

Appendix F

Stormwater Management (Existing Conditions)



**CLASS ENVIRONMENTAL ASSESSMENT
GUELPH LINE (REGIONAL ROAD 1) IMPROVEMENTS
QEW TO 100M SOUTH OF MCDOWELL ROAD
CITY OF BURLINGTON
IBI GROUP REF: 24RX12.0315
REGION FILE: PR-2829A**

STORMWATER MANAGEMENT
EXISTING CONDITION REPORT
NOVEMBER 20, 2012

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1. INTRODUCTION

1.1 Background

IBI Group has been retained by Halton Region to conduct a Class Environmental Assessment (EA) study and prepare detailed design of Guelph Line improvements. The study area is located between QEW and 100m South of McDowell Road, including intersecting Roadways/QEW Ramp improvements in the City of Burlington. The location of the study area is shown in **Figure 1**.

Guelph Line south of the QEW is a 6-lane urbanized major arterial roadway with separate turn lanes at all major roadway crossings. The road section contains sidewalks, gutter and curbs. It is used for a wide range of travel purposes and provides a direct link to the QEW. Harvester Road east of Guelph Line and Queensway Drive west of Guelph Line are both 4-lane major urban arterial roadways.

The purpose this EA is to study the following:

- Identify and evaluate a variety of reconstruction and intersection improvement alternatives that will satisfy future travel demands.
- Potential improvements including a combination of intersection and entrance modifications, and corridor improvements.

At this time, the Region anticipates that the required road improvements for Guelph Line in the study area could include all or a combination of the following:

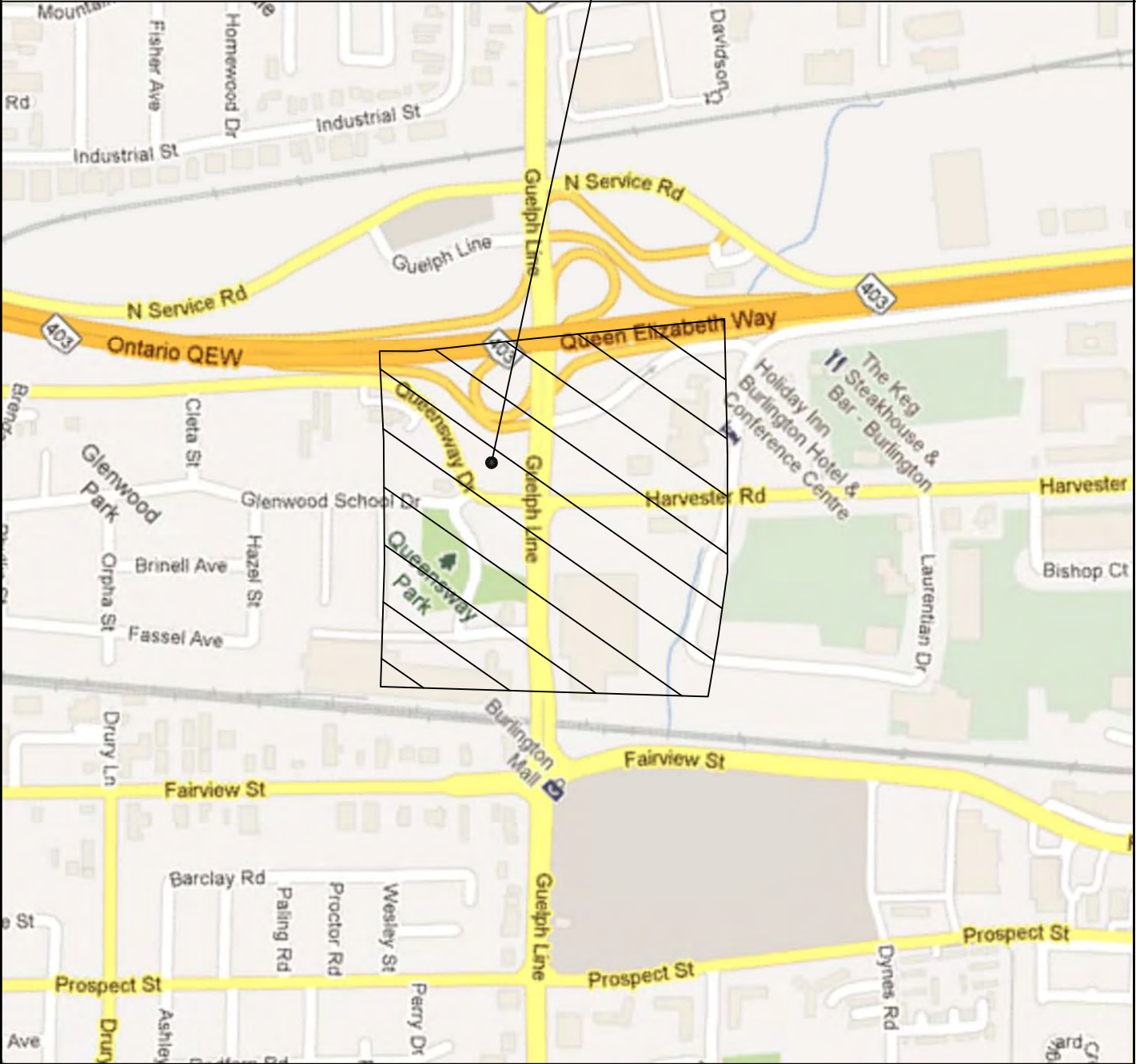
- Widening the northbound (NB) and southbound (SB) approaches of Guelph Line at Harvester Road/Queensway Dr. to accommodate separate SB double left turn lanes on Guelph Line;
- Widening the westbound (WB) approach of Harvester Road and the Eastbound (EB) approach of Queensway Drive at Guelph Line to accommodate an additional WB thru lane and a separate WB right turn lane;
- Widening the Guelph Line NB and SB approaches at the South Service Road (SSR) to accommodate as SB left turn lane to the SSR;
- SSR geometry modifications at Guelph Line;
- QEW W-N/S, QEW N-E and QEW S-E Ramp geometry modifications; and
- Traffic signal modifications associated with all or part of the above.

This Stormwater Management Existing Condition Report (SWMR) is a supporting document to the Class EA for the reconstruction of Guelph Line from QEW to McDowell Road.

The objective of this report is to summarize the drainage and stormwater management conditions that currently exist within the study limits.



**STUDY AREA
GUELPH LINE IMPROVEMENT**



DRAWING NAME: J:\24RX12.0315_HALTON-GUELPH-LINE-IMPROVEMENTS\5.9 DRAWING\59CIVIL\DRAINAGE\FIGURE1-KEYPLAN.DWG MODIFIED: Dec. 04, 2012 10:41 AM



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Date	Issued For	Rev.
Client HALTON REGION, ONTARIO		
Project GUELPH LINE IMPROVEMENT, CITY OF BURLINGTON		
Drawing Title STUDY AREA	Region File: PR-2829A	
	IBI Project No. 24RX12.0315	
Drawing No.		FIGURE 1

1.2 Existing Drainage Infrastructure

As part of Guelph Line EA the following drainage component were identified:

- Culverts CV1, CV2, CV3, CV4 and CV5 convey interchange storm runoff across ramps (N-E, S-E), Queensway and South Service Road (SSR). All culverts are CSP and of approximately 800 mm diameter;
- Culvert CV5 underneath Queensway and N-E Ramp receives interchange runoff from S-W quadrant and outlet to a stormwater sewer crossing Guelph Line;
- Storm sewers at Guelph Line convey minor system drainage; while major system flows overland on Guelph Line. The diameter of storm sewers range from approximately 450mm to 525mm;
- The existing ditches at Guelph Line interchange provide water quality/quantity control to the interchange runoff before discharging to Harvester Road stormwater sewer.
- Storm runoff south of Harvester road is collected storm sewers and conveyed to Roseland Creek enclosed section beneath Guelph Line.

2. SITE DESCRIPTION

2.1 Existing Drainage Conditions

There is no watercourse/creek within the project limits; however storm runoff from the study area ultimately discharges to Roseland Creek. Roseland Creek drains into Lake Ontario. The location of Roseland Creek and associated drainage features are illustrated on **Figures 2**.

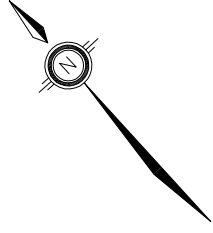
The general slope of Guelph Line, within the project limits, is from north to south, with a low point at the CN rail crossing. The road section is fitted with curb and gutter and catch basin inlets that direct drainage to storm sewers. Roadway drainage at the interchange runs off the road surface and drains into existing ditches running along ramps, Queensway and SSR. Corrugated steel pipe (CSP) culverts of approximately 800 mm diameter and varying lengths convey stormwater under ramps, SSR and Queensway with eventual discharge to either QEW drainage system or Harvester Road storm sewer.

Figure 3 illustrates location of culverts, ditches and storm sewers, including associated drainage areas. As shown in **Figure 3**, the Area 1 (A1) drains to QEW drainage system while, Area 2 (A2) discharges to Harvester Road storm sewer.

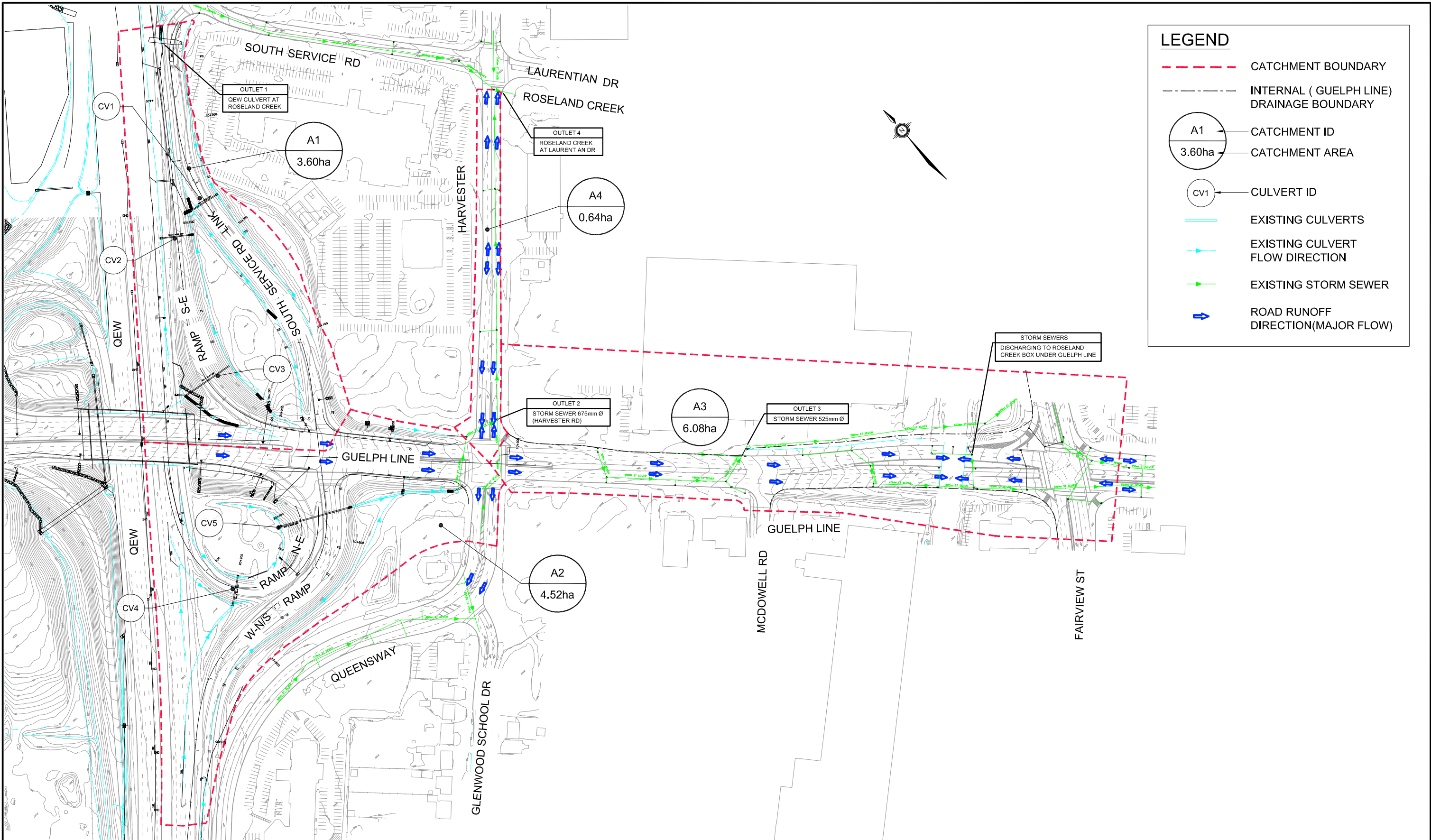
2.2 Description of Study Area

The Roseland Creek watershed within the study area has a mixed land use, consisting of residential, employment, open areas, commercial and recreational uses. Drainage of the area is facilitated by a major/minor storm system that consists of both open creek reaches and enclosed/overland drainage systems. The open channel system extends from north of the Queen Elizabeth Highway (QEW), south of Harvester Road and north of Fairview Street and east of Guelph Line to Lake Ontario. The enclosed sections are from the QEW to Harvester Road, CN rail tracks/ Fairview Street to east of Guelph Line at Glencrest Road.

Based on available records, the natural environmental value associated with the study area is considered quite limited, due to the significant amount of existing development and the lack of natural areas. Conservation Halton does not have any information due to the absence of natural areas. The Ministry of Natural Resources has listed from the Natural Heritage Information Centre (NHIC) database that one plant species is at risk within the Roseland Creek Watershed. The Ministry of Natural Resources has noted that specific information is not available for public record (Roseland Creek Flood Control EA, 2009).



EXISTING DRAINAGE CONDITION
GUELPH LINE IMPROVEMENT



STORM DRAINAGE PLAN
GUELPH LINE IMPROVEMENT

2.3 Existing Drainage Areas

A review of available topographic and storm sewer mapping was undertaken to determine drainage boundaries. Based on this assessment, and the combining of the drainage boundaries used in the information provided by the Region, some minor modifications have been made to drainage boundaries and areas. The study area has been divided into 4 separate catchments to better reflect the drainage contributions to culverts and storm sewers. **Figure 3** shows location of sub-catchments and associated drainage areas. Roadside ditching has been used throughout the interchange to direct drainage to nearest outlets.

2.4 Existing Drainage Elements

2.4.1 CULVERTS

Currently, there are five (5) culverts within the study area and are located as follows:

Ramp Culverts

- 762 mm diameter CSP approximately 25 metres in length located at under S-E ramp;
- 762 mm diameter CSP approximately 48 metres in length located at under S-E ramp;
- 762 mm diameter CSP approximately 21 metres in length located at under N-E ramp.
- 800 mm diameter CSP approximately 55.2 metres in length located under N-E and W-N/S ramps of the Guelph Line interchange.

South Service Road Link Culvert

- 762 mm diameter CSP approximately 23 metres in length located at the S-E quadrant.

Table 1 presents a summary of culverts.

Table 1 - Summary of Existing Culverts

Culvert ID ⁽¹⁾	Location	Type	Existing Size (mm)	Existing Length (m)	Surface Drainage Characteristics	Creek Watershed
CV1	SSR Link	CSP	762	23	Drainage Ditch	Roseland
CV2	Ramp S-E	CSP	762	25	Drainage Ditch	Roseland
CV3	Ramp S-E	CSP	762	48	Drainage Ditch	Roseland
CV4	Ramp N-E	CSP	762	21	Drainage Ditch	Roseland
CV5	Ramp N-E / Ramp W-N/S	CSP	800	55	Drainage Ditch	Roseland

Note: 1. Refer Figure 3 for crossing/culvert location.

2.4.2 STORM SEWERS

Under existing conditions, runoff from Guelph Line is primarily collected by catchbasins and conveyed to road side ditches or storm sewer. The size of storm sewers range from 450mm to 525mm. The location of storm sewers including outlet points are shown on **Figure 3**.

Outlet 1 (QEW Culvert at Roseland Creek)

- 1200 mm diameter QEW storm pipe collecting runoff from S-E quadrants of the interchange and discharging to Roseland Creek Culvert at QEW.

Outlet 2 (Harvester Road)

- 450 mm diameter storm pipe collecting runoff from S-W quadrants of the interchange, crossing Guelph Line and discharging to a 675 mm diameter Harvester Road storm sewer.

Outlet 3 (Guelph Line)

- 525 mm diameter storm sewer on the east side of Guelph Line crossing Fairview Street and discharging to Roseland Creek Box under Guelph Line;
- 525 mm diameter storm sewer under Guelph Line crossing CN Rail/Fairview Street and discharging to Roseland Creek Box under Guelph Line.

Outlet 4 (Roseland Creek at Laurentian Drive))

- 675 mm diameter storm pipe collecting runoff from Harvester Road and discharging to the Roseland Creek enclosed system at Laurentian Drive.

2.4.3 DRAINAGE DITCHES

V-shaped ditches currently exist and provide stormwater controls within the interchange areas.

3. DRAINAGE AND STORMWATER MANAGEMENT ISSUES

It is expected that the quantity of runoff from the improved section of the roads will not result in a significant increase in runoff, and as such, specific techniques to reduce the quantity and rate of runoff may not be considered warranted. This is due to the fact that the peak flows generated from the upstream rural catchments are much greater than the peak flows generated from smaller roadway paved areas, which occur earlier. Due to this lagging effect a small increase in the peak flow generated by the roadway does not result in an appreciable increase in the peak flow of the overall hydrograph. However, the present conveyance capacity of existing drainage elements will require a detailed hydraulic assessment.

Water quality controls will be required for all new additional paved areas associated with the proposed widening of the road as per Halton Region objectives.

The area between SSR/Queensway and McDowell Road where significant paving will be proposed, Oil and Grit Separator units will be required for quality control. North of SSR/Queensway, in

general, the interchange geometry presently has a rural cross-section, meaning stormwater is managed through roadside ditches. The existing water quality control measures by means of grassed ditches/swales will be maintained. The possibility of enhancing the existing V-shaped ditches to a flat bottom will be reviewed.

The proposed improvements will increase the pavement area however; flows to the existing storm sewer would not increase significantly and may not impact storm sewer system conveyance.

It is anticipated that the proposed improvements will not alter the interchange ramps significantly at Guelph Line interchange and therefore minor changes will not affect the existing culverts at this interchange location.

4. DESIGN CRITERIA

In conformance with Halton Region current policies and guidelines the following design criteria will be adopted in the development of drainage and stormwater management strategies for this project.

Culverts

According to the guidelines of MTO's Drainage Design Standards (Jan. 2008), the design return period for urban structures with a span less than 6.0 m is 50-year. A structure with a span of over 6 m on an Urban Arterial road should be designed to convey the 100-year design storm at the required freeboard and soffit clearance. The following criteria were applied to evaluate hydraulic performance of the existing culverts. The City of Burlington IDF curves are to be used for all hydrological analyses.

Freeboard

Clause 1-10.8.2 of the Canadian Highway Bridge and Design Code (CHBDC) recommends a freeboard of 1.0 metre "...from the edge of through traffic lanes to the design high-water level" for the design storm. This freeboard is a recommended value although it is recognized that, due to site-specific considerations, it is not always feasible to provide this value.

Vertical Clearance to Soffit

The provision of vertical clearance is typically related to scour and debris. For low vulnerability bridges (rigid frame, internal abutment and slab) and for culverts less than 6.0m in general, the requirement is a minimum of 0.30 m vertical clearance from the design flood. For structures greater than 6.0 m, the vertical clearance shall not be less than 1.0 m.

Changes in Upstream Water Levels

In accordance with good design practice, any increase in the upstream flood elevation resulting from the construction of a new structure should be kept to a minimum.

Storm Sewer System

- Minor drainage system to be sized to convey runoff from a 5 year storm, as per City of Burlington Standards.

Major System Drainage

- Major system flows (i.e. storms in excess of a 5 year event) to be conveyed overland to receiving drainage watercourses.

Water Quality

- Oil/Grit separators are to be designed according to the Ministry of the Environment (MOE) 'Enhanced' Level Of Protection (i.e. 80 percent long-term suspended solid removal);
- Grass Swales are to be designed to meet the following MOE criteria for quality control:

Minimum length of swale:	60 m
Allowable velocity (25 mm Chicago Storm):	0.5 m/s
Minimum bottom width of swale:	0.75 m
Maximum Drainage Area:	2 ha

5. CONCLUSION

The following summarizes the existing drainage and stormwater management conditions that have been investigated in support of Guelph Line EA:

- Five (5) CSP culverts currently existing within the interchange areas south of the QEW. Runoff from S-E quadrant is directed to a 1200 mm diameter QEW storm sewer discharging to Roseland Creek Culvert under QEW. Runoff from S-W quadrant is collected by a 450 mm diameter storm pipe under Guelph Line and discharges to Harvester Road storm sewer;
- The diameter of storm sewers under Guelph Line range from approximately 450mm to 525mm diameters;
- Physical condition of storm sewers is not known and need to be established either by existing/future CCTV/Video inspection report (if available with the City) to determine its structural condition.
- The existing minor system capacity was confirmed and it could be concluded that the existing storm sewers have enough capacities to convey 5-yr event flows.
- The major system, in excess of those captured by the minor system, is conveyed overland on Guelph Line. Depth of flooding at the CN Rail sag is to be determined during a 100-yr storm event to ensure that all flow depths on the roads will remain less than 0.3 above the gutter.
- The existing ditches at the interchange will continue to provide stormwater treatments to interchange runoff.
- Existing culverts at the interchange are approximately 800 mm diameter in size. MTO Drainage Design Standards dictates a minimum culvert size of 800 mm must be applicable to all new culverts.