater than 5 dBA – investigate noise control measures within the right-of-way.

Where introduced, noise control measures should achieve a minimum of 5 dBA attenuation over the first row of receivers. Noise control measures should mitigate to ambient, as administratively, economically and technically feasible.

Roadway noise, like most noise, varies throughout the day. Therefore, the noise descriptor used in Ontario to assess noise is the equivalent sound, Leq. Leq is identified as the continuous sound level which has the same energy as a time varying noise level over a specified time period. The Ministry of the Environment (MOE) uses the 16 hour period between 7 a.m. and 11 p.m. for the assessment of municipal roadway noise.

Traffic volume data was utilized from the traffic analysis as prepared by R and R Associates Inc. provided in **Table 7-2**. The AADT and 7 a.m. to 11 p.m. traffic forecasts were estimated from this data by adjusting the forecasts for the peak hour to give 16 and 24 hour averages using daily traffic variation assumptions provided in the traffic assessment.

Table 7-2: Traffic Volume Data
Guelph Line Corridor
Conservation Road to 1 km north of Derry Road

Characteristic	Existing (2008)	Future 2021
Existing (km/hr)	60	-
Future (km/hr) [11]		60
ADT (vpd)	6,400	8,100
AM Peak Hour (vph)	625	790
PM Peak Hour (vph)	660	835
Cars (%)	94.3	96.0
Small Trucks (%)	0.9	2.0
Medium Trucks (%)	1.8	1.0
Heavy Trucks (%)	3.0	1.0

[11] Assumed future speed limit.

Calculations were performed using the MOE Stamson (Version 5.0) prediction at the outdoor living areas. *Points of Reception* were selected typical of the NSAs along the both sides of Guelph Line which are adjacent to the Study area.

Two scenarios were compared under the future conditions:

- 2021 future conditions without any improvements to Guelph Line; and
- 2021 future conditions with improvements to Guelph Line.

Table 7-3 summarizes the results from the noise modelling.

Table 7-3: Noise Assessment Results

Receptor Location	Existing Year 2008 Leq (dBA)	Future Year 2021 (With Improvements) Leq (dBA)	Future Year 2021 (Without Improvements) Leq (dBA)
R1	48	48	48
R2	46	45	45
R3	49	49	49
R4	51	51	51
R5	56	55	54
R6	52	51	51
R7	43	42	42
R8	45	44	44
R9	54	53	53
R10	56	55	55
R11	53	52	52
R12	54	53	53

The projected noise level changes as a result of reconstructing Guelph Line are calculated to remain near existing levels at all Receptors. As the change in noise levels is predicted to be less than 5 dBA, consideration of noise mitigation is not required based on MTO and MOE criteria.

7.3.3.1 Construction Noise

Construction noise is temporary noise and depends on the type of work required. The impact of construction noise depends on the type of equipment used, number of pieces of equipment, time and duration of operation and the proximity to noise sensitive receivers in question.

Guelph Line, within the extent of the undertaking, is located in the Town of Milton. Therefore, the noise control by-law for the Town of Milton (By-law No. 16-84) applies. The following summarizes the applicable sections of the Town of Milton Noise Control By-law (No. 16-84) concerning construction noise:

> *3 q) "Any noise that disturbs or is likely to disturb persons in any office, hospital or in any dwelling, hotel or other type of residence, or of any persons in the vicinity arising between the hours of 2100 hours of one day and 0700 hours of the next following day from an excavation, quarry or construction work whatsoever, including the erection, demolition, alteration or repair of any building."*

7.3.3.2 Construction Noise Mitigation Measures

- It is recommended that the noise control by-law for the Town of Milton (By-law No. 16-84) be obeyed. Exemptions, where required, will be applied for through the municipality and should be included in the construction contract documents.
- General noise control measures will be referred to, or placed into construction contract documents. The following constraints addressing construction equipment operation and maintenance should be included in the construction contract documents:
    - *Equipment Maintenance*: Equipment shall be maintained in an operating condition that prevents unnecessary noise, including but not limited to non-defective muffling systems, properly secured components and the lubrication of moving parts; and
    - *Equipment Operation*: Idling of equipment shall be restricted to the minimum necessary to perform the specified work.
- Any initial complaint from the public will require verification that the general noise control measures agreed to are in effect, any noise concerns will be investigated, and the contractor warned of any problems.
- Notwithstanding compliance with the "general noise control measures", a persistent complaint will require a contractor to comply with the MOE sound level criteria for construction equipment contained in the MOE Model Municipal Noise Control By-law. Subject to the results of field investigation, alternative noise control measures will be required, where these are reasonably available.

Additional information on the *Environmental Noise Assessment Report* is provided in **Appendix H**.

7.3.4 Air Quality

As part of Halton Region Transportation Master Plan (HTMP) 2004, the Region has developed an *Air Quality Management Strategy* to proactively address air quality as part of its overall

roadway system rather than on a project specific basis. The strategy includes a number of initiatives, which in most cases, overlap with some of the other guidelines and plans presented in the HTMP. It is the Region's intent that the initiatives be taken together in addressing air quality issues as part of their air quality management strategy.

7.4 Cultural Environment

7.4.1 Archaeological Assessment

As part of the Guelph Line Transportation Corridor Improvements Class EA study, a Stage 1 Archaeological Assessment (background research and property inspection) was undertaken to determine potential impacts to existing archaeological resources.

The Stage 1 archaeological assessment determined that seven archaeological sites have been registered within one kilometre of the Guelph Line study corridor, none of which are located immediately adjacent to it. Additionally, a review of the general geography and local nineteenth century land use of the study corridor suggested that it has potential for the identification of Aboriginal and Euro-Canadian archaeological sites.

Based on the results of the property inspection, it was determined that the Guelph Line right-of-way has been subject to extensive and deep land alterations. The Niagara Escarpment cuts across the northern end of the Guelph Line corridor, and the lands adjacent to the right-of-way consist of rocky uneven terrain. However, minimal disturbances have occurred at the southern half of the corridor and at the west and south corners of the Guelph Line and Conservation Road (formerly Steeles Avenue) intersection.

7.4.1.1 Mitigation Recommendations

Based on the State 1 archaeological assessment results, recommendations were made as follows:

- The existing Guelph Line right-of-way does not retain archaeological site potential due to previous ground disturbances. Additional archaeological assessment is therefore not required along this portion of the study corridor; and
- If construction extends beyond the disturbed right-of-way, a Stage 2 assessment is recommended on any lands within the study corridor where there is potential for archaeological sites, in accordance with Ministry of Culture's *2009 Draft Standards and Guidelines for Consultant Archaeologists*.

In addition, compliance with the following legislation was recommended as follows:

- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act; and
- The Cemeteries Act requires that any person discovering human remains must immediately notify the police or coroner and the Registrar of Cemeteries, Ministry of Consumer Services.
- As part of the Class Environmental Assessment process, the Stage 1 Archaeological Assessment was provided to the First Nations for information purposes. In the event that aboriginal remains or significant artifacts are uncovered during the construction phase, all work activities will be ceased to minimize further disturbance to the area and the appropriate authorities will be notified, including the First Nations, of the archaeological discovery. Halton Region will not resume work activities until all issues have been satisfactorily addressed.

The details of the *Stage 1 Archaeological Assessment Report* is provided Section 3.4.1 and in **Appendix I**.

7.4.2 Built Heritage Assessment

As part of the Guelph Line Transportation Corridor Improvements Class EA study, a Cultural Heritage Resource Assessment was undertaken to determine potential impacts to existing heritage resources.

A review of background historical research and the Town of Milton's Heritage Inventory confirmed that the study corridor is historically located on part of Lots 12 to 15, between the road allowance for Concessions III and IV, in the former Township of Nelson, Halton County. The Township of Nelson experienced Euro-Canadian settlement activities in the early nineteenth century, and by the end of the century, the township had flourished as an ideal place for agricultural land use activities. The 1877 historical atlas maps confirms that lands adjacent to the study corridor had been cleared and developed into farmstead properties, featuring homestead structures and landscape features such as orchards.

The results of the field review confirmed that the study corridor retains visual, landscape, and structural reminders of this rural nineteenth century land use history. Six cultural heritage resources were identified adjacent to the Guelph Line road right-of-way (Refer to Section 3.4.2 and *Table 2* in **Appendix I** of the *Cultural Heritage Resource Assessment Report* for a complete description of the existing heritage resources). The following provides a summary of the field review findings:

- A total of six cultural heritage resources were identified in the study corridor which included two built heritage resources (BHR) and four cultural heritage landscapes (CHL);
- Identified cultural heritage resources include two residences (BHR 1 and BHR 2) and four farmsteads (CHL 1 – CHL 4);
- A total of five cultural heritage resources located in the study corridor have been listed on the Town of Milton's Heritage Inventory (BHR 2, CHL 1 – CHL 4);
- One cultural heritage resource located in the study corridor was identified during the field review (BHR 1); and
- No properties located in the study corridor have been designated under the Ontario Heritage Act.

7.4.2.1 Mitigation Recommendations

Based on the results of the field review and identification of potential impacts, the following mitigation measures are recommended:

- Road improvements should be suitably planned in a manner that avoids identified, above ground, cultural heritage resources;
- Wherever possible, historic roadscapes should be maintained through the use of landscaping with historic plant materials for berms or vegetative screens, and hedge rows should be preserved where extant; and
- When detailed road improvements plans are complete, specific impacts of the undertaking should be identified and appropriate mitigation measures developed, including, but not limited to, requirements for heritage impact assessments, documentation reports, and/or buffering strategies.

The details of the *Cultural Heritage Resource Assessment Report* are provided in Section 3.4.2 and **Appendix I**.

7.5 Design and Construction Considerations

The mitigation of construction impacts will follow the *Environmental Construction Guidelines for Municipal Road, Sewage and Water Projects*, issued by the Municipal Engineers Association.

7.5.1 Potential Impacts During Construction

The following sections describe the potential environmental impacts during construction and the proposed mitigation measures. The following potential adverse effects were identified, where applicable:

- Protection of existing vegetation;
- Construction noise and air quality;
- Disruption to vehicular traffic during construction; and
- Mud and dust control during construction.

The mitigation and monitoring conditions included in the following sections indicate a commitment on the part of the Region to mitigate potential environmental impacts and undertake a monitoring program during and after construction.

During the detail design stage and prior to the construction stage, the Region will be responsible for obtaining approval from the Ministry of the Environment for stormwater management works. Permit approval may be required from Conservation Halton for all culvert installations within regulated areas pursuant to Ontario Regulation 162/06.

All works associated with the proposed undertaking will be executed in such a manner, which to the fullest extent possible, minimizes any adverse effects on the natural environment within the project area. The Contractor will be responsible to ensure that his personnel are sufficiently aware and instructed that the work is to be carried out in a manner consistent with minimizing environmental impacts. Environmental monitoring of the Contractor's activities and compliance with environmental objectives will be undertaken by the Region's Environmental Inspector (Refer to Section 7.2.2).

7.5.2 Disposal of Excess Material

Surplus excavated material shall be removed to locations arranged by the Contractor. Prior to the disposal of any surplus excavated material, the Contractor will provide the Engineer with a sketch of the dumping site(s) and indicate how and when the site can be accessed including any required site restrictions. A written statement from the property owner(s) agreeing to allow the disposal of fill on the property must be approved by the Engineer. Furthermore, the placement of fill within any swamp, ravine or floodplain will require the written permission of Conservation Halton.

The Contractor will be responsible for obtaining all approvals from applicable authorities.

Upon completion of the disposing, leveling and grading of surplus excavated material on any property, the Contractor shall obtain a written statement from the property owner(s) releasing the Contractor and Region from any claims and accepting the condition of the property as satisfactory.

7.5.3 Measures for Proper Tree Removal and Preservation of Residual Plant Communities

Minimum measures for proper tree removal and preservation of residual plant communities shall include the following:

- A Tree Protection Plan should be developed during the detail design stage. This plan will provide guidelines for protecting trees during construction, as well as minimizing soil compaction and making wise use of the removed timber resource. The plan should also include recommendations for during and post-construction maintenance including hazard tree monitoring, pruning, insect and disease control, aerating, watering and mulching;
- The Contractor shall not damage or remove any trees or shrubs on the road allowance or adjoining lands unless the Engineer or his/her representative shall otherwise direct. Trees and shrubs which require trimming or tying back should be trimmed or tied back in advance of construction under the direction of the Engineer;
- Adjacent to vegetated areas, the cut and fill slope limits will be identified and a temporary fence should be erected. This will restrict the construction work area, protect the root zone of trees from damage and avoid soil compaction during construction. Temporary fence will be erected around the drip line of trees to be retained; and
- Any trees to be removed from Town of Milton property (if necessary) will require prior approval in accordance with applicable Town by-laws and procedures. Trees will be felled away from the residual stand to avoid damage. Tree removal should be conducted by a qualified firm experienced in the tree cutting operations.

7.5.4 Construction Noise and Air Quality

As part of the Halton Transportation Master Plan (HTMP), the Region has developed an air quality management strategy to proactively address air quality as part of its overall roadway system rather than on a project specific basis. The strategy includes a number of recommendations, which in most cases overlaps with other guidelines and plans presented in the HTMP. These include the following measures:

- Increase Regional fleet fuel efficiency;
- Maintain appropriate driving speeds (e.g. 50-80 km/h) where possible, as these minimize emissions;
- Develop design and maintenance guidelines that reduce air pollution, such as wider shoulders/trails/sidewalks and frequent street and shoulder flushing in construction areas;
- Develop a ‘corporate model’ to reduce emissions and lead by example; and

- Develop an education campaign to promote good air quality practices.

7.5.5 Mud and Dust Control

The Contractor shall take such steps as may be required to prevent dust nuisance resulting from construction operations. The Contractor shall be responsible for all dirt and mud that is tracked onto the roadways from vehicles entering or leaving the job site. The Contractor shall, upon request from the Engineer, immediately proceed with clean-up operations, or in the opinion of the Engineer, the Contractor has not or cannot sufficiently remove the mud from the road, the Engineer will proceed with the necessary clean-up.

7.5.6 Traffic Control

Construction Staging – It is anticipated that Guelph Line will be constructed in one or two stages. Temporary, short-term lane closures may be required during the construction stage.

Local Traffic – The Contractor shall provide access for local residents and businesses that currently have access from Guelph Line and Conservation Road (where applicable).

Construction Signs – The Contractor shall apply, place and maintain all barricades, warning signs, delineators and flashing lights necessary for the protection of the public and the work, including warning signs of construction operations in accordance with the Ministry of Transportation's Temporary Condition Manual (February 2000), Book 7 for all temporary traffic control issues for both short and long term durations.

Flagging – The Contractor shall, when directed by the Engineer, supply an adequate number of traffic control persons to direct traffic during construction, also in accordance with Ministry of Transportation's Temporary Condition Manual (March 2001), Book 7 and as directed by the Engineer.

7.6 Monitoring and Maintenance

The Region will ensure that the environmental protection recommendations described in Sections 7.2 through 7.5 and other subsequent agency approval conditions are complied with during the construction stage.

7.7 Mitigation Measures and Detailed Design Commitments

Environmental concerns, anticipated impacts, and proposed mitigation measures as they relate to the project, have been described in Section 7. Many of the environmental concerns have

been mitigated through the process by which the recommended design was selected, as described in the ESR. This section provides a detailed list of specific commitments to be carried forward into Phase 5 of the Municipal Class EA process—Implementation Phase. These commitments have been developed through consultation with various agencies throughout the study process.

Specific mitigation measures have been selected and committed to by Halton Region to address potential impacts as discussed throughout Section 7. It is recommended that these commitments, as presented in the ESR, become part of the contract package so that contractors are aware of the requirements prior to tendering. Monitoring of construction activities must ensure that all environmental standards and commitments for construction are met. Halton Region will work with Conservation Halton and other authorities, during detail 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 7-4: Detailed Design Commitments

No.	Description of Detailed Design Commitment
	Fisheries and Aquatic Ecosystems
1.	All work areas should be delineated with construction fencing to restrict the equipment and construction from potentially sensitive areas.
2.	All in-water construction activities should be implemented in the permitted time period to ensure that spawning fish and spawning habitat, eggs and fry are protected through the critical period. Any in water work must occur between July 1st and September 15th.
3.	Heavy equipment should be limited to stable areas and away from potentially soft banks.
4.	All culvert extensions, where applicable, should be countersunk to the depth of the existing culvert and backfilled with native material.
5.	All work should be completed under low flow and dry conditions and work areas should be isolated from flows during the construction phase.
6.	Fish should be removed from any area that may be isolated during the construction phase and released in the watercourse beyond the work area.
7.	Best management practices related to materials storage, machinery operation and the movement of earth should be implemented during construction.
	Stormwater Management and Erosion and Sedimentation Control
8.	Soils exposure time should be kept to a minimum.
9.	Silt fencing should be installed along the stream margins in areas of soil disturbance to minimize disturbance of these areas and restricted dumping of waste/fill materials in a potential erosion zone. Silt fencing should also be installed along wetland areas, where required. The document, “Sediment Control Guideline for Urban Construction” should be consulted during the detailed design phase.
10.	Use of an erosion control blanket in areas of soil disturbance should be used to provide slope protection and stabilization; seeding, sodding, and mulching material can also be effective if applied appropriately. Slopes should be revegetated with locally native, non-invasive species suitable for the site condition.

Table 7-4: Detailed Design Commitments

No.	Description of Detailed Design Commitment
11.	In sensitive areas associated with the riparian buffers, the placement of the vegetation mats of native materials is effective at reducing erosion while quickly establishing stability to the bank.
12.	For longer term requirements in controlling the overland flows, vegetated swales, rock checks and rip-rap linings in ditches should be used for controlling excessive sediments from reaching the watercourses. Other alternative measures for controlling overland flows and salt removal prior to entering the natural heritage areas should be investigated during the detailed design phase. The need and use of oil/grit separators as pipe end treatments for the storm sewer and culverts should be investigated during the detailed design phase.
13.	All temporary measures should remain in place until the natural vegetation is established on any exposed soils.
14.	Total Suspended Solids (TSS) within the watercourse(s) will be characterized before, during, and after construction.
15.	The contractor will identify a contingency plan for accidental sediment release.
16.	During the detailed design, consideration should be given toward the potential formation of karst as it relates to the installation of the storm sewers (i.e. potential to disrupt groundwater flow through the fractured bedrock by introducing a preferential flow path along the storm sewer system). Should karst formations be encountered, mitigation measures such as the use of clay waterstops, installed at regular intervals along the storm sewer to help prevent a preferential flow path along the storm sewer system, or other mitigation efforts should be considered and implemented as part of the detailed design.
17.	A hydrogeotechnical study should be undertaken during the detailed design phase as part of the roadway geotechnical evaluation to examine potential impacts to drainage infrastructure (recharge/discharge areas) and provide mitigation measures to prevent any negative surface groundwater interactions where required.
18.	During the detailed design phase, an overall integrated Stormwater Management Plan will be prepared.
	Terrestrial Ecosystems and Wildlife Habitat
19.	Impacts to Jefferson Salamander and its habitat can be minimized through the following measures: • Installation of silt fencing along the road side to prevent erosion and sedimentation into breeding pools during rain events; • Storage of fill and spoil should be kept well away from Jefferson Salamander breeding habitats and secured using standard erosion control measures; • Installation of a double perched culvert (ecopassage) at the existing culvert crossing (approximate Station 2+778 – Preferred Preliminary Design Plan) will provide a secure crossing for all amphibians once roadway improvements are complete; the second 'dry' culvert should be placed beside and downstream of the 'wet' culvert used to convey water and perched at an elevation that is 15 centimetres higher than the upstream culvert. Additional design details related to the perched culvert should be provided to Conservation Halton during the detailed design phase. The eco-passage should include "directional funneling" on either side of the culvert on both sides of the roadway; and • Plantings at the inlet and outlet of both culverts should be provided to provide cover and facilitate amphibian movement.
20.	A Tree Preservation Plan should be prepared during the detailed design stage, identifying the amount of vegetation to be removed throughout the project limits. Tree removal should be completed in phases so as to not pre-stress the interior trees. Tree removal from the woodlot edge should not involve any heavy equipment to minimize damage to the remaining trees.
	Environmental Monitoring
21.	The Region will commit to have an Environmental Inspector on site during the construction phase as a

Table 7-4: Detailed Design Commitments

No.	Description of Detailed Design Commitment
	condition of any required permits issued by CH or other permitting authorities.
	Construction Noise Mitigation Measures
22.	The noise control by-law for the Town of Milton (By-law No. 16-84) should be obeyed. Exemptions, where required, will be applied for through the municipality and should be included in the construction contract documents.
23.	General noise control measures will be referred to, or placed into construction contract documents. The following constraints addressing construction equipment operation and maintenance should be included in the construction contract documents: • Equipment Maintenance: Equipment shall be maintained in an operating condition that prevents unnecessary noise, including but not limited to non-defective muffling systems, properly secured components and the lubrication of moving parts; and • Equipment Operation: Idling of equipment shall be restricted to the minimum necessary to perform the specified work.
24.	Any initial complaint from the public will require verification that the general noise control measures agreed to are in effect, any noise concerns will be investigated, and the contractor warned of any problems.
25.	Notwithstanding compliance with the "general noise control measures", a persistent complaint will require a contractor to comply with the MOE sound level criteria for construction equipment contained in the MOE Model Municipal Noise Control By-law. Subject to the results of field investigation, alternative noise control measures will be required, where these are reasonably available.
	Air Quality
26.	Apply water and dust suppressants during construction to protect air quality due to dust.
	Archaeology
27.	If construction extends beyond the disturbed right-of-way, a Stage 2 assessment is recommended on any lands within the study corridor where there is potential for archaeological sites, in accordance with Ministry of Culture's 2009 Draft Standards and Guidelines for Consultant Archaeologists.
28.	Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act.
29.	In the event that aboriginal remains or significant artifacts are uncovered during the construction phase, all work activities will be ceased to minimize further disturbance to the area and the appropriate authorities will be notified, including the First Nations, of the archaeological discovery.
	Built Heritage
30.	Historic roadscapes should be maintained through the use of landscaping with historic plant materials for berms or vegetative screens, and hedge rows should be preserved.
31.	Specific impacts of the undertaking should be identified and appropriate mitigation measures developed, including, but not limited to, requirements for heritage impact assessments, documentation reports, and/or buffering strategies.
	Materials Management
32.	A construction work plan should be developed which designates locations for stockpiling of soils and other materials including fuel. Prior to the commencement of construction, the limits of protection areas will be delineated and fenced to avoid inadvertent intrusion of machinery or other activities such as stockpiling of excess materials. This fencing should be maintained and remain in place until final grading and landscaping has been completed. There will be no dumping of excess fill within Conservation Halton's regulated area.

Table 7-4: Detailed Design Commitments

No.	Description of Detailed Design Commitment
33.	All excavated materials requiring stockpiling will be in accordance with OPSS 180.07.06 and placed in predetermined locations. The perimeters of stockpiles will be encircled with silt fencing, according to OPSD 219.110.
	Other
34.	Utility relocations should be undertaken in consideration of the sensitivity of the surrounding natural environment and be carried out in such a way so as to minimize any negative impacts to the environment.
35.	A traffic volume/turning movement intersection count shall be conducted at the intersection of Guelph Line/Conservation Road on a typical event day for the Crawford Lake conservation area during the detailed design phase. The results of the traffic count will be reviewed to determine the warrant/need for northbound/southbound left turn lanes at this intersection location.
36.	Development within Conservation Halton's regulated area requires permission pursuant to Ontario Regulation 162/06 and must meet the policies within Conservation Halton's Policies, Procedures and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning Policy Document, April 27, 2006. All required permits, including any Department of Fisheries and Oceans (DFO) Authorizations, should be obtained prior to the commencement of the construction phase.
37.	The Ministry of Natural Resources (MNR) shall be contacted during the detailed design phase to determine if a permit is required under the Endangered Species Act (ESA) to facilitate the detailed design.
38.	Contractors should be certified in Erosion and Sedimentation Control as a condition of any required permits issued by CH or other permitting authorities.