

City of Markham

# Glynnwood Tributary Area Sewer Surcharge & Glynnwood / Shouldice Pond Restoration Implementation of Various Flood Remediation Class Environmental Assessment

## Report

JUNE 13, 2023





# Glynnwood Tributary Area Surcharge & Glynnwood / Shouldice Pond Restoration Implementation of Various Flood Remediation Class Environmental Assessment

## Report

City of Markham

Project No.: 121-15461-00

Date: June 13, 2023

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June 13, 2023

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**Subject: Glynnwood Tributary Area Sewer Surcharge & Glynnwood / Shouldice Pond Restoration  
Implementation of Various Flood Remediation Class Environmental Assessment**

Dear Ms. Azmy:

We are pleased to submit a digital copy of the above-referenced submission. The Project File has been structured to fulfill the requirements of Schedule 'B' of the Municipal Class Environmental Assessment (EA) process.

The main body of the report presents the key aspects and findings of the study. Further details are included in the attached appendices.

The document has been revised to incorporate the revised preferred alternative (dated January 2021), addressed all comments received based on the latest submissions (dated November 25, 2021) and incorporates details of the Stage 1 Archaeology review and engagement with First Nations.

To form a completed submission package, the following supporting documents are attached and included in **Appendix H**.

- ▶ Scoped EIS, WSP, September 29, 2020
  - ▶ Geotechnical Investigation, WSP, January 12, 2022
  - ▶ Arborist Report, WSP, September 17, 2021
- We trust our submission meets the City's requirements for this project.

Yours sincerely,

WSP CANADA INC.

Albert Zhuge, M.Sc., P.Eng, PMP  
Senior Project Manager  
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# Revision History

## FIRST ISSUE

October 7, 2016	Final Version		
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## REVISION 1

January 16, 2019	Draft Revision for Project Updates		
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## REVISION 2

April 27, 2021	Update to Include the Latest Preferred Alternative (dated January 2021)		
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## REVISION 3

September 7, 2021	Finalize to Address Comments		
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# Revision History Continued

## REVISION 4

April 18, 2022	Finalize to Address Comments (Dated November 25, 2021)		
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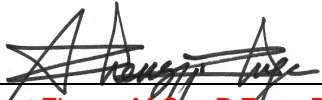
## REVISION 5

June 13, 2023	Revised to update Section 6.4.6 and add Section 7.4		
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# Signatures

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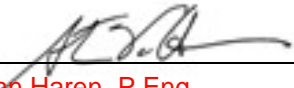


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Albert Zhuge, M.Sc., P.Eng., PMP  
Senior Project Manager  
Water Resources

June 13, 2023  
Date

## APPROVED<sup>1</sup> BY



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Steve van Haren, P.Eng.  
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June 13, 2023  
Date

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# EXECUTIVE SUMMARY

## Introduction and Background

Due to flooding occurrence on August 19, 2005 in the area of the Thornhill Community Centre (TCC) and the Glynnwood Retirement Residence, the City of Markham (the City) has initiated an engineering review to address this flooding problem. The original study was carried out by Clarifica in 2010 for the West Thornhill Area with a resulting report “West Thornhill Stormwater Flood Remediation Class EA Study”. Part of this study dealt with the Glynnwood storm sewer tributary area and assessed the major / minor stormwater systems and the causes of flooding along with preparation of a model in InfoWorks CS. Clarifica was then awarded a subsequent study to develop a preliminary remediation plan to alleviate the flooding both in the TCC (located within the Thornhill Square Shopping Centre) and the Glynnwood Retirement Residence and the associated underground parking garage. This subsequent study / report prepared by Clarifica “Glynnwood Tributary Area Sewer Surcharge and Glynnwood / Shouldice Pond Restoration, Implementation of Various Flood Remedial Measures and Pond Restoration Works” identified three (3) potential servicing alternatives to address the flood issues for both the Thornhill Square and the Glynnwood Retirement Residence.

Historically, flooding has occurred on a regular basis during intense storms in the Bayview / John Street area which impacted both the TCC and the Glynnwood Retirement Residence sites. Flows from the Thornhill Plaza, Bayview Avenue and overland flows from the Glynnwood Retirement Residence and the adjacent Shouldice Hospital site drain to the existing Glynnwood Ponds and thence through a tributary to Pomona Mills Creek, itself a tributary to the Don River.

The key purpose of this study includes:

- ▶ Alleviate flooding to the TCC and the Glynnwood Retirement Residence by providing a level of service to the 1 in 100-year storm event; and
- ▶ Provide an opportunity to introduce Enhanced Level water quality control for the stormwater runoff from the existing TCC / Thornhill Plaza area

## Description of Study Area

The bulk of the drainage catchment associated with the Study Area is located on the east side of Bayview Avenue from north of Green Lane extending south to John Street. It includes the contributing catchment areas for the Thornhill Square Shopping Centre and TCC, a townhouse development and an adjacent church located at the eastern boundary of the shopping centre as well as the drainage area contributing to the Glynnwood Pond.

Storm drainage from this area, including drainage from John Street to the south and Green Lane to the north, discharges through the Thornhill Square Shopping Centre and under Bayview



Avenue. A storm sewer located in an easement through the Glynnwood Retirement Residence conveys the minor system flows directly to the Pomona Mills Creek Tributary immediately downstream of the Glynnwood Pond. The Glynnwood Pond receives drainage from the major / minor system north of Green Lane and from Shouldice Hospital, which discharges to the elevated forebay. These flows enter Glynnwood Pond at the northern limit (elevated forebay), which then discharges through the main pond to the small tributary of Pomona Mills Creek, a tributary of the Don River. This pond was identified in the West Thornhill Stormwater Flood Remediation Class EA Study as the only manmade pond in the study area; however, it did not qualify as a stormwater management pond.

The minor system associated with the northern sewershed, north of Green Lane has an area of 44.9 ha and is the only one to currently drain directly to the Glynnwood Pond. Contributing overland flow from the northern sewershed drains to Bayview Avenue and thence to the Glynnwood Retirement Residence access road. There is a potential for some spilling of these flows from the northern catchment down the Shouldice Hospital access road to the Glynnwood Pond during major storm events.

### Scope of Study

The study has been carried out to assess the existing major and minor stormwater drainage systems to identify the causes, mechanisms and impacts of flooding and to develop a comprehensive flooding remediation plan that best meet the target level of service criteria of the City. An opportunity was added to introduce stormwater quality improvement measures to help achieve Enhanced Level of water quality to the flows from the Thornhill Square Shopping Centre.

The study scope included the undertaking of the following tasks:

- ▶ The Municipal Class Environment Assessment (EA) project Schedule B activities;
- ▶ Comprehensive review of background data and available information such as reported flood complaints, operation and maintenance records to confirm existing field conditions, supplemented as-required with additional field investigations;
- ▶ Update of the existing InfoWorks CS computer model provided by the City based on topographic survey and modelling of design storms to identify / confirm existing flooding issues and identify impacts of proposed remediation measures;
- ▶ Identification and prioritization of the locations and causes of flooding and surface flooding;
- ▶ Summary of the mechanisms by which storm runoff causes flooding, including interaction of the storm major / minor systems;
- ▶ Confirmation and identification of extent of previous / potential flooding locations through the analysis of model simulation results;

- ▶ Evaluation of drainage deficiencies and development of various flood remediation measures and comprehensive cost-effective flood remediation plans to achieve the targeted level of service for the study area according to the City's adopted criteria;
- ▶ Development of measures to improve the water quality of wet weather discharges from the stormwater outfalls discharging into the Pomona Creek;
- ▶ Conduct Public Information Centre to gain public input for measures to address flooding; and
- ▶ Provision of feasible conceptual design details of the proposed works recommended in the preferred alternative.

### York Region Bayview Avenue Class EA Study

The Regional Municipality of York (York Region) has completed a Class EA study for Bayview Avenue from Steeles Avenue to Elgin Mills Road (July 26, 2017) to address drainage issues for this section of road. This Glynnwood Tributary Sewer Surcharge Class EA study falls within the project study area. The Bayview Avenue EA recommends the inclusion of an oil and grit separator upstream of the outlet to the Glynnwood Pond. No quantity or flood control measures are recommended as part of the Bayview Avenue EA document.

### Conclusions

The following conclusions can be drawn from the completion of this study:

- ▶ The model of the existing system showed agreement with recorded flow data in terms of peak flows and volume of runoff. The calibration model was successfully validated using the historic storm events of May 12, 2000, August 19, 2005 and July 8, 2013;
- ▶ The causes of flooding that occurred during the August 19, 2005 event can be generally attributed to the following:
  - Surcharge of the Thornhill Square Shopping Centre storm sewer system during major rain storms with accumulation of surface runoff in low-lying areas causing water to spill into the TCC;
  - Surcharge of the storm sewer located in the easement associated with the Glynnwood Retirement Residence access road causing flooding in the Glynnwood Retirement Residence underground parking;
  - Overland flows from Bayview Avenue spilling down the Glynnwood Retirement Residence access road to the upper parking lot due to road grades with some flows spilling down the access ramp to the underground parking area; and
  - Overloaded storm sewers resulting in high overland flow.

- ▶ Source control measures were beyond the scope of this study, therefore, preferred remedial measures consist of a combination of conveyance control measures and remedial measures applicable to the sewer systems;
- ▶ Various flood protection solutions were investigated. They include upsizing of existing storm sewers and an offline line storage facility. They were evaluated and analyzed based on constructability, implementation feasibility, environmental impact, technical considerations, costs, etc. The preferred and recommended solutions were presented in a public information centre session for the public to provide comments;
- ▶ With the implementation of the revised preferred remedial measures (January 2021), both the storm sewer system and Glynnwood Pond measures, surface ponding in the parking areas will be limited to City guidelines and downstream impacts reduced;
- ▶ This study analyzed the alternatives recommended the previous study plus additional measures to address concerns of the Shouldice Hospital representatives. In addition to the implementation of the preferred flood protection solutions, this study provides an opportunity to enhance water quality improvements that were not previously available. The identified water quality enhancements will achieve some reductions in stormwater quality parameters and contribute to possibly achieving the long-term objectives of Enhanced Level control of storm runoff from the existing Thornhill Square Shopping Centre and the northern contributing catchment through Shouldice. The design of water quality controls to achieve the required targets will be performed during the detail design stage. Note that these measures will not necessarily achieve an 80% (Enhanced Level of Control) reduction in TSS loadings for the existing drainage area, nor will it achieve all the objectives of the City, MOECC and TRCA with respect to stormwater quality. Furthermore, any future development will require its own water quality controls to achieve an 80% Enhanced Level of Control;
- ▶ The preferred solution under this EA includes an oil / grit separator and possible conversion of the Glynnwood Pond to an extended detention facility for stormwater quality improvement. Again, please note the design of water quality controls to achieve the required targets will be performed during the detail design stage; and
- ▶ The Schedule 'B' Class EA process has been fulfilled through the Public Notification, the PIC, agency consultation and the submission of this project file document.

## Recommendations

The following recommendations are made with respect to this study:

- ▶ The City may proceed to detailed design and construction of the revised preferred long-term remediation measures. They include upgrading the capacity of the storm sewer system, and construction of a proposed open channel located on the north side of the existing parking lot associated with Glynnwood Retirement Residence. This work should be conducted in accordance with available funding from the capital budget and sequencing with other municipal projects.



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# 1 INTRODUCTION AND BACKGROUND

The Corporation of the City of Markham (City) originally retained GENIVAR Inc., which is now part of WSP Canada Inc. (WSP), to provide the necessary engineering services to carry out a detailed Environmental assessment of the Glynwood Tributary Area sewer system and to address existing flooding issues. This study is focussed on alleviating surface and basement flooding in the vicinity of Bayview Avenue between John Street and Green Lane, including the Thornhill Community Centre, the Glynwood Retirement Residence and the Shouldice Hospital grounds.

## 1.1 Introduction

Historically flooding has occurred on a regular basis during intense storms in the vicinity of Thornhill Community Centre on Bayview Avenue, between John Street and Green Lane (refer to Figure 1-1 for study area location). This has resulted in flooding of nearby facilities including the Thornhill Community Centre, the Glynwood Retirement Residence, and Shouldice Hospital.

On August 19, 2005 a very intense storm event occurred over the Greater Toronto Area producing rainfall greater than 1 in 300-year return period in some areas and 1 in 100-year return period within the Glynwood study area. As a result of this storm, surcharge issues in the local storm sewer on both Bayview Avenue and its surrounding area occurred, including the sewer under the Glynwood building and the Glynwood pond. The sewer under the Glynwood building has surcharged during intense storms resulting in flooding of the underground parking area several times a year. Similar flooding issues have also occurred in the area of the Thornhill Community Centre.

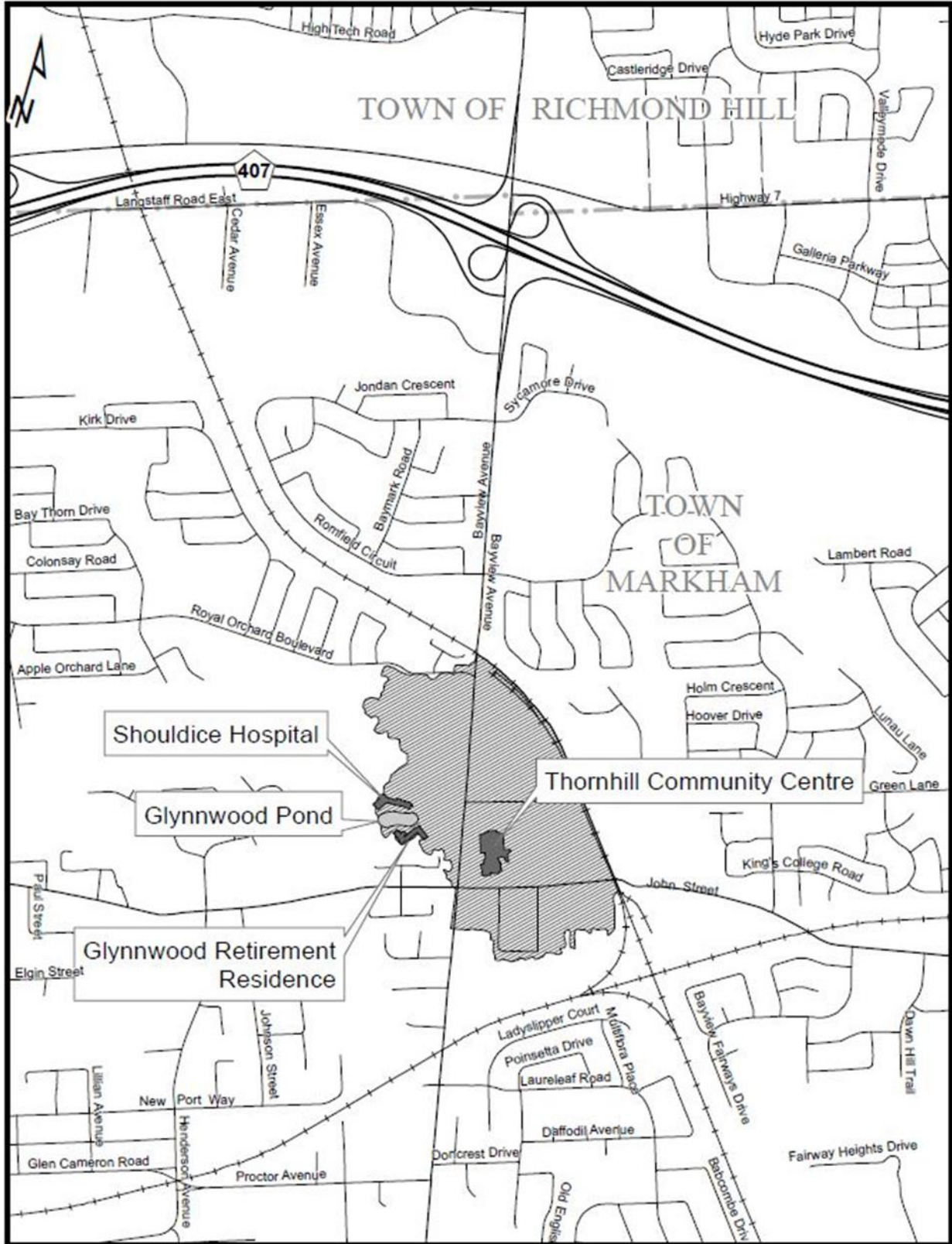


The Glynwood Pond, which is located near the northwest corner of John Street and Bayview Avenue, forms part of the drainage area for the study area. The property is jointly owned by Shouldice Hospital and the Glynwood senior citizen's residence. Although the property is private, the pond receives runoff from lands predominately to the north and east of the pond including Bayview Avenue and lands to the east.

The pond, which is approximately 45 years old, consists of an elevated forebay area, a connecting channel, and a main storage area. An existing storm sewer connection through the Shouldice property discharges into the elevated forebay area through an inlet structure located at the North-East corner of the upper pond (Photograph #1).

Representative photographs of flooding that occurred during the August 19, 2005 storm event are shown in Photographs #2 to #4.

Figure 1-1: Study Area Location Map



## 1.2 Background

In February 2010, Clarifica, a Division of Cole Engineering Group Limited, completed a study for the City of Markham entitled, “West Thornhill Stormwater Flood Remediation Class EA Study”. The Glynnwood Sewer Tributary was included in the study as part of Area 3, which encompassed a much larger study area. The Clarifica report documented that during the August 19, 2005 storm event, the rain gage at the Leslie Street Pumping, north of Steeles Avenue, recorded a total of 113mm of precipitation depth over the entire storm duration. Specifically, it recorded a maximum intensity of 191 mm/hour over 10 minutes, 133 mm/hour over 30 minutes, 79 mm/hour over one (1) hour, and 48 mm/hour over two (2) hours. The 30 minutes, one (1) hour and two (2) hour intensities exceeded the 1 in 100-year storm return period design storm intensities for the area.

The purpose of the Clarifica report was to assess the existing major and minor stormwater systems within the West Thornhill area to identify causes, mechanisms, and impacts of flooding, identify levels of services for the various areas and develop a remediation plan to alleviate flooding.

Clarifica was subsequently awarded another study to focus on the flooding associated specifically with the Glynnwood Storm Sewer Tributary Area. This resulted in the preparation of the document entitled, “Glynnwood Tributary Area Sewer Surcharge and Glynnwood / Shouldice Pond Restoration, Implementation of Various Flood Remedial Measures and Pond Restoration Works” in November 2011 prepared by Clarifica Engineering (now Cole Engineering). Three (3) servicing alternatives (or options as referred to in the report) were identified and modelled to alleviate flooding in the Thornhill Community Centre (TCC) and Glynnwood Retirement Residence and to provide stormwater quality treatment to the runoff from the TCC area. The alternatives considered and modelled are identified in **Section 4.1**. However, it should be noted that the above noted Clarifica report did not assess the alternatives to identify the preferred solution nor did it follow a Municipal Class Environmental Assessment (EA) process.

Since the existing Glynnwood Pond structure was constructed approximately 45 years ago, the City has been concerned about this pond due to silt accumulation, surface debris and the potential function of the pond for stormwater management purposes. As a result, the City retained the services of Stantec Ltd. to prepare detailed design for the restoration of the pond. All the regulatory approvals were obtained, and the project was tendered in the spring of 2012. Restoration work of the pond started on July 3, 2012 and was completed by the latter part of August 2012.

Since the pond has already been restored with new contour elevations, the elevation / storage relationships for the forebay and main Glynnwood Pond have been developed from the Stantec detailed design drawings and were used in the modelling of flows through the pond to estimate storage requirements and associated water levels.



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## 1.3 Ontario Environmental Assessment Act

Studies of this type are subject to Ontario's Environmental Assessment (EA) Act. The Act was passed in 1975 and began being applied to municipalities in 1980. The EA Act requires the study, documentation and examination of the environmental effects that could result from major projects or activities and their alternatives.

The objective of the Act is to consider possible effects of these projects early in the planning stage when concerns may be most easily resolved, and to select a preferred alternative on the basis of these effects.

The Act defines environment very broadly as:

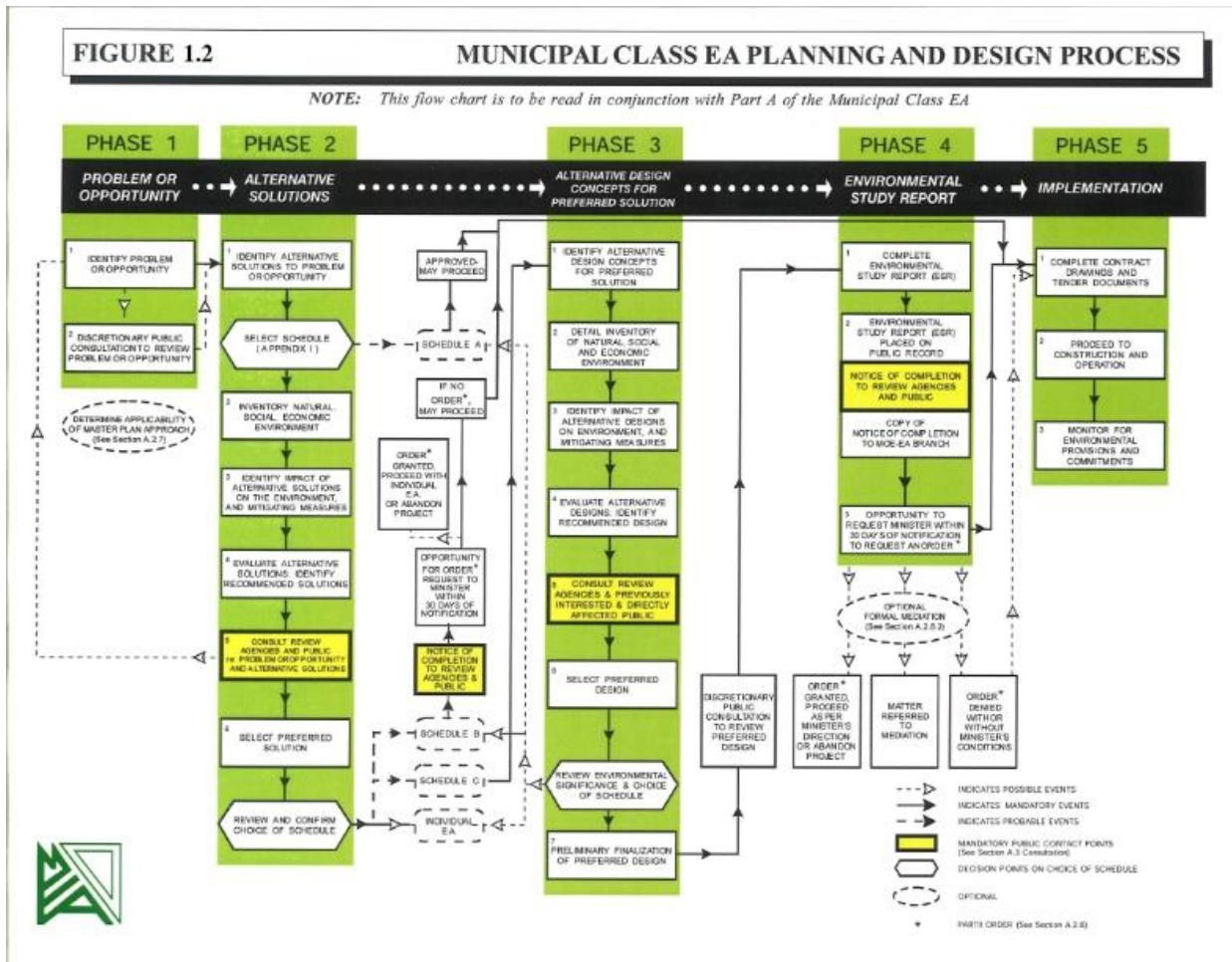
- a) air, land or water;
- b) plant and animal life, including humans;
- c) the social, economic and cultural conditions that influence the life of humans or a community;
- d) any building, structure, machine or other device or thing made by humans;
- e) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities; or
- f) any part or combination of the foregoing and the interrelationship between any two (2) or more of them, or of Ontario.

In applying the requirements of the EA Act to undertakings, the EA Act identifies two (2) types of environmental assessment planning and approval processes:

- ▶ Individual Environmental Assessments (Part II of the EA Act) – projects for which a Terms of Reference and an individual environmental assessment are carried out and submitted to the Ministry of the Environment (now Ministry of Environment and Climate Change) for review and approval; and
- ▶ Class Environmental Assessments (Class EAs) – projects that are approved subject to compliance with an approved class environmental assessment process with respect to a class of undertakings. Providing the appropriate Class EA approval process is followed, a proponent will comply with Section 13 (3) a, Part II.1 of the EA Act.

An approved Class EA document describes the process for a class or group of undertakings that a proponent must follow in order to meet the requirements of the EA. The current version (October 2007) of the approved Class Environmental Assessment document prepared by the Municipal Engineers Association outlines the procedures to be followed for projects of the type considered here to satisfy the EA Act requirements. The Class EA planning and design process is shown in **Figure 1.2**.

**Figure 1-2: Class EA Process**



The Class EA document places projects into four (4) possible schedules, depending on their characteristics (i.e. Schedule A, A+, B or C projects). The schedule in which a project falls determines the planning and design procedures that must be followed. Schedule A projects are minor operational and upgrade activities and may go ahead without further assessment once Phase 1 of the Class EA process is completed (i.e. the problem is reviewed, and a solution is confirmed). Schedule A+ projects are also pre-approved; however, the public is to be advised prior to public implementation. The manner in which the public is advised is to be determined by the proponent. Schedule B projects must proceed through the first two (2) phases of the process. Proponents must identify and assess alternative solutions to the problem, inventory impacts, and select a preferred solution. They must also contact relevant agencies and affected members of the public. Provided no significant impacts are found and no requests are received to elevate the project to Schedule C or to order the project to comply with Part II of the Environmental Assessment Act (referred to as a Part II order), the project may proceed to detailed design (Phase 5). Schedule C projects require more detailed study, public consultation, and documentation as they have more significant impacts. Projects categorized as Schedule C must proceed through all five (5) phases of assessment.

For this undertaking, it was determined that a Schedule B, Class Environmental Assessment was to be followed. This is because the flooding issues are related to an existing storm sewer system and the potential

water quality protection associated with the existing Glynnwood Pond for which a retrofit of the existing facilities will be required.

Additional documentation on the Class Environmental Assessment process is provided in **Section 7**.

## 2 PROBLEM STATEMENT

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### 2.1 Purpose of the Study

The purpose of this undertaking is to:

- ▶ Alleviate flooding to the Thornhill Community Centre (TCC) and Glynnwood Retirement Residence by providing a level of service to the 1 in 100-year storm event; and
  - ▶ Provide an opportunity to introduce Enhanced Level (Level 1) water quality control for the stormwater runoff from the Thornhill Community Centre area.
- 

### 2.2 Project Justification

As noted previously, a review of the stormwater management in the area is required because of recurrent flooding affecting the TCC and Glynnwood Retirement Residence as well as the lack of quality control measures for stormwater runoff from the TCC. Flooding causes risk to life, damage to property and can lead to reduced property values. The existing catchment is fully developed, which limits the potential for instituting upstream controls. The previous study by Cole Engineering, Glynnwood Tributary Sewer Surcharge and Glynnwood / Shouldice Pond Restoration, Implementation of Various Flood Remediation and Pond Restoration Works, November 25, 2011, identified a number of potential options to address the localized flooding in the TCC and Glynnwood Retirement Residence. Further examination of these options was required to establish their effectiveness in addressing the existing flooding issues and assessing their impacts on natural heritage features associated with Glynnwood Pond.

Similarly, untreated stormwater runoff can result in the transportation of oil, grease, grit, debris, heavy metals and other chemicals to Glynnwood tributary and ultimately Don River East. These pollutants can cause damages to fish, wildlife, vegetation and impact recreational opportunities. As part of the previous study a number of options were identified to address water quality issues.

Hence there is ample justification for this project proceeding forward.

## 3 EXISTING CONDITIONS

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### 3.1 Project Setting

The TCC is located on the east side of Bayview Avenue between Green Lane and John Street and includes the Thornhill Square Shopping Centre, a townhouse development and an adjacent church located at the eastern boundary of the shopping centre. Storm drainage from the site, including drainage from John Street and Green Lane, discharges through a storm sewer located in an easement through the Glynnwood Retirement Residence to the Pomona Mills Creek Tributary immediately downstream of the Glynnwood Pond. The Glynnwood Pond also receives drainage from the major / minor system north of Green Lane and from Shouldice Hospital, which discharges to the elevated forebay. These flows enter Glynnwood Pond at the northern limit (elevated forebay), which then discharges through the main pond to the small tributary of Pomona Mills Creek. Pomona Mills Creek is a tributary of the Don River. This pond was identified in the West Thornhill Stormwater Flood Remediation Class EA Study as the only man-made pond in the study area; however it did not qualify as a stormwater management pond.

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### 3.2 Sewershed Area

There are three (3) main sewersheds that impact this study: the northern sewershed, the southern sewershed, and an area of the Glynnwood Retirement Residence. **Figure 3.1** illustrates the drainage areas of the sewersheds.

The minor system associated with the northern sewershed, located north of Green Lane, has an area of 44.9 ha and is the only sewershed to currently drain directly to the Glynnwood Pond via a storm sewer. Contributing overland flow from the northern sewershed drains to either Bayview Avenue or John Street; however, there is a potential for some spilling of these flows down the Shouldice Hospital access road to the Glynnwood Pond. The modeling assumes that all these flows flow to the Glynnwood Retirement Residence access road and thence through the upper parking lot to the Glynnwood Pond.

The southern sewershed has an area of 58.0 ha and consists of three (3) parts:

- ▶ The TCC and the associated shopping centre as well as the minor system drainage from John Street that discharges through the shopping centre sewer system;
- ▶ The Green Lane and Bayview Avenue major / minor system and the major system flows from John Street, which bypass the TCC and collect at the entrance to the Glynnwood Retirement Residence Site; and
- ▶ Drainage from the Glynnwood Retirement Residence and Shouldice Hospital.

The southern sewershed minor system drains through the existing storm sewer, located in an easement associated with the access roadway for the Glynnwood Retirement Residence, which outlets to the Pomona Mills Creek tributary immediately downstream of Glynnwood Pond. The overland flow from the southern sewershed area also drains down this access driveway along with the overland flows from the northern sewershed. It has been recognized that the overland flow splits at the access driveway. However, due to the site conditions, it is difficult to determine the amounts of the overland flows that drain to the Glynnwood Pond




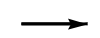
via the upper parking lot and those that drain to the Pomona Mills Creek Tributary immediately downstream of the Glynnwood Pond. Therefore, the model assumes that overland flows from both the northern and southern sewersheds are directed to the Glynnwood Pond through the upper parking lot, which is generally consistent with the observed grading.

A small area of the Glynnwood Retirement Residence grounds and the adjacent Shouldice Hospital grounds discharges as sheet flow overland to the Glynnwood Pond. This area is approximately 0.14 ha in size.

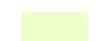




**Legend**

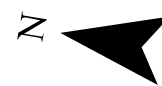
**Sewer System Types**

-  Existing Storm Sewers
-  Overland Flow Path

**Sewershed**

-  Direct to Pond via Overland
-  Northern Sewershed

 Southern Sewershed



Glynnwood Tributary Area Sewer Surcharge & Glynnwood / Shouldice Pond Restoration Implementation of Various Flood Remediation Class Environmental Assessment

Existing Condition  
Sewershed Map



Checked	JH	Drawn	SC
Date	February 2022	Project No.	121-15461-00
Scale	NTS	Figure No.	3-1

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## 3.3 Physical and Natural Environment

### 3.3.1 Topography

The sewersheds consist of tablelands draining to a defined valley containing the Glynnwood Pond. The lands around the pond consist of fairly steep slopes which continue directly to the pond water surface. The tributary downstream of the pond has a very well-defined channel that runs through a defined valley form to Pomona Mills Creek. The TCC shopping centre has fairly flat grades rising to the east where it steepens in the area of the town house development. John Street, south of the plaza, has a moderate slope from east to west where it meets Bayview Avenue.

The sewershed north of Green Lane has fair to moderate slopes draining to the Shouldice Hospital access road then flattens along Bayview Avenue as it approaches the Glynnwood Retirement Residence access road, the low point on Bayview Avenue. The sewer easement / access driveway to the Glynnwood Retirement Residence is fairly steep, with a potential to spill to the upper parking lot at the Glynnwood Retirement Residence, until it drains to the sewer outfall at Pomona Mills Creek.

### 3.3.2 Land Use

The land use within the northern sewershed is a mix of residential, institutional (school and associated sports fields) and a residential high-rise complex with associated landscaped areas. The southern sewershed consists of the TCC shopping centre, a townhouse complex that discharges through the shopping centre sewer system, residential units that front John Street and Bayview Avenue and the Glynnwood Retirement Residence and associated landscaped and parking areas.

### 3.3.3 Vegetation / Natural Heritage Features

A site visit was conducted on July 31, 2020 to confirm the presence of Natural Heritage Features, map vegetation, and to determine the general vegetative characteristics of the Site. The focus of the 2020 site investigations was to document the dominant vascular plants and natural features within the proposed development area with a specific focus on the naturalized area between Shouldice Hospital and Glynnwood Retirement Residence.

Prior to the site visit, a review of background information, satellite images and topographic maps was conducted to identify Natural Heritage Features and the potential for species of conservation concern. During the site visit photographs of the site were taken and observations of any wildlife, vegetation or natural features were recorded. A vegetation list of observed species is provided in **Appendix A**. In general, the site consists of manicured lawn, woodlot and naturalized valley land and is typical of highly disturbed areas. Wildlife species present at the site included common urban dwelling species, and no evidence of use by species at risk (SAR) were noted as being present during the site investigation.

Endangered, rare or threatened species were not identified during the site investigation; however, endangered bat species, including Little Brown Myotis (*Myotis lucifuga*), Eastern Small-footed Bat (*Myotis leibii*), Northern Myotis (*Myotis septentrionalis*) and Tri-colored Bat (*Perimyotis subflavus*) have moderate potential to be present in the study area, given the presence of a woodland with some dead or dying trees. The significant woodland within the wider landscape also provides moderate habitat potential for SAR bird species. Mitigation

measures to minimize the potential for impacts to potential SAR and their habitat are provided in the 2020 Environmental Impact Study (EIS) prepared under a separate title (WSP 2020).

Three (3) bird species: Belted Kingfisher, Hairy Woodpecker and Red-breasted Nuthatch have been assigned a rank of L4 by the TRCA, indicating that these species represent a concern due to their potential to decline within an urban matrix; however, they are thought to be able to withstand some disturbance. These species were observed in and / or adjacent to the Cultural Woodland. Other wildlife species observed on or adjacent to the study area have ranks of L5 and are considered generally secure within the TRCA jurisdiction and are not of concern.

Twelve (12) floral species were identified within the study area as uncommon or regionally rare in Ecoregion 7E, York Region, Greater Toronto Area (GTA), and / or by the TRCA. Seven (7) of these species occur within or immediately adjacent to the anticipated development footprint; however, most of the species listed above are planted, or have established themselves within the surrounding urban matrix. Impacts to these regionally or locally uncommon or sensitive flora within the study area is anticipated to be minimal. For more detail on regionally and locally rare and uncommon species within the Site, refer to the 2020 EIS report (WSP 2020).

Vegetation units have been described using the ELC System for Southern Ontario: First Approximation and Its Application (Lee et al., 1998), or by ELC for Southern Ontario: 2nd Approximation (Lee et al. 2008), as required. ELC information gathered included vegetation community type, species associations, abundances and condition / level of disturbance.

The study area is surrounded by urban land use (e.g. residential mid-rises, commercial property, parking lots, railway and arterial roads). Vegetation community types were observed to be highly impacted by historic anthropogenic activities and the introduction of exotic/invasive species. This has led to the establishment of a cultural woodland and manicured green spaces within and surrounding the study area. Planted landscape vegetation with species typical of cities was observed surrounding the residential buildings and within public spaces. Landscape plant species observed are typically used due to their tolerance to air pollution, salt and drought. The vegetation type comprising the treed area within the study area and surrounding the banks of the stormwater management pond is considered to have relatively higher ecological value; however, this area was also observed to consist largely of exotic / introduced species.

To further classify site vegetation, the Site was divided into vegetation types, which are identified in **Figure 3.2** below. A brief description of the vegetation communities observed within each area is outlined below.

**Figure 3-2: Existing Conditions - Natural Heritage Areas**



### CUW1 – Mineral Cultural Woodland Ecosite

This vegetation type was observed in treed habitats of the study area. The majority of trees were observed to be young (< 25 cm diameter at breast height [DBH]) and are likely the result of successional growth following a historic excavation/disturbance of this area. The canopy consisted of a mix of Canada Poplar (*Populus x canadensis*) and Freeman’s Maple (*Acer x freemanii*) with occasional Scots Pine (*Pinus sylvestris*). Rare occurrences of Silver Maple (*Acer saccharinum*) and Elm Species (*Ulmus sp.*) were also noted. Within the sub-canopy, species mostly consisted of planted Blue Spruce (*Picea pungens*), Norway Maple (*Acer platanoides*), Norway Spruce (*Picea abies*), White Spruce (*Picea glauca*) with occasional Freeman’s Maple and invasive Common Buckthorn (*Rhamnus cathartica*). Closer to the stormwater management pond and watercourse and associated habitat, the sub-canopy included rare amounts of Golden Weeping Willow (*Salix x sepulcralis*), White Willow (*Salix alba*), Red Maple (*Acer rubrum*) and Trembling Aspen (*Populus tremuloides*). The understory of the CUW1 consisted of an abundance of invasive Common Buckthorn (*Rhamnus cathartica*) and Garlic Mustard (*Alliaria petiolata*), as well as occasional Norway Maple, Black Raspberry (*Rubus occidentalis*), Eastern White Cedar (*Thuja occidentalis*), domestic apple (*Malus spp.*), invasive Honeysuckle Species (*Lonicera sp.*), Common Burdock (*Arctium minus*), Dame’s Rocket (*Hesperis matronalis*), Canada Goldenrod (*Solidago canadensis var. canadensis*) and Panicked Aster (*Symphyotrichum lanceolatum*). The groundcover was limited and consisted of invasive Common Buckthorn seedlings, Garlic Mustard and occasionally Wild Carrot (*Daucus carota*), European Wood-sorrel (*Oxalis stricta*), Ground-ivy (*Glechoma hederacea*), Common

Burdock, Wood Avens (*Geum urbanum*), Dame's Rocket, Woodland Strawberry (*Fragaria vesca*) and Heart-leaved Aster (*Symphotrichum cordifolium*).

### **Landscape and Lawn**

Surrounding the residential buildings, pathways, pedestrian trails and in public open areas, vegetation consisted of mowed lawn with planted trees that are being maintained / cared for and introduced species. Common planted trees consisted of Norway Maple, Freeman's Maple, Blue Spruce, White Spruce, Norway Spruce, Red Maple and Bur Oak (*Quercus macrocarpa*). In areas that could not be mowed easily (e.g. on steep slopes), Garlic Mustard and Common Buckthorn seedlings were found in abundance.

In accordance with the TRCA's request, the EIS was scoped to include an assessment of basal area based on results of prism sweeps for each vegetation community. Appendix B of the TRCA's Guideline for Determining Ecosystem Compensation (June 2018) was used as a guideline to complete the assessment. Basal area was determined using a BAF 2 metric prism. During the 2020 site visit, a WSP ecologist assessed basal area in the wooded area with the greatest potential for impact. The average basal area for the CUW1 vegetation type was estimated to be 19 m<sup>2</sup>/ha. Once the final footprint of impact is determined at detailed design, and the extent of tree removals is better understood, compensation requirements should be determined through consultation with the TRCA and the City.

A list of vegetation species observed by WSP staff during the site investigation is included in **Appendix A**. There were no species at risk observed on the site.

The results of the assessment of significant Natural Heritage Features identified on or adjacent to the site are provided in **Table 3.1**. This summary is based on a two (2) site visits and a review of documentation received by WSP pertaining to the site and adjacent lands. In order to minimize the effects of the development on these natural features, mitigation measures may have to be considered for all work conducted in the area.

**Table 3-1: Significant Feature Assessment Summary**

Feature	Present	Comment
Fish Habitat	Yes	Fish were present in the Glynnwood Pond at the time of the site visit. Fish habitat will be discussed in further detail in a separate Fisheries Assessment Report (summarized in Section 3.3.4 Fishery below).
Significant ANSI	No	No ANSIs have been identified on or within 120 m of the Site.
Threatened or Endangered Species Habitat	No	No Threatened or Endangered species habitat has been identified on or within 120 m of the Site; however, endangered bat species and SAR bird species have moderate potential to be present in the study area.
Significant Wetland	No	No significant wetlands have been identified on or within 120 m of the Site.
Significant Wildlife Habitat	No	No significant wildlife habitat has been identified on or within 120 m of the Site.
Significant Woodland	Yes	The pond is identified as 'Floodplain' by the City of Markham and is within the City's protected Greenway System. As such, it must be given a 6m environmental buffer.
Significant Valleyland	Yes	The City of Markham has identified significant valley lands along the Glynnwood Pond and watercourse, which exist in the centre of the Site. Significant valley lands must be given a 10m environmental buffer.

### 3.3.4 Fishery

#### 3.3.4.1 Historical Studies

Historical studies pertaining to natural environment of the Glynnwood Pond area were reviewed to better understand the conditions of the area, and specifically, the area of the preferred alternative.

The following studies were reviewed for information:

- ▶ Don River Watershed Plan – Aquatic System Report on Current Conditions (2009);
- ▶ Don River Watershed Plan Implementation Guide (2009);
- ▶ West Thornhill Storm Remediation Class EA Study (November 2010); and,
- ▶ Glynnwood Tributary Area Sewer Surcharge and Glynnwood / Shouldice Pond Restoration (November 2011).

The Glynnwood Pond Study Area is located northwest of the Bayview Avenue and John Street intersection and is highly urbanized and primarily residential. Two (2) major watercourses are immediately west of the Glynnwood Pond Study Area; the East Don River is the main stem and Pomona Mills Creek is a major tributary to the East Don River. Pomona Mills Creek flows north-southerly immediately west and adjacent to the Study

Area. The Glynnwood Pond is located on a small unnamed tributary oriented east-westerly to Pomona Mills Creek. The pond was originally created by damming the unnamed tributary in the 1930s. The pond receives stormwater runoff directly from storm sewers collecting flow from lands to the east (Clarifica, November 2010).

The Study Area is entirely within the Don River Watershed, specifically, the Upper East Don River Watershed. The Upper East Don River subwatershed has been and still is the most diverse subwatershed within the Don River watershed; however, habitat conditions range from quite 'poor' to 'good' depending on location. The smaller contributing watercourses have very low diversity (only 2 – 6 fish species present) and are dominated by tolerant minnows. For instance, blacknose dace (*Rhinichthys atratulus*) represented over 95% of the fish caught in Pomona Mills Creek in recent sampling events (Toronto and Region Conservation, 2009). Blacknose dace are cool water fish, with a preferred temperature range of 19 to 25 °C, and are rated intermediate in tolerance to temperature and disturbance (Eakins, 2012). Thermal regimes downstream of the Glynnwood Pond are relevant to this study in terms of potential negative impacts to downstream communities. The separation of a community due to barriers and on-line ponds tends to dramatically increase stream temperatures from cool water to warm water. No significant aquatic habitat has been identified in the upper reaches of the Pomona Mills Creek in a previous study (Clarifica, 2010).

#### **3.3.4.2 2012 Study**

WSP biologists conducted a site visit on May 23, 2012, at which time, fish were visually observed in the pond. The forebay was sampled on July 4, 2012 by Aquafor Beech Ltd. staff; however, no fish were captured. On July 27, as part of the pond retrofit by Stantec, Aquafor Beech Ltd. staff documented the capture of approximately 3000 carp (*Cyprinus carpio*), 3000 goldfish (*Carassius auratus auratus*) and one (1) juvenile painted turtle (*Chrysemys picta*). The pond was completely drained as part of the restoration project. It was noted that submergent aquatic vegetation in the Glynnwood Pond was completely lacking.

#### **3.3.4.3 2020 Study**

Pomona Creek is a tributary of the Don River and is considered a permanent stream (key hydrologic feature), which is a protected area as part of the Regional Greenlands System, municipal Greenway System, and a Natural System (valley corridor) under the TRCA Living City Policies (2014). The creek is approximately 300 m west of the proposed area for impact and approximately 165 m away from the stormwater management pond. Therefore, direct impacts to Pomona Creek and potential fish habitat are not anticipated. Potential indirect impacts to downstream fish habitat can be addressed through standard erosion and sedimentation controls and best management practices for outfall construction.

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## **3.4 Water Quantity and Quality**

### **3.4.1 Water Quantity Modelling**

The InfoWorks CS computer model, which was developed by Wallingford Software Inc., was previously set-up and applied by Clarifica (now part of Cole Engineering) for the Glynnwood Storm Sewer Tributary Area. The model combines a relational database with geographical analysis to provide a single environment that integrates asset planning with detailed and accurate hydrological and hydraulic modelling. The InfoWorks model incorporates full solution modelling of open channel and closed pipe networks, simulating complex hydraulic conditions of backwater effects and reverse flow, trunk sewers, complex pipe connections and



complex ancillary structures. The InfoWorks hydrologic routine generates wastewater flows as well as storm related flows including direct inflow / infiltration and groundwater infiltration.

The existing InfoWorks model provided by the City includes the major / minor system splits for the external areas as part of the basic model. The existing minor system flows are directed to two (2) outlets. The northern sewershed outlets directly to the upper Glynnwood Pond via a trunk sewer located in an easement through the Shouldice Hospital property. The southern sewershed currently bypasses the Glynnwood Pond and discharges through a storm sewer, located in an easement along the Glynnwood Retirement Residence property access road, to the Pomona Mills Creek tributary immediately downstream of the Glynnwood Pond.

Since there was no recorded flow data for the purpose of model calibration, WSP conducted a peer review of the model and made minor adjustment in sewer elevations based on the topographic survey conducted for the local area. Furthermore, in order to understand the existing sewer conditions, a detailed survey (including the CCTV inspection and dye test) was completed by the City of Markham in October 2020. WSP has reviewed the survey results and refined the InfoWorks model to reflect the actual existing conditions of the storm sewer system for the subject study. The InfoWorks CS model was updated to InfoWorks ICM version 9.5 in this process.

The InfoWorks model of the existing condition accounts for flows that exceed the capture capacity of the minor system as major system flows. These major system flows include some overland flow from drainage catchments east of the CN railway embankment which acts as the eastern border of the sewersheds of the Study area. The existing model shows these overland flows spill to the west through the embankment at the John Street and Green Lane underpasses.

The major system flows will continue to drain along the existing overland flow routes associated with the road drainage system on Green Lane, John Street and Bayview Avenue. These major system flows are currently conveyed to the spill point on Bayview Avenue at the entrance to the Glynnwood Retirement Residence.

Based on the field survey, some of these flows will actually spill down the Glynnwood Retirement Residence access road to discharge directly to the tributary immediately downstream of the Glynnwood Pond. The survey identifies a super elevation at the western side of the roadway adjacent to the upper parking lot entrance but the depth of flow, the high velocity and the abrupt direction change (see Photograph) and the flattening of the access road grade will result in flows spilling through the entrance to the upper parking lot. A speed bump had previously been constructed at the entrance to the upper parking lot access, with a height of 0.23 m, in an attempt to direct flows down the access road rather than spilling to the parking lot and underground garage;

however; the abrupt bend in access road to the southwest adjacent to the entrance, accompanied by a flattening in the access road grade in this direction and the relatively high velocities for the flow down the access road still causes spilling of storm overland flows to the upper parking road / underground parking entranceway as evidenced in the August 19, 2005 storm event. However, due to the above site conditions, it is difficult to properly determine the flow separation. Therefore, the InfoWorks model assumes all overland flows at this location are directed to the Glynnwood Pond through the upper parking lot, which is generally consistent with the observed grading.



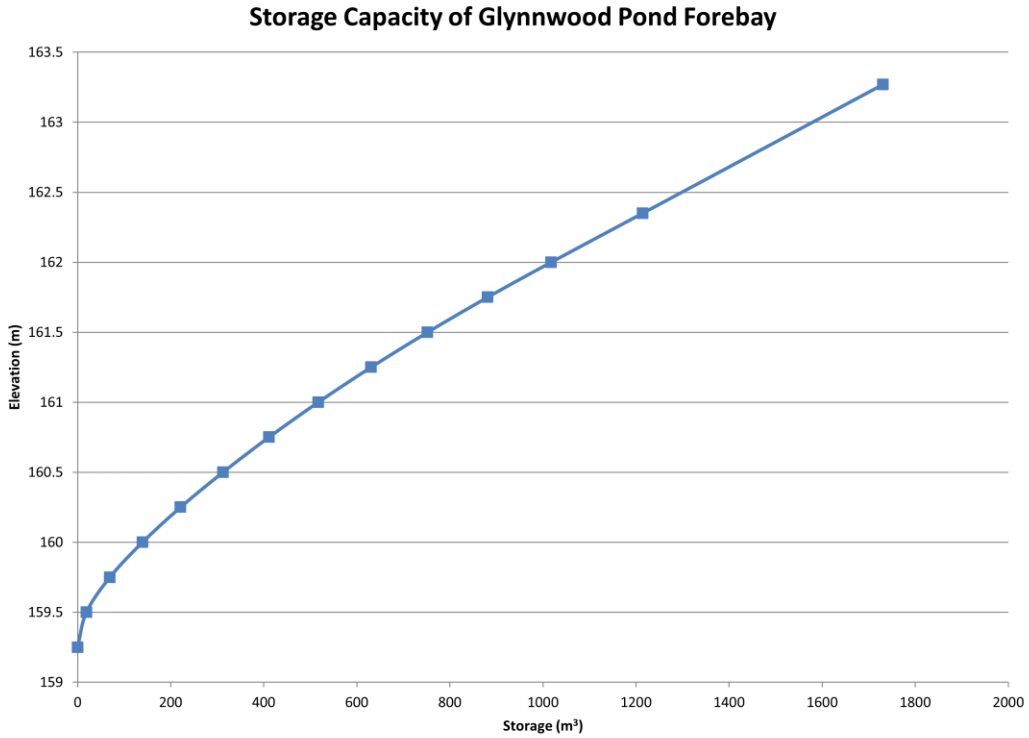
The model accounts for overland flow from Thornhill Square Shopping Centre by assuming a spill point at the entrance to Bayview Avenue. Any flows in excess of the minor system capacity are assumed to be held in generic surface storage with a defined head storage relationship. Once the head exceeds the spill point elevation at the Bayview Avenue entrance, the excess flows are directed to the Bayview Avenue major system and thence the Glynnwood Retirement Residence access road entrance as noted above. The storm drainage major and minor systems are shown on **Figure 3-1**.

The model provided by the City did not contain the elevation / storage / discharge relationships for the Glynnwood Pond. This is required in order to assess the storage impacts of the 100-year storm event in the pond. Therefore, using the Stantec detailed design drawings for the restoration of the pond (provided by the City), elevation/storage relationships were developed for the forebay and main Glynnwood Pond. The elevation/storage relationships for the forebay and main pond are shown in **Figure 3-3** and **Figure 3-4**, respectively.

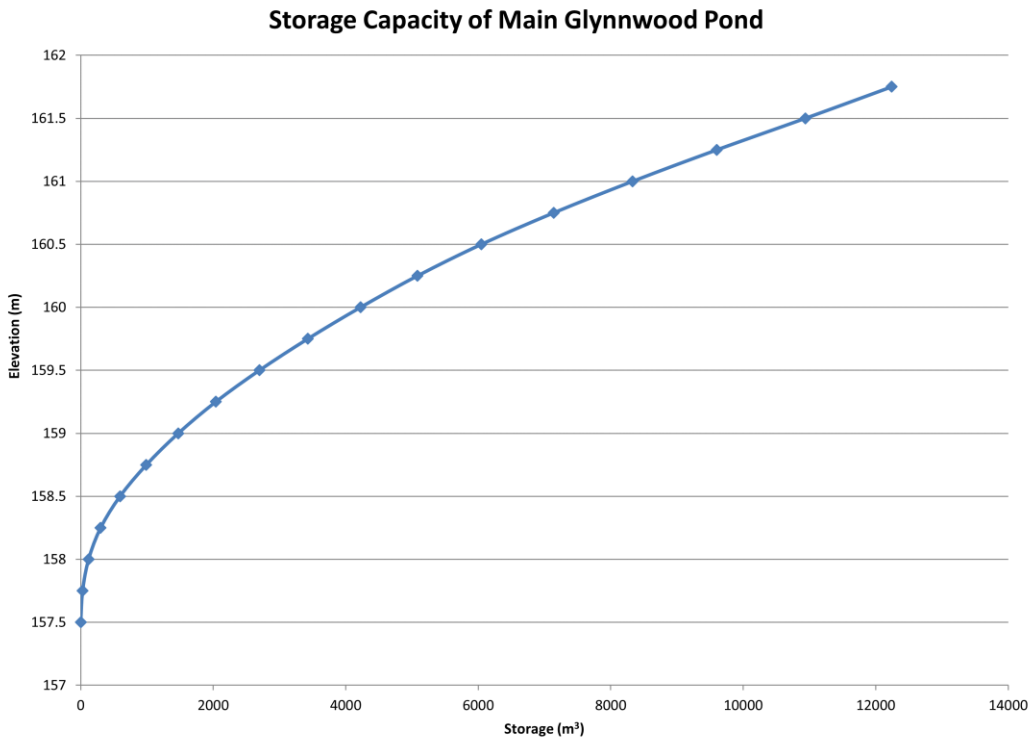
Separate elevation / discharge relationships (for active storage) were also developed for the forebay and main pond considering the broad-crested weir equations. Subsequently, the active storage elevation / storage / discharge relationships were input into the InfoWorks model for simulation of flow events. Storage elements are modelled in InfoWorks using the elevation versus plan area relationship.

The model was subsequently used to run the 25 mm storm event to obtain erosion control storage requirements in Glynnwood Pond and the 100-year storm event to determine the hydraulic profiles in order to assess the level of flooding. The model shows that under existing conditions, the storm sewer in the TCC area and that in the easement along the southern part of the Glynnwood Retirement Residence discharging to the tributary south of the Main Pond are surcharged to the surface under the 100-year storm event. Hydraulic profiles pertaining to this event are shown in **Appendix B**. Under this event, the water level in the pond would rise to elevation 160.95 m assuming that only the storage above the weir level in the main pond would be available for flood storage and the storage below the weir level would be utilized for permanent pool, as there is no other outlet below the weir elevation.

**Figure 3-3: Stage Storage Curve for Glynnwood Pond Forebay**



**Figure 3-4: Stage Storage Curve for Glynnwood Pond Main Bay**



## 3.4.2 Glynnwood Pond Water Quality Storage

### 3.4.2.1 Methodology

Under existing conditions, only the storm sewer system from the sewershed north of Green Lane plus local overland drainage discharges to Glynnwood Pond. The minor system catchment area currently contributing to the Glynnwood Pond has been estimated to be 44.9 ha of which 35% is considered to be impervious area. Based on Table 3.2 of the March 2003 Ministry of the Environment (MOE), now the Ministry of Environment and Climate Change (MOECC) document entitled "*Stormwater Management Planning and Design Manual*", the storage volume for 35% impervious area is 140m<sup>3</sup>/ha for a wet pond with Enhanced Level of Protection (i.e., 80% TSS Removal). Of this requirement, 100 m<sup>3</sup>/ha is for Permanent Pool storage and 40 m<sup>3</sup>/ha for Extended Detention storage. Hence for a total catchment area of 44.9 ha, the storages are as follows:

$$\text{Permanent Pool Storage} = 44.9 \text{ ha} \times 100 \text{ m}^3/\text{ha} = 4,490 \text{ m}^3$$

$$\text{Extended Detention} = 44.9 \text{ ha} \times 40 \text{ m}^3/\text{ha} = 1,796 \text{ m}^3$$

The Extended Detention for the pond is based on the greater of the water quality requirements (40 m<sup>3</sup>/ha) versus the Erosion Control. A computer run using the InfoWorks model was conducted for the 25 mm design storm event for the sewershed area currently discharging to the Glynnwood Pond to estimate the Erosion Control storage required. Based on this run, the peak flow prior to entering the pond was found to be 854 L/s and the total volume of runoff to be 2,148 m<sup>3</sup>. Since the Erosion Control storage requirement (2,148 m<sup>3</sup>) is larger than the required Extended Detention storage (i.e., 1,796 m<sup>3</sup>), it governs and is provided by the available active storage at the Glynnwood Pond.

### 3.4.2.2 Permanent Pool

Based on the pond restoration work being undertaken for Glynnwood Pond, stage / discharge curves were developed for the Forebay Pond and the Main Pond.

The existence of the weir at the outlet of the sediment forebay with a crest elevation of 162.35 m is identified as the permanent pool elevation of the forebay. The corresponding storage is approximately 1,214 m<sup>3</sup>.

The elevation of the control broad-crested weir at the outlet of the main pond is 160.45 m, which is defined as the permanent pool elevation of the main pond. The storage available at this level based on the stage / storage relationship with the restoration in place is approximately 5,855 m<sup>3</sup>.

Therefore, the total permanent pool storage available at the Glynnwood pond is determined to be 7,069 m<sup>3</sup>, which is more than the permanent pool storage of 4,490 m<sup>3</sup> required to provide Enhanced Level of Protection (i.e., 80% Long-term TSS Removal).

A summary of the existing Glynnwood Pond water quality control storage volume and associated elevations are presented in **Table 3.2**.

**Table 3-2: Summary of the Existing Glynnwood Pond Water Quality Control Storage**

Existing Contributing Drainage Area		Minor System from North Catchment Area	
Permanent Pool Elevation	Permanent Pool Elevation at Forebay	(m)	162.35
	Permanent Pool Elevation at Main Pond	(m)	160.45
Available Permanent Pool Volume	Available Permanent Pool Volume at Forebay	(m <sup>3</sup> )	1,214
	Available Permanent Pool Volume at Main Pond	(m <sup>3</sup> )	5,855
	Total Available Permanent Pool Volume	(m <sup>3</sup> )	7,069
Required Permanent Pool Volume for Enhanced Level of Protection (i.e., 80% TSS Removal)		(m <sup>3</sup> )	4,490
Surplus (+) / Deficit (-)		(m <sup>3</sup> )	+ 2,579
Achieved Level of Protection		Enhanced (80% Long-term TSS Removal)	

# 4 IDENTIFICATION AND SCREENING OF ALTERNATIVES

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## 4.1 Background

In the City of Markham document entitled, “Glynnwood Tributary Area Sewer Surcharge and Glynnwood / Shouldice Pond Restoration, Implementation of Various Flood Remedial Measures and Pond Restoration Works” prepared by Cole Engineering Group Limited in November 2011, three (3) servicing alternatives (or options as referred to in the report) were identified and modelled to alleviate flooding in the Thornhill Community Centre (TCC) and Glynnwood Retirement Residence and to provide stormwater quality treatment to the runoff from the TCC area.

The Cole alternatives shown in **Table 4.1** were developed to reduce the flows in the existing storm sewer downstream of the TCC, increase the flood protection to the Retirement Residence and provide water quality improvements from the TCC stormwater runoff.

**Table 4-1: Alternative Remedial Measures Development in Previous Study**

Alternative No.	Description of Alternative
Alternative #1	The main components of this alternative are depicted in Figure 4-1. They include diverting flow from MH8 to the Glynnwood Pond via a new storm sewer and providing an Oil / Grit Separator downstream of MH7.
Alternative #2	The main components of this alternative are depicted in Figure 4-2. They include diverting flow from MH8 to the Glynnwood Pond via a new storm sewer, in addition to diverting flow from MH7 to new MH near MH8 and providing an Oil / Grit Separator downstream of new MH.
Alternative #3	The main components of this alternative are depicted in Figure 4-3. This alternative is the same as Alternative #2 except the Glynnwood Pond would be used for water quality treatment and does not include an Oil / Grit Separator in the TCC.

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## 4.2 Identification of Additional Alternatives

The Terms of Reference for this study identified the need to consider an additional four (4) alternatives. Based on a review of background information, property easements, plan / profile drawings, field reconnaissance, topographic surveys undertaken, meetings with the stakeholders (e.g., TRCA and landowners, etc.), the additional alternatives WSP developed are shown in **Table 4.2**.

**Table 4-2: Additional Alternative Remedial Measures Developed as Part of this Study**

Alternative No.	Description of Alternative
Alternative #4	The main components of this alternative are depicted in Figure 4-4. They include replacing the existing storm sewer from MH11 to New CB / MH, providing temporary detention storage for flow through MH8, providing Oil / Grit Separator downstream of MH7 and twinning part of the sewer in the easement south of the Glynnwood Retirement Residence.
Alternative #5	The main components of this alternative are depicted in Figure 4-5. This alternative is the same as Alternative 4, except temporary detention storage has not been included.
Alternative #6	The main components of this alternative are depicted in Figure 4-6. In addition to replacing the existing storm sewer from MH11 to New CB / MH, the alternative included the same sewer alignments as Alternative #3. The alternative also considers diversion to the Glynnwood Pond from the existing MH on the Glynnwood Retirement Residence Access Road, south of Bayview Avenue.
Alternative #7	The main components of this alternative are depicted in Figure 4-7. This alternative was introduced based on the meeting with TRCA on January 16, 2020. The alternative includes an open channel located on the north side of the existing parking lot associated with Glynnwood Retirement Residence, instead of deep underground pipe sections. The alternative utilizes the existing sewer across Bayview Ave and introduces proposed relief pipes system to divert all surface flows up to the 100-year storm events to the Glynnwood Pond.

### 4.3 Water Quantity Modelling of Alternatives

The InfoWorks CS model (Ver. 12.5) was subsequently used to simulate the hydraulic conditions for the alternatives identified in **Tables 4.1** and **4.2**. The hydraulic profiles for each alternative are appended in Appendix C with a summary provided in **Table 4.3**.

**Table 4-3: Result of Water Quantity Modelling**

Alternative No.	Result of Water Quantity Modelling
Alternative #1	The existing storm sewer on the south side of Glynnwood Retirement Residence Building is surcharged. The south branch of the sewer from TCC is also surcharged and in some locations the HGL is above ground level.
Alternative #2	The existing storm sewer on the south side of Glynnwood Retirement Residence Building is surcharged. The south branch of the sewer from TCC is also surcharged. The extent of surcharge is lower than Alternative #1.
Alternative #3	Similar to Alternative #2.
Alternative #4	The HGL in the existing sewer is below basement elevation (greater than 1.8m below ground level). The relief sewer along the south side of Glynnwood Retirement Residence Building has adequate capacity to convey flows downstream. The south and north branches of the sewer from TCC are surcharged. The level of surcharge is lower than Alternative #1, #2 and #3.

Alternative No.	Result of Water Quantity Modelling
Alternative #5	The HGL in the existing sewer is below basement elevation (greater than 1.8m below ground level). The relief sewer along the south side of Glynnwood Retirement Residence Building has adequate capacity to convey flows downstream. The south and north branches of the sewer from TCC are surcharged. The level of surcharge is higher than Alternative #4.
Alternative #6	The HGL in the existing sewer is below basement elevation (greater than 1.8m below ground level)The diversion sewer from the south side of Glynnwood Retirement Residence Building to the Glynnwood Pond has adequate capacity to convey flows to the pond. The south and north branches of the sewer from TCC are not surcharged by flow but experience backwater effects from downstream capacity constraints in the existing 900 mm sewer crossing Bayview Avenue.
Alternative #7	The HGL in the existing sewer is below basement elevation (greater than 1.8m below ground level). The diversion sewer from the south side of Glynnwood Retirement Residence Building to the Glynnwood Pond has adequate capacity to convey flows to the pond. The south and north branches of the sewer from TCC are not surcharged by flow but experience backwater effects from downstream capacity constraints in the existing 900 mm sewer crossing Bayview Avenue.

#### 4.4 Water Quality Control Storage Requirements

The approach used in Section 3.4.2 was used to assess the water quality storage impacts to the Glynnwood Pond from directing the minor system flow under the proposed conditions, where both the existing minor system from the north catchment area and the diversion of all storm sewers from the TCC site are directed to the Glynnwood Pond.

The catchment area for both the north and south branches of the storm sewer through the TCC is approximately 26.4 ha, with 62.5% of it impervious. Therefore, the total contributing drainage area of the Glynnwood pond (including both the existing area from the north catchment and the diversion from the TCC site) is calculated to be 71.3 ha, with imperviousness of 45.2%.

Based on the MOE (MOECC) document for water quality control requirements (i.e., Table 3.2, SWM Design Guideline), a summary of the calculated required storage volumes is provided in **Table 4.4**.

**Table 4-4: Summary of the Proposed Glynnwood Pond Water Quality Control Storage**

Contributing Catchment Area		Proposed Drainage Area (including the Existing Minor System from North Catchment Area and the Diversion of all Branches from TCC Minor System)	
Total Available Permanent Pool Volume at the Existing Glynnwood Pond	(m <sup>3</sup> )		7,069
Enhanced Level of Protection (i.e., 80%)	Required Permanent Pool Volume	(m <sup>3</sup> )	8,913



Contributing Catchment Area		Proposed Drainage Area (including the Existing Minor System from North Catchment Area and the Diversion of all Branches from TCC Minor System)	
Long-term TSS Removal)	Surplus (+) / Deficit (-)	(m <sup>3</sup> )	- 1,844
Normal Level of Protection (i.e., 70% Long-term TSS Removal)	Required Permanent Pool Volume	(m <sup>3</sup> )	4,278
	Surplus (+) / Deficit (-)	(m <sup>3</sup> )	+ 2,791

As shown in the above Table, without any modification or upgrade of the existing Glynnwood Pond, it will provide a Normal Level of Protection (i.e., 70% Long-term TSS removal) for all its proposed upstream drainage area including both North Catchment Area and the TCC site. However, in order to achieve an Enhanced Level of protection, an additional 1,844 m<sup>3</sup> of permanent pool storage will be required. Such additional storage may be available through pond cleaning out process and/or by pond modification, e.g., raise of pond weir crest inverts, etc. However, the modification of the existing pond may require comprehensive review of pond detailed design which may be challenge according to the site conditions.

Alternatively, Oil / Grit Separator (OGS) is a feasible option to provide compensation for the study area in order to achieve the required Enhanced Level of Protection (i.e., 80% Long-term TSS removal). OGS unit(s) can be installed at the proposed STM system prior (upstream) to the Pond, the unit(s) will intercept heavier sediment particles, oil / grease and other debris before they are transported into the downstream. The sizing of the OGS unit(s) can be performed by the qualified water resources/civil engineer during the detail design stage.

Furthermore, it has been recognized and confirmed by TRCA that any future development located within the drainage area of pond will require its own water quality controls to achieve the identified Enhanced Level of Protection (i.e., 80% Long-term TSS removal).

## 4.5 Pre-Screening of Alternatives

Based on the InfoWorks modelling of the various alternatives and water quality analysis, the seven (7) alternatives were pre-screened to assess whether they solve the flooding problem and provide the required Enhanced Water Quality Level of Protection. A pre-screening of the alternatives is presented in **Table 4.5**.

**Table 4-5: Pre-Screening of Alternatives**

Pre-Screening Alternative No.	Description of Alternative	Assessment of Alternative	Decision on Whether Alternative Proceeds Forward for Further Assessment
Alternative #1	<p>The main components of this alternative are depicted in Figure 4-1. They include diverting flow from MH8 to the Glynnwood Pond via a new storm sewer and providing an Oil / Grit Separator downstream of MH7.</p>	<p>This alternative does not alleviate flooding along the existing storm sewer on the south side of the Glynnwood Retirement Residence Building. This sewer has surcharged in the past and caused excessive flooding to the underground garage. With respect to the water quality, the installation of a Stormceptor MAX 3000-27 with a size of 3,050 mm diameter and 17 m long would be difficult to install as it will be near Bayview Avenue where maintenance access will be difficult. The overall capital cost has been estimated to be approximately \$1.3 million.</p>	<p>Since this alternative is not a complete solution to alleviate flooding for all areas, it was screened out from further assessment.</p>

Pre-Screening Alternative No.	Description of Alternative	Assessment of Alternative	Decision on Whether Alternative Proceeds Forward for Further Assessment
Alternative #2	The main components of this alternative are depicted in Figure 4-2. They include diverting flow from MH8 to the Glynnwood Pond via a new storm sewer, in addition to diverting flow from MH7 to new MH near MH8 and providing an Oil / Grit Separator downstream of new MH.	This alternative is similar to Alternative #1 in that it does not alleviate flooding for the Glynnwood Retirement Residence Building. The capital cost is approximately \$1.4 million.	Since this alternative is not a complete solution to alleviate flooding for all areas, it was screened out from further assessment.
Alternative #3	The main components of this alternative are depicted in Figure 4-3. This alternative is the same as Alternative #2 except the Glynnwood Pond would be used for water quality treatment and does not include an Oil / Grit Separator in the TCC.	This alternative is similar to Alternative #2 in that it does not alleviate flooding for the Glynnwood Retirement Residence Building. The capital cost is approximately \$0.9 million.	Since this alternative is not a complete solution to alleviate flooding for all areas, it was screened out from further assessment.

Pre-Screening Alternative No.	Description of Alternative	Assessment of Alternative	Decision on Whether Alternative Proceeds Forward for Further Assessment
Alternative #4	<p>The main components of this alternative are depicted in Figure 4-4. They include replacing the existing storm sewer from MH11 to New CB / MH, providing temporary detention storage for flow through MH8, providing Oil / Grit Separator downstream of MH7 and twinning part of the sewer in the easement south of the Glynnwood Retirement Residence.</p>	<p>This alternative alleviates flooding on the south side of the Glynnwood Retirement Residence Building. It requires a relief sewer along the south side of the Glynnwood Retirement Residence Building and an offline storage unit North of TCC. The relief sewer would be difficult to install as it will inconvenience to residents' access to the retirement home and also construction of the large storage unit in the parking lot will be limited by space and expensive. The overall capital cost has been estimated to be approximately \$2.2 million.</p>	<p>This alternative alleviates flooding on the south side of Glynnwood Retirement Residence and was carried forward for further assessment.</p>

Pre-Screening Alternative No.	Description of Alternative	Assessment of Alternative	Decision on Whether Alternative Proceeds Forward for Further Assessment
Alternative #5	<p>The main components of this alternative are depicted in Figure 4-5. This alternative is the same as Alternative #4, except temporary detention storage has not been included.</p>	<p>This alternative alleviates flooding on the south side of the Glynnwood Retirement Residence Building. Requires a relief sewer along the south side of the Glynnwood Retirement Residence Building. The relief sewer would be difficult to install as it will inconvenience residents' access to the retirement home. The overall capital cost has been estimated to be approximately \$1.1 million.</p>	<p>This alternative alleviates flooding on the south side of Glynnwood Retirement Residence and was carried forward for future assessment.</p>
Alternative #6	<p>The main components of this alternative are depicted in Figure 4-6. It included the same sewer alignments as Alternative #3, includes replacing the existing storm sewer from MH11 to New CB / MH and considers diversion to the Glynnwood Pond from the existing MH on the Glynnwood Retirement Residence access road, south of its Bayview Ave entrance.</p>	<p>This alternative alleviates flooding on the south side of the Glynnwood Retirement Residence Building. It requires a diversion sewer from the existing MH to the Glynnwood Pond. The construction of the diversion sewer will not cause major disruption and hindrance to the residents' access to the retirement home. The overall capital cost has been estimated to be approximately \$1.2 million.</p>	<p>This alternative alleviates flooding on the south side of Glynnwood Retirement Residence as well as flooding for all areas; it was carried forward for further assessment.</p>

Pre-Screening Alternative No.	Description of Alternative	Assessment of Alternative	Decision on Whether Alternative Proceeds Forward for Further Assessment
Alternative #7	The main components of this alternative are depicted in Figure 4-7. It includes an open channel located on the north side of the existing parking lot associated with Glynnwood Retirement Residence. The alternative utilizes the existing sewer pipe across Bayview Ave and introduces proposed relief system to divert all surface flows up to the 100-year storm events to the Glynnwood Pond.	This alternative alleviates flooding on the south side of the Glynnwood Retirement Residence Building. It requires a diversion sewer system to capture all surface runoff and discharge to the Glynnwood Pond. The construction of the diversion system, including the relief pipes and open channel, will not cause major disruption and hindrance to the residents' access to the retirement home. The overall capital cost has been estimated to be approximately \$1.5 million.	This alternative alleviates flooding on the south side of Glynnwood Retirement Residence as well as flooding for all areas; it was carried forward for further assessment.

Based on the above pre-screening assessment, the short-listed Alternatives 4, 5, 6 and 7 were carried forward for additional assessment.

## 5 ASSESSMENT OF ALTERNATIVES

In Section 4, the long list of alternatives was considered through the screening process to eliminate those that did not meet the objectives of the study. In accordance with the Class Environment Assessment (EA) process, these short-listed measures need to be evaluated further before a preferred solution can be selected. This section establishes the evaluation criteria and the evaluation methodology for the selection of the preferred solution.

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### 5.1 List of Alternatives

Based on the short-listed control measures identified in Section 4, the following alternative solutions have been formulated for further evaluation. The numbering has been updated for the screening of these short-listed alternatives

**Alternative 1.** Do Nothing.

**Alternative 2.** Replacing the existing storm sewer from MH11 to New CB / MH, providing temporary detention storage for flow through MH8, providing Oil / Grit Separator downstream of MH7 and twinning part of the sewer in the easement south of the Glynnwood Retirement Residence (Pre-screening Alternative #4).

**Alternative 3.** Replacing the existing storm sewer from MH11 to New CB / MH, providing Oil / Grit Separator downstream of MH7 and twinning part of the sewer in the easement south of the Glynnwood Retirement Residence (Pre-screening Alternative #5).

**Alternative 4.** Diverting flow from MH8 to the Glynnwood Pond via a new storm sewer, in addition to diverting flow from MH7 to new MH near MH8, replacing the existing storm sewer from MH11 to New CB / MH, and also diverting flow to the Glynnwood Pond from the existing MH on Glynnwood Retirement Residence Road, south of Bayview Avenue (Pre-screening Alternative #6).

**Alternative 5.** Utilizing the existing pipe across Bayview Ave and introducing proposed relief system to divert all surface flows up to the 100-year storm events to the Glynnwood Pond. The relief system includes an open channel located on the north side of the existing parking lot associated with Glynnwood Retirement Residence, and proposed pipes, MH and CBs designed to capture all surface runoff up to the 100-year events (Pre-screening Alternative #7).

The 'Do Nothing' alternative above, in which no specific measures are taken to control the impacts of flooding and water quality, is included in this evaluation as a benchmark for assessing the appropriateness of other alternatives. This is a requirement of the Class EA process.

It should be noted that for Alternative 2 and Alternative 3, information provided by the Glynnwood Retirement Residence maintenance staff has identified that an underground garage was constructed subsequent to the original storm sewer construction in the access road easement. The underground garage extends across the alignment of this sewer, which will limit the capability for twinning of this sewer and possibly require an additional easement bypassing the footprint of the garage.

Furthermore, it has been anticipated that a new building will be proposed at the existing parking lot associated with Glynnwood Retirement Residence, where a relief sewer system is proposed by Alternative 4.

## 5.2 Evaluation Criteria and Scoring Systems

In order to evaluate the alternative solutions identified in Section 5.1, evaluation criteria have been developed to select the preferred alternative. The evaluation criteria include natural environment, socio-cultural environment, technical considerations and economic considerations. These criteria and measures of the environmental effects are presented in **Table 5.1**.

**Table 5-1: Glynnwood Tributary Area Sewer Surcharge Evaluation Criteria**

Criteria Description		Measures for Evaluating
<b>Natural Environment Criteria</b>		
Terrestrial System	Potential to impact sensitive vegetative species or wildlife habitat. The potential to impact Environmentally Sensitive Areas (ESAs) or Areas of Natural and Scientific Interest (ANSIs) are also considered.	5- Excellent: No risk of adverse impacts to existing terrestrial systems; ability to create new terrestrial habitat. 4- Very good: Minimal risk of adverse impacts to existing terrestrial systems; potential to create new terrestrial systems. 3- Good: Risk of adverse impacts to existing terrestrial systems. 2- Average: Risk of adverse impacts to existing terrestrial systems and to ESAs or ANSIs. 1- Below average: High risk of adverse impacts to existing terrestrial systems and to ESAs or ANSIs.
Aquatic System	Potential to impact aquatic habitat in Glynnwood Pond and downstream watercourse.	5- Excellent: No risk of adverse impacts to existing aquatic habitat; ability to create new habitat. 4- Very good: Risk of adverse impacts to existing aquatic habitat, but no sensitive species; potential to create new habitat. 3- Good: Risk of adverse impacts to existing aquatic habitat with sensitive species; no new habitat creation. 2- Average: High risk of adverse impacts to existing aquatic habitat with sensitive species. 1- Below average: Very high risk of adverse impacts to existing aquatic habitat with sensitive species.
Groundwater	The potential for dewatering during construction in the proximity of Glynnwood Pond. Alternatives that require more than 0.3 m of excavation will likely require some dewatering during construction.	5- Excellent: No risk of dewatering activities. 4- Very good: Minimal risk of dewatering activities. 3- Good: Some risk of dewatering activities. 2- Average: Risk of dewatering activities. 1- Below average: High risk of dewatering activities.

### Socio-Cultural Environment



Criteria Description		Measures for Evaluating
Inconvenience caused by Basement and / or Surface Flooding	The potential for the solution to reduce the inconvenience to property owners caused by the occurrence of basement and / or surface flooding.	<p>5- Excellent: The solution provides high level of protection against the occurrence of basement and/or surface flooding.</p> <p>4- Very good: The solution provides relatively high level of protection against the occurrence of basement and/or surface flooding.</p> <p>3- Good: The solution provides medium level of protection against the occurrence of basement and/or surface flooding.</p> <p>2- Average: The solution provides basic level of protection against the occurrence of basement and/or surface flooding.</p> <p>1- Below average: The solution provides low level of protection against the occurrence of basement and/or surface flooding.</p>
Flood Damages and Property Values	The potential for the solution to reduce the costs associated with flood damages and lower property values.	<p>5- Excellent: The solution provides low risk to the occurrence of flood damage and causing reduction in property values.</p> <p>4- Very good: The solution provides some risk to the occurrence of flood damage and causing reduction in property values.</p> <p>3- Good: The solution provides below average risk to the occurrence of flood damage and causing reduction in property values.</p> <p>2- Average: The solution provides average risk to the occurrence of flood damage and causing reduction in property values.</p> <p>1- Below average: The solution provides high risk to the occurrence of flood damage and causing reduction in property values.</p>
Easement Requirements	The need for the City to obtain easements to construct the works.	<p>5- Excellent: The solution does not require any easements for the construction of the works.</p> <p>4- Very good: The solution requires minor easements for the construction of the works.</p> <p>3- Good: The solution requires easements for only one sewer connection to the Glynnwood Pond for the construction of the works.</p> <p>2- Average: The solution requires easements for two sewer connections to the Glynnwood Pond for the construction of the works.</p> <p>1- Below average: The solution requires easements for the two sewer connections to the Glynnwood Pond plus other easements in the TCC area for construction of the works.</p>

Criteria Description		Measures for Evaluating
Disruption during Construction	The potential to disrupt businesses / institutions, traffic and pedestrians during construction.	5- Excellent: No risk of disruption to businesses / institutions, traffic and pedestrians during construction. 4- Very good: Minimal risk of disruption to businesses / institutions, traffic and pedestrians during construction. 3- Good: Some risk of of disruption to businesses / institutions, traffic and pedestrians during construction. 2- Average: Average risk of disruption to businesses / institutions, traffic and pedestrians during construction. 1- Below average: High risk of disruption to businesses / institutions, traffic and pedestrians during construction.
Archaeology / Built Heritage	The potential of the solution to impact any archaeologically significant / natural heritage areas.	5- Excellent: No risk of the solution to impact archaeologically significant artifacts and/or natural heritage areas. 4- Very good: Minimal risk of the solution to impact archaeologically significant artifacts and/or natural heritage areas. 3- Good: Some risk of the solution to impact archaeologically significant findings and/or natural heritage areas on the site. 2- Average: Risk of the solution to impact archaeologically significant artifacts and/or natural heritage areas. A Stage 2 Archaeological Assessment is required. 1- Below average: High risk of the solution to impact archaeologically significant artifacts and/or natural heritage areas. A Stage 2 Archaeological Assessment is required.
<b>Technical Considerations</b>		
Performance –Water Quantity	The ability of the solution to alleviate flooding to flood prone areas.	5- Excellent: The solution performs very well. 4- Very good: The solution performs well. 3- Good: The solution performs satisfactory. 2- Average: The solution performs inconsistently. 1- Below average: The solution performs very poorly.
Performance –Water Quality	The ability of the solution to improve water quality in Glynnwood Pond and downstream watercourse.	5- Excellent: The solution performs very well, exceeds objectives. 4- Very good: The solution performs well, meets objectives. 3- Good: The solution performs satisfactory and meets objectives. 2- Average: The solution performs inconsistently but may not meet objectives. 1- Below average: The solution is unreliable and will not meet objectives.

Criteria Description		Measures for Evaluating
Ease of Construction	The ease to which the solution can be constructed with minimum disruption to the neighbourhood, using standard construction techniques and with minimal disturbance to users.	5- Excellent: The solution can be easily constructed. 4- Very good: The solution can be constructed. 3- Good: The solution can be constructed with some difficulty. 2- Average: The solution can be constructed with moderate difficulty. 1- Below average: The solution is difficult to construct.
Regulatory Approvals	The need to seek regulatory approvals (beyond the MOECC and the City of Markham) to implement the solution, such as for construction in a regulated area (TRCA) or in a Federal EA under the Canadian Environmental Assessment Act (CEAA).	5- Excellent: The solution does not require additional regulatory approvals beyond the MOECC and the City of Markham. 4- Very good: The solution requires approvals from the TRCA, the MOECC, and the City of Markham. 3- Good: The solution requires approvals from the TRCA, the MOECC, and the City of Markham and other provincial level agencies. 2- Average: The solution also requires a permit from a federal authority. 1- Below average: The solution also requires the completion of a CEAA.
<b>Economic Considerations</b>		
Capital Cost	The total estimated capital costs associated with the construction of the alternative remedial measure.	5- Excellent: Low capital cost. 4- Very good: Below average capital cost. 3- Good: Average capital cost. 2- Average: Above average capital cost. 1- Below average: High capital cost.
Operation & Maintenance (O&M) Cost	The annual estimated Operational & Maintenance cost associated with the alternative remedial measure.	5- Excellent: Low Operational & Maintenance cost. 4- Very good: Below average Operational & Maintenance cost. 3- Good: Average Operational & Maintenance cost. 2- Average: Above average Operational & Maintenance cost. 1- Below average: High Operational & Maintenance cost.

### 5.3 Evaluation of Alternatives

For each of the comparative criteria, a rating ranging from 1 to 5 was applied specific to the particular solution being evaluated where one (1) represents the worst condition and five (5) the best, as identified in **Table 5.1**. Based on this approach, an overall rating based on the total scoring was obtained for each alternative solution. Subsequently a ranking was assigned for each alternative solution with the highest overall total assigned one

(1) and the others sequentially 2, 3, 4, etc. based on the scoring. Where the total ratings are the same, the same ranking was assigned.

In the evaluation methodology proposed, a ranking of 1 is the preferred alternative, where a ranking of four (4) is the least preferred alternative. The evaluation of the alternatives solutions is presented in **Table 5.2** with additional information on the scoring of the alternatives for each criterion summarized below:

**Table 5-2: Evaluation Alternatives**

Alternatives	Description	Comparative Criteria Scoring														Total Score	Ranking
		Natural Environment Criteria			Social Environment Criteria					Technical Considerations				Cost Considerations			
		Terrestrial System	Aquatic System	Groundwater	Inconvenience due to Flooding	Flood Damage and Property Values	Easement Requirements	Disruption during Construction	Archaeology / Built Heritage	Performance – Water Quantity	Performance – Water Quality	Ease of Construction	Regulatory Approvals	Capital Cost	O & M Cost		
Alternative 1	Do Nothing - No remediation to existing system.	5	4	5	1	1	5	5	5	1	1	5	4	2	1	45	4
Alternative 2 <i>(Pre-screening Alternative #4)</i>	Replace existing storm sewer from MH11 to New CB / MH, provide temporary detention storage for flow through MH8, install Oil / Grit Separator downstream of MH7 and twin part of the sewer in the easement south of the Glynnwood Retirement Residence.	5	5	3	4	4	3	1	3	4	4	1	2	2	1	42	5
Alternative 3 <i>(Pre-screening Alternative #5)</i>	Replace existing storm sewer from MH11 to New CB / MH, install Oil / Grit Separator downstream of MH7 and twin part of the sewer in the easement south of the Glynnwood Retirement Residence.	5	5	3	4	4	4	2	3	4	4	1	2	4	3	48	3
Alternative 4 <i>(Pre-screening Alternative #6)</i>	Divert flow from MH8 to the Glynnwood Pond via a new storm sewer, in addition to diverting flow from MH7 to new MH near MH8, replace the existing storm sewer from MH11 to New CB / MH, and also divert flow to the Glynnwood Pond from the existing MH on the Glynnwood Retirement Residence Road, south of Bayview Ave.	4	3	3	5	5	2	3	3	5	5	2	3	4	5	52	2
Alternative 5 <i>(Pre-screening Alternative #7)</i>	Utilizing the existing pipe across Bayview Ave and introducing proposed relief system to divert all surface flows up to the 100-year storm events to the Glynnwood Pond. The relief system includes an open channel located on the north side of the existing parking lot associated with Glynnwood Retirement Residence, and proposed pipes, MH and CBs designed to capture all surface runoff up to the 100-year events.	3	3	3	5	5	3	4	3	5	5	3	3	5	5	55	1

# 6 PREFERRED ALTERNATIVE

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## 6.1 Preferred Alternative

On January 16, 2020, a technical meeting with TRCA staff was completed to discuss the Preferred Alternative. During the discussion, it was recognized that the section of proposed underground pipes located at Glynnwood parking lot would result in significant impacts on the affected properties due to the requirement of a deeper retaining wall. In addition, it would bring challenges to the construction due to the required access of the pilling equipment and open cut excavation for the purpose to install the deep underground pipes. The discussion confirmed that instead of deep underground pipe sections, an open channel located on the north side of the existing parking lot associated with Glynnwood Retirement Residence is preferred.

Furthermore, it has been anticipated that a new building will be proposed at the existing parking lot associated with Glynnwood Retirement Residence, the proposed open channel located at the north of such existing parking lot will provide proposed development opportunity.

Consequently, Alternative #5 (original Pre-screening Alternative #7, as shown in **Figure 4.7**) was selected as the preferred alternative. It is also the highest scoring alternative among the applicable alternatives based on the evaluation of the alternatives discussed in the previous section.

The proposed system remedial measures included in the preferred alternative consist of the following components:

- 1 A new 600 mm diameter sewer draining west and then north from the existing MH (s2391) in the south TCC parking lot to new manholes MH1 and MH2 located along the grassy area on the east side of Bayview Avenue south of the TCC entrance. The length of sewer from the existing MH (s2391) to MH1 is approximately 49m; and from MH1 to MH2 is approximately 70 m.
- 2 A new 525 mm diameter sewer draining from the existing MH (n1613) in the north TCC parking lot to new manhole and MH3 located at the grassy area on the east side of Bayview Avenue north of the TCC entrance. The length of sewer from the new manhole to MH3 is approximately 63m.
- 3 Replace and upgrade the existing MH 7 (n1594) to receive 2 new pipe connections from MH3 and MH2. The new connection between MH7 and MH3 is a 525 mm Dia. 7.2 m long pipe sewer, and the new between MH7 and MH2 is a 900 mm Dia. 27.6 m long pipe sewer.
- 4 An inlet upgrade will be proposed at the south side of the TCC driveway entrance. One possible option of the upgrade will be multiple catch basins with curb open. They will capture all major system flows up to 100-year on TSSC site and ensure that there will be no 100-year overland flows spill to the Glynnwood property across Bayview Ave.
- 5 Install a new MH8 and replace and upgrade the existing MH (n1592). Introduce a new pipe to connect the new MH8 and upgraded MH (n1592). It will be a 1200 mm Dia. And 3.5 m long pipe section.
- 6 A new 1200 mm diameter sewer draining west and then north from the new MH8 to new MH5 and new MH6. The length of sewer from MH8 to MH5 is approximately 28m and located along the Glynnwood property entrance driveway and south of the existing 900 mm sewer. The length of sewer from MH5 to MH6 is approximately 35.1m in length. It will cross the existing 900mm sewer. The analysis of constructability confirms that there will be a vertical clearance of 0.33m at this sewer crossing.

- 7 The new MH6 will discharge to a new 81 m long open channel from a new concrete headwall. The open channel will be designed to have an adequate capacity to convey the 100-year flows from MH6 to the downstream Glynnwood pond. An approximately 78 long retaining wall will also be required to support the proposed open channel. The discharge from the open channel will be conveyed into a new plunge pool between the upper forebay pond and the Main Pond to dissipate the energy and reduce the potential for erosion. The plunge pool will be approximately 5 m long by 3 m wide and 1.5 m deep.
- 8 An inlet upgrade will be proposed at the Glynnwood property driveway entrance located west side of Bayview Ave. One possible option of the upgrade will be multiple catch basins with curb open. They will capture all major system flows up to 100-year at the Glynnwood driveway entrance and ensure there will be no 100-year overland flow spill to Glenwood parking lot.
- 9 Install a new Oil / Grit Separator between MH5 and MH8 that will be part of the stormwater water quality treatment train. The OGS will be sized to remove the heavier particles, oil / grease and other debris prior to additional treatment in the Glynnwood Pond.

In addition to the above components, the City will need to secure an easement for the new storm sewer west of Bayview Avenue to provide access during construction and for maintenance purposes when the system is in operation.

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## 6.2 Effectiveness of Preferred Alternative

The evaluation by using the InfoWorks computer modelling confirms that the Preferred Alternative will achieve the required design targets in relieving flooding under the level of service, at the Thornhill Community Centre, Glynnwood Retirement Residence, and Shouldice Hospital. Constructability of the Preferred Alternative was also evaluated based on the vertical and horizontal clearances between the elements. Plots of the hydraulic grade line / sewer profiles are shown in **Appendix C**.

A copy of the meeting minutes with TRCA staff on January 16, 2020 is included in **Appendix E**. All background and supporting documentations related to the development of the Preferred Alternative are included in **Appendix F**. The conceptual design of open channel cross sections is also included in the Appendix for reference purposes.

In summary, the function of the revised Preferred Alternative is described as follows:

- ▶ Divert all surface flows up to the 100-year storm events to the Glynnwood Pond. More specifically,
  - All major system flows up to 100-year will be captured on TSSC site. There will be no 100-year overland flows spill to the Glynnwood property across Bayview Ave, and
  - All major system flows up to 100-year will be captured at the Glynnwood driveway entrance and diverted to the downstream Pond via the proposed open channel. There will be no 100-year overland flow spill to Glenwood parking lot.
- ▶ Prior to conveyance to the Pond, an oil / grit separator (OGS) will intercept heavier sediment particles, oil / grease and other debris before they are transported to the downstream.

The Preferred Alternative will convey majority of the volume in the major system and within the minor system on the Glynnwood Retirement Residence to the pond through the diversion system. A summary of the key

elevations of the existing Glynnwood pond, as per the Stantec detailed design drawings, is provided in **Table 6-1**. The listed pond characteristics will remain unchanged (without modification) in the preferred alternative. A summary of the model results is included in **Table 6-2**, which compares the total volume of runoff and peak flows to the pond under the 100-year event for the existing and the preferred alternative scenarios.

It is concluded that under the preferred alternative scenario, the surface runoff to the existing Glynnwood Pond will increase under a 100-year return period rainfall event. The InfoWorks model confirms that the maximum water elevation within the pond during the 100-year storm is 160.97 m, which is lower than the estimated top of pond elevation of 161.52 m. Therefore, it is concluded that Glynnwood Pond has adequate capacity to accept additional flows from the subject site and the local flooding in the identified area will be mitigated.

**Table 6-1: Key Elevations of the Existing Glynnwood Pond**

Pond Parameter	Value
Elevation of Estimated Bottom of Main Pond	157.00 m
Elevation of Sediment Forebay Outlet Weir (Permanent Pool Elevation at Forebay)	162.35 m
Elevation of Main Pond Outlet Weir (Permanent Pool Elevation at Main Pond)	160.45 m
Elevation of Top of Stone Wall / Estimated Top of Pond (m)	161.52 m

Source: Stantec drawings for Town of Markham – Pond Remedial Work Plans (Project No. 160621916) dated February 27, 2012.

The top of stone wall elevation is assumed to be the lowest point along the estimate top of pond, which varies in elevation along the pond perimeter.

**Table 6-2: Comparison of Flow Parameters Between Current and Preferred Under 100-Year Storm Event**

Comparison	Existing Conditions	Preferred Alternative
Minor System of Northern Sewershed to Pond	26.2	26.2
Overland System to Pond	4.2	0.6
Proposed Diversion Pipe to Pond	N/A	8.0
Total Conveyed to Glynnwood Pond	30.4	34.8
Minor System Downstream of Diversion to Creek	15.5	11.0
Minor System of Northern Sewershed to Pond	5.98	5.97
Overland System to Pond	2.97	0.27



Comparison	Existing Conditions	Preferred Alternative
Proposed Diversion Pipe to Pond	N/A	3.33
Minor System Downstream of Diversion to Creek	3.27	3.08
Pond Elevation under 100-year Storm Event (m)	160.95	160.97

## 6.3 Capital Cost

A preliminary capital cost (see **Appendix G** for the details) has been estimated based on the breakdown of the storm sewer components identified in Section 6.1.

## 6.4 Mitigation of Potential Impact and Agency Concerns

The potential environmental impacts associated with the recommended alternative are related to the construction and implementation of the remedial measures. Most of these impacts will be basically in effect during the construction period. These impacts, their potential sources and mitigation, are identified in the following sections.

### 6.4.1 Traffic

Potential concerns include traffic disruption during construction due to closed roads or blockage of parking spaces in the parking lots. The following mitigating measures are proposed:

- ▶ Consultation will be held with the City's Transportation Department and Region of York Transportation Department to determine which lane(s) of traffic will be maintained or detour utilized to ensure a constant flow of traffic during construction along Bayview Avenue; and
- ▶ The local stakeholders will be notified should there be temporary blockage to the access roads or parking areas during construction. Where and when these impacts occur, alternative short-term access routes and/or parking will need to be provided.

### 6.4.2 Noise and Vibration

Truck traffic and construction activities may be a potential source of noise and vibration. The following mitigating measures are proposed to reduce these impacts:

- ▶ The City's anti-noise by-law will be enforced for all construction activities;
- ▶ Hours of operation during construction activities will be restricted to the hours between 7:00 a.m. and 7:00 p.m.;
- ▶ A pre-construction survey will be undertaken for structures which may be affected by soil vibration during construction activities; and
- ▶ Where rock excavation is required, blasting will not be permitted.

### 6.4.3 Sedimentation

Potential sources for sedimentation related to construction activities include sediments disturbed and deposited by construction vehicles and blowing sand and dust. The following mitigating measures are proposed:

- ▶ A silt fence will be installed along the perimeters of the construction sites where appropriate to capture blowing sand and dust. Watering of exposed areas should be also considered;
- ▶ Catchbasins will be covered by filter fabric during construction to prevent migration of sediments to receiving watercourses;
- ▶ Sediment traps will be placed to deal with storm runoff during construction;
- ▶ Exposed excavated material will be covered to prevent erosion by rain / wind; and
- ▶ Tire washing facilities is to be provided for vehicles exiting the sites.

### 6.4.4 Trees

The removal of any existing trees will be avoided, where possible. The proposed mitigation includes the following:

- ▶ Mature trees will be avoided where feasible to eliminate the need for their removal;
- ▶ Small trees, if removed, will be replaced or replanted. The replaced trees will be in accordance with City's requirements;
- ▶ Prior to the commencement of construction, tree protection barriers shall be installed in accordance with the City of Markham's Tree Preservation Requirements (2009), and in accordance with the approved Tree Preservation Plan and Arborist Report prepared under a separate title (WSP 2021);
- ▶ Any limbs damaged or broken during construction should be pruned cleanly, utilizing by-pass secateurs in accordance with approved horticultural practices. Any proposed pruning must be approved by the Region or its designate prior to undertaking of pruning;
- ▶ Depending upon the intensity of encroachment, root zone compaction protection may be required;
- ▶ If required, root-exploratory excavation may be required to visually determine the extent of existing tree roots within an area of proposed excavation without damaging the roots;
- ▶ Root pruning, if required, will be done in accordance with City Parks Department Standards;
- ▶ In areas where tree protection zone encroachment is approved in writing by the Region or its designate and where impacts may occur upon the main stem or scaffold branches of a tree to be preserved, stem protection shall be installed; and,
- ▶ A forest restoration plan in consultation with the TRCA and City will be prepared during the detail design stage.

### 6.4.5 Restoration

All sites / areas disturbed by construction will be restored. The proposed mitigating measures include the following:

- ▶ Disturbed sidewalks, road and parking areas will be restored to their existing conditions or better after construction;
- ▶ Removed small trees will be replanted or replaced; and
- ▶ Disturbed private properties will be restored to their existing conditions or better.

#### **6.4.6 Archaeological Disturbance**

The Stage 1 archaeological assessment, published concurrently with this report, notes the presence of previously disturbed areas, a previously assessed area, and areas where additional test pits will be required during future design stages. Key findings from the assessment include:

“Although the potential for the presence of archaeological resources in this area is high, modern developments have removed archaeological potential in some parts of the study area as indicated in aerial mapping and supported by the Archaeological Management Plan for York Region. The Bayview Avenue right-of-way was also previously documented as disturbed and does not retain archaeological potential (NDA, 2016).“

Along with the following recommendation:

“Based on the results of the Stage 1 archaeological assessment, Stage 2 archaeological assessment is required for the parts of the study area determined to retain archaeological potential (Figure 7).“

The requirement for a Stage 2 archaeological assessment in the indicated locations will be carried forward to the background studies component in the next phase of the project where the detailed design of the preferred solution will be advanced.

# 7 CLASS ENVIRONMENTAL ASSESSMENT PROCESS

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## 7.1 The Environmental Assessment

This study is being conducted in accordance with the requirements of the Municipal Class Environmental Assessment (EA) process. The Class EA planning process allows for the integration of sound engineering judgement, prudent long-term planning, and protection of all aspects of the environment (natural, social, economic and cultural). This includes consultation with the public and affected agencies to obtain comments and input, ensure regulatory compliance, and ultimately achieve acceptance of the preferred alternative.

The Class EA process was developed as a method of planning municipal infrastructure projects (including water and wastewater projects), which display the following common characteristics:

- ▶ Recurring;
- ▶ Usually similar in nature;
- ▶ Generally limited in scale;
- ▶ Have a predictable range of environmental effects; and
- ▶ Responsive to mitigation measures.

The requirements for undertaking a Class EA are described in the document Municipal Class Environmental Assessment, June 2000, Municipal Engineers Association (MEA) as amended in 2007. A Class EA applies to a group of projects that are permitted under the Environmental Assessment Act as long as they follow the approved planning process. The specific requirements depend on the type and complexity of the project as well as the significance of potential environmental impacts. Reference to Section 1.3 of this document confirms that a Schedule 'B', Class EA process has been followed for this project.

Throughout the EA planning process, agreements made or commitments given by the proponent to affected agencies or the public must be followed through and implemented. If an affected agency or the public has a concern that cannot be resolved by discussion and negotiation with the proponent, they can make a request to the Ministry of the Environment for a proponent to comply with Part II of the EA Act. Through issuance of a Part II Order, Schedule 'B' and Schedule 'C' projects may be elevated to an individual EA, requiring the proponent to comply with Part II of the EA Act. Schedule 'B' projects could also be elevated to a Schedule 'C'.

The residents in the neighbourhood surrounding the Thornhill Community Centre and the residents at the Glynnwood Retirement Residence have experienced surface and basement flooding during wet weather conditions. This project assesses the existing major and minor stormwater system to identify the causes, mechanisms and impacts of flooding and to develop comprehensive flooding remediation plans that best meet the target level of the service criteria of the City. The study also provides measures for the improvement of the stormwater quality through modification of the Glynnwood Pond.

As a Schedule 'B' project, the following two phases of the Class EA process are required as shown in **Figure 1-2**.

- ▶ Phase 1: Identifying the problem or need for the project; and
- ▶ Phase 2: A thorough evaluation of the planning options or alternative solutions to the problem.

The Schedule 'B' Class EA concludes with the Notice of Completion and filing of the Class EA Project File for a minimum 30-day public review period.

The focus of Phase 2 of the EA Process is to develop and evaluate alternative flood and water quality remedial measures within the defined study area. Phase 2 work involved.

- ▶ Preparation of an Environmental Inventory;
- ▶ Development of Study Alternatives;
- ▶ Sizing of Alternatives;
- ▶ Establishment of Evaluation Criteria and Scoring System;
- ▶ Evaluation of Alternatives;
- ▶ Public Consultation; and
- ▶ Selection of the Preferred Solutions.

These steps are documented in the following sections of this Project File. This report documents Phase 1 and 2 of the Class EA study to fulfill the requirements for this Class EA Schedule 'B' project. The Project File will be available for the mandatory 30-day public review by the public and agencies.

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## 7.2 Public Consultation

### 7.2.1 Public Consultation Process

A comprehensive public consultation program was conducted for the study with the following components:

- ▶ **Master Distribution List** – A master residential list was obtained from the City of Markham to include the local residents near the project site, all review agency contacts, First Nations communities as well as local interest groups and ratepayer associations residing within the study area. In addition, all members of the public who requested to be added via telephone, email or comment sheet were included. All persons on the mailing list were sent notices prior to each of the public open house events. In total, notices were hand delivered to over 500 local residents and businesses while other notices were mailed to review agencies, interest groups and First Nations communities;
- ▶ **Public Open House** – One open house event was held to inform the public of the alternatives considered and solution recommended. The event consisted of a drop-in centre with display panels and provided an opportunity for the public to speak with City staff and consulting team. Sign-in sheets and comment forms were made available;
- ▶ **Newspaper Advertisements** – A newspaper advertisement was placed in the local Markham Economist & Sun newspaper to announce the open house for the Class EA Study prior to the open house event. The advertisement for Open House was issued on October 25, 2012. A second notice was issued on November 1, 2012 in advance of the Open House. The advertisements invited the public to attend the event and identified ways to obtain more information; and
- ▶ **Notices Distribution** – The Notice of Commencement was mailed by WSP staff at the beginning of the study. Similarly, approximately two (2) weeks prior to the public contact, Notice of the PIC was also

mailed to local residents and businesses. Notices to other parties outside the immediate study area were also sent by mail.

Copies of all public consultation related materials and correspondence can be found in **Appendix D**.

### 7.2.2 Public Notification

A Notice of Study Commencement was hand delivered / mailed to all residents and business owners within the boundaries of the study area loosely bounded by the CNR tracks to the east, Royal Orchard Boulevard to the north, CNR tracks to the south and just to the west of Bayview Avenue. The Flyers were also mailed to local First Nations Communities and several review agencies such as Region of York, Toronto and Region Conservation Authority, Department of Fisheries and Oceans. The notice introduced the study, explained the objectives and the Municipal Class EA process, and identified means of providing input.

In late October 2012, another notice was created and hand delivered / mailed to all parties identified in Section 7.2.1. This notice explained details of the Public Open House and announced that recommendations for the neighbourhood were to be presented. Advertisements for the Public Open House appeared in the October 25 and November 1, 2012 editions of the Markham Economist & Sun newspaper.

### 7.2.3 Public Open House

The Public Open House was held on November 1, 2012 from 6:30 p.m. to 8:30 p.m. at the Thornhill Community Centre located on the northeast corner of the Bayview Avenue and John Street intersection. The purpose of the meeting was to:

- ▶ Introduce and provide background information on the study;
- ▶ Explain the Municipal Class Environmental Assessment Process;
- ▶ Present the causes of basement / surface flooding and water quality impairments;
- ▶ Identify the potential solutions to eliminate the flooding and improve the water quality in the Glynnwood Tributary discharging to the Don River system;
- ▶ Outline the next steps in the study; and
- ▶ The format of the meeting included a public information centre with display panels. City staff and consultants were available to speak one-on-one with the public and answer questions. A comment sheet requesting input on the study was provided to participants along with a postage paid envelope. Participants were asked to submit their comments to the City within a two-week period following the Open House. Seven (7) members of the public signed in at the meeting.

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## 7.3 Agency Consultation

The Notice of the Study Commencement was distributed at the beginning of the study to all relevant government agencies to inform them of the nature and scope of the project. Notice for the Public Open House was also distributed approximately two (2) weeks prior to the November 1, 2012 PIC.

A meeting was held with the Toronto and Region Conservation Authority (TRCA) June 2012 to discuss fisheries and terrestrial requirements. A copy of the meeting summary is attached in **Appendix D**.

A second meeting was held with the TRCA in July of 2018 to discuss the design impacts of the preferred alignment on the natural environment. It was expressed by the TRCA that there was concern that the Glynnwood pond was not originally intended to be used as a stormwater management feature when it was constructed. The TRCA has requested that all relevant history of the pond be provided as part of their review, which has been included in **Appendix D**. Although it is not clear what the intended purpose of the pond was when it was constructed, it receives runoff from a storm sewer outfall, and has undergone sediment removal and retrofit with erosion control measures in 2012. As discussed in **Section 6.2**, the preferred alternative includes a modification to the outlet weir to reduce the permanent pool level of the pond, allowing for increased active storage to offset the increase in volume to the pond.

On January 16, 2020, we had a third meeting with TRCA staff to discuss the Preferred Alternative. As the outcome from the discussion, it was confirmed that an open channel located on the north side of the existing parking lot associated with Glynnwood Retirement Residence will be proposed. Consequently, a revised Preferred Alternative (dated January 2021) was prepared (as described in Section 6.5). A copy of the meeting summary is attached in **Appendix F**. A draft EA package (including Scoped EIS, Geotechnical Report, Arborist Report and EA study report) was submitted for review in September 2021.

Upon completion of review, TRCA provided comments dated November 25, 2021 on the draft EA submission. Consequently, on January 18, 2022, we had a fourth meeting with TRCA staff to discuss the comments. As the outcome from the meeting, it was concluded that the final EA report would incorporate further details of the final preferred alternative, and address all comments provided by TRCA. A copy of the meeting summary is attached in **Appendix F**.

Other discussions were also held with the management of the Glynnwood Retirement Residence and Shouldice Hospital. Copies of correspondence are also included in **Appendix D**.

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## 7.4 First Nation Consultation

First Nation communities were contacted in mid 2022 and invited to participate in the EA process by providing comments on issues of particular importance to the project study area for them with ongoing consultation with responding Nations until the filing of the Notice of Completion. The following Nations were consulted during the outreach exercise:

- ▶ Huronne-Wendat
- ▶ Mississaugas of the Credit First Nation
- ▶ Haudenosaunee Confederacy
- ▶ Kawartha Nishnawbe First Nation
- ▶ Williams Treaties First Nation
- ▶ Chippewas of Rama First Nation
- ▶ Scugog Island First Nation
- ▶ Hiawatha First Nation
- ▶ Chippewas of Georgina Island First Nation

- ▶ Curve Lake First Nation
- ▶ Beausoleil First Nation
- ▶ Alderville First Nation
- ▶ MNO Toronto & York Region Metis Council
- ▶ Metis Nation of Ontario

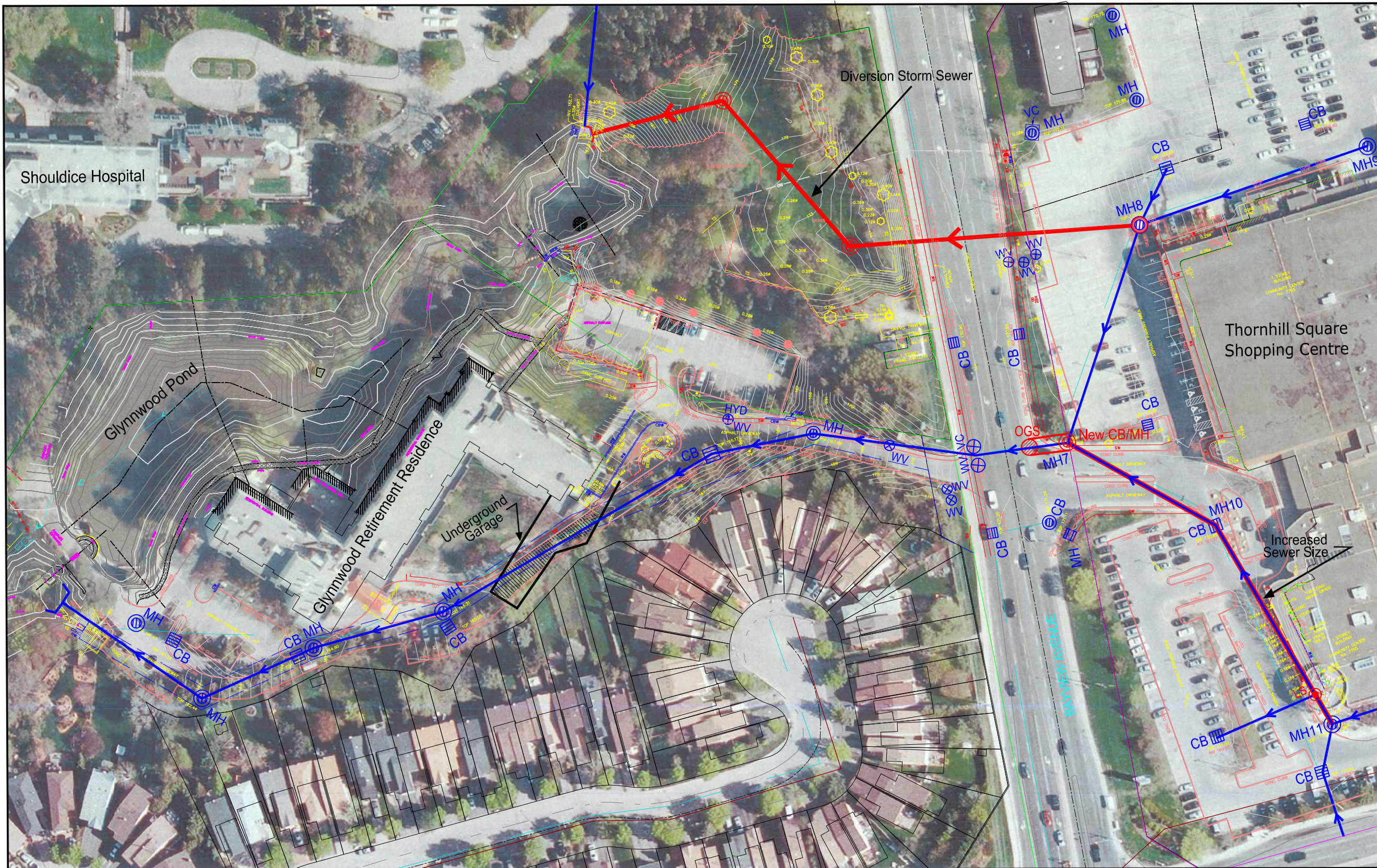
Responses to the invitation to participate were received from the Mississaugas of the Credit and Curve Lake First Nations. Responses on their identified issues were provided to both Nations, and ongoing dialog with Curve Lake First Nation's consultation team is underway.









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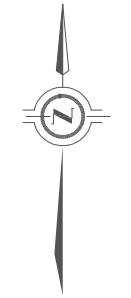
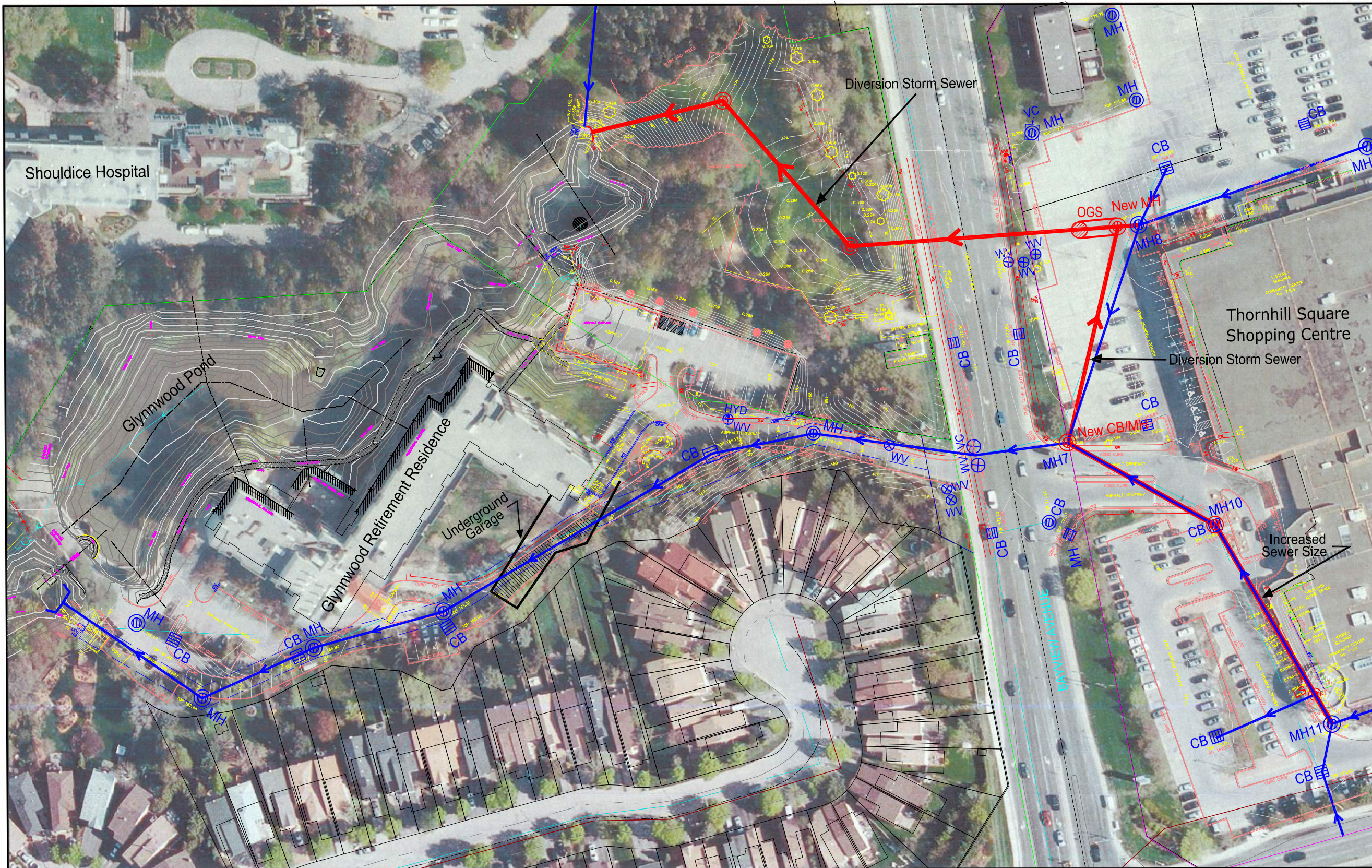
## **7.5 Notice of Completion**

The filing of this Project File and the issuance of the Notice of Completion fulfill the requirements for Schedule 'B' projects under the Class EA process. Subject to comments received and the receipt of the necessary approvals, the City of Markham intends to continue with the detailed design and construction of the flood remediation measures to alleviate basement and surface flooding and improve water quality within the subject project site.





	
<b>LEGEND</b> EXISTING STORM SEWER  PROPOSED STORM SEWER  EXISTING MANHOLE  PROPOSED MANHOLE  OIL/GRIT SEPARATOR (OGS)  BUILDING 	
	
Project 121-15461-00	
Glynnwood Tributary Class EA	
Scale: N.T.S.	
Figure 4-1	
<b>GLYNNWOOD TRIBUTARY AREA SEWER SURCHARGE STUDY ALTERNATIVE # 1</b>	



**LEGEND**

EXISTING STORM SEWER	
PROPOSED STORM SEWER	
EXISTING MANHOLE	
PROPOSED MANHOLE	
OIL/GRIT SEPARATOR (OGS)	
BUILDING	



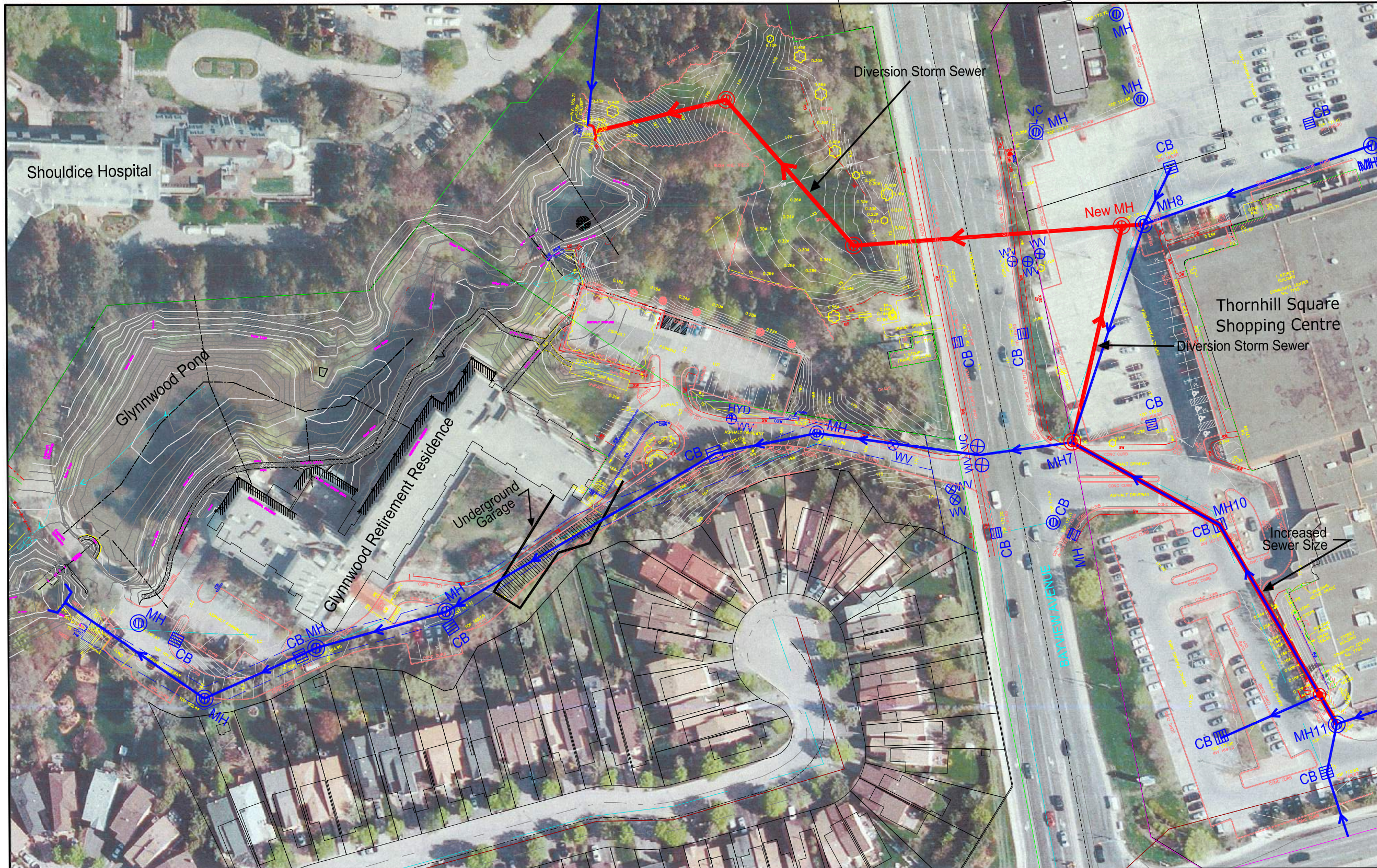
Project 121-15461-00

Glynnwood Tributary Class EA

Scale: N.T.S.

Figure 4-2

**GLYNNWOOD TRIBUTARY AREA  
SEWER SURCHARGE STUDY  
ALTERNATIVE # 2**



**LEGEND**

EXISTING STORM SEWER	
PROPOSED STORM SEWER	
EXISTING MANHOLE	
PROPOSED MANHOLE	
OIL/GRIT SEPARATOR (OGS)	
BUILDING	



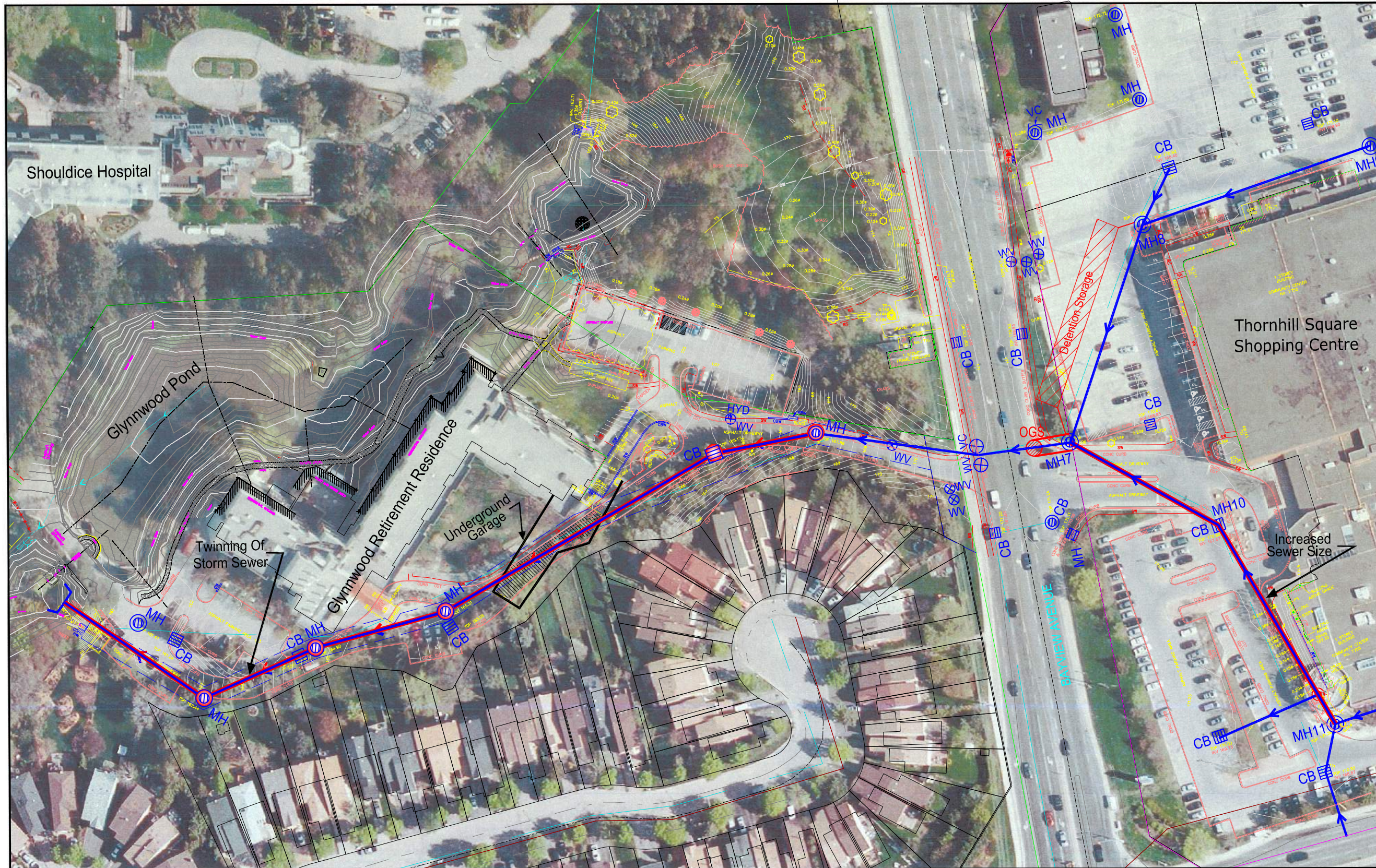
Project 121-15461-00

Glynnwood Tributary Class EA

Scale: N.T.S.

Figure 4-3

GLYNNWOOD TRIBUTARY AREA  
SEWER SURCHARGE STUDY  
ALTERNATIVE # 3



LEGEND	
EXISTING STORM SEWER	
PROPOSED STORM SEWER	
EXISTING MANHOLE	
PROPOSED MANHOLE	
OIL/GRIT SEPARATOR (OGS)	
BUILDING	



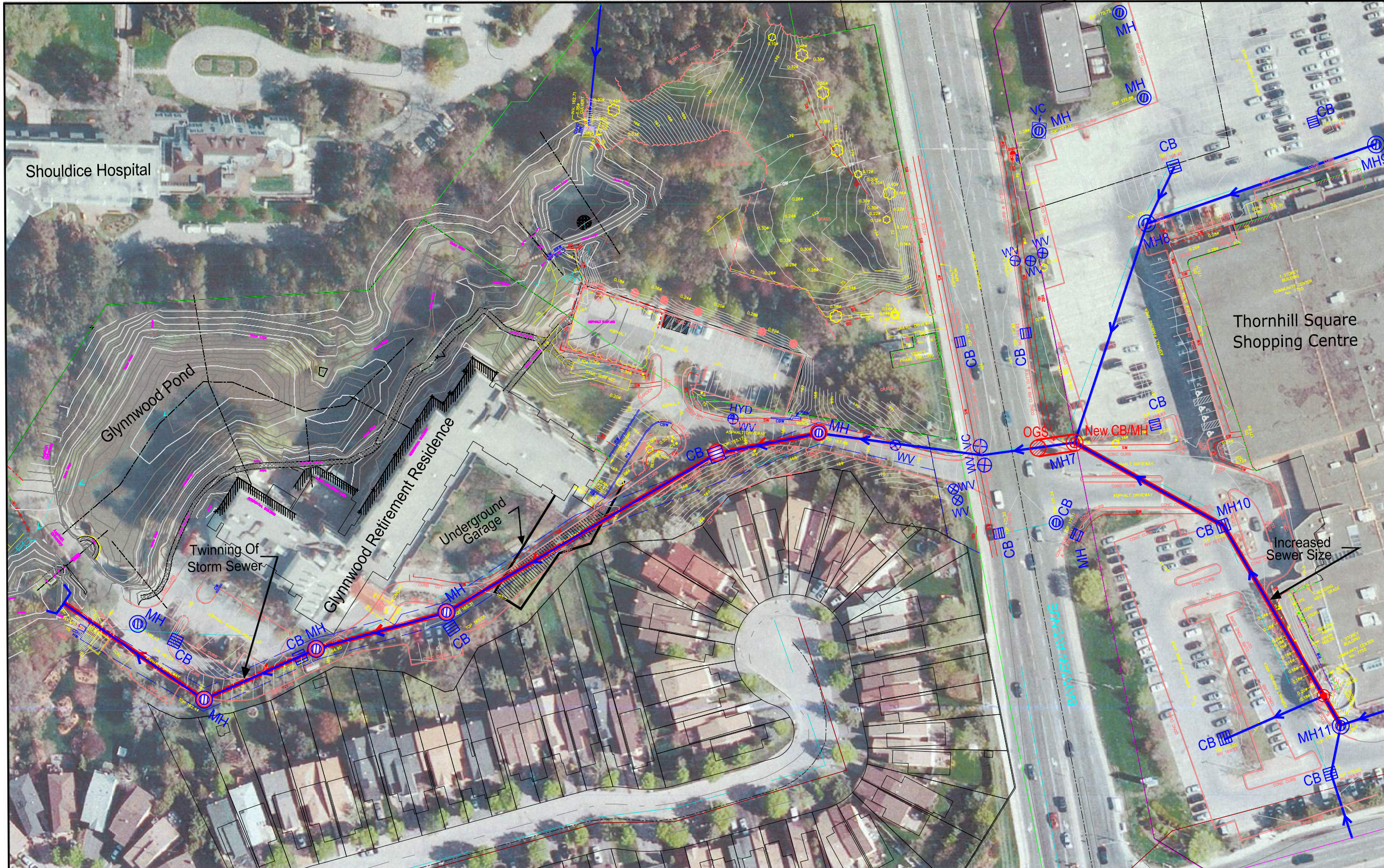
Project 121-15461-00

Glynnwood Tributary Class EA

Scale: N.T.S.

Figure 4-4

GLYNNWOOD TRIBUTARY AREA  
SEWER SURCHARGE STUDY  
ALTERNATIVE # 4



**LEGEND**

EXISTING STORM SEWER	
PROPOSED STORM SEWER	
EXISTING MANHOLE	
PROPOSED MANHOLE	
OIL/GRIT SEPARATOR (OGS)	
BUILDING	



Project 121-15461-00

Glynnwood Tributary Class EA

Scale N.T.S.

Figure 4-5

**GLYNNWOOD TRIBUTARY AREA  
SEWER SURCHARGE STUDY  
ALTERNATIVE # 5**



**LEGEND**

- EXISTING STORM SEWER →
- PROPOSED STORM SEWER →
- EXISTING MANHOLE ⊕
- PROPOSED MANHOLE ⊕
- OIL/GRIT SEPARATOR (OGS) ⊗
- BUILDING



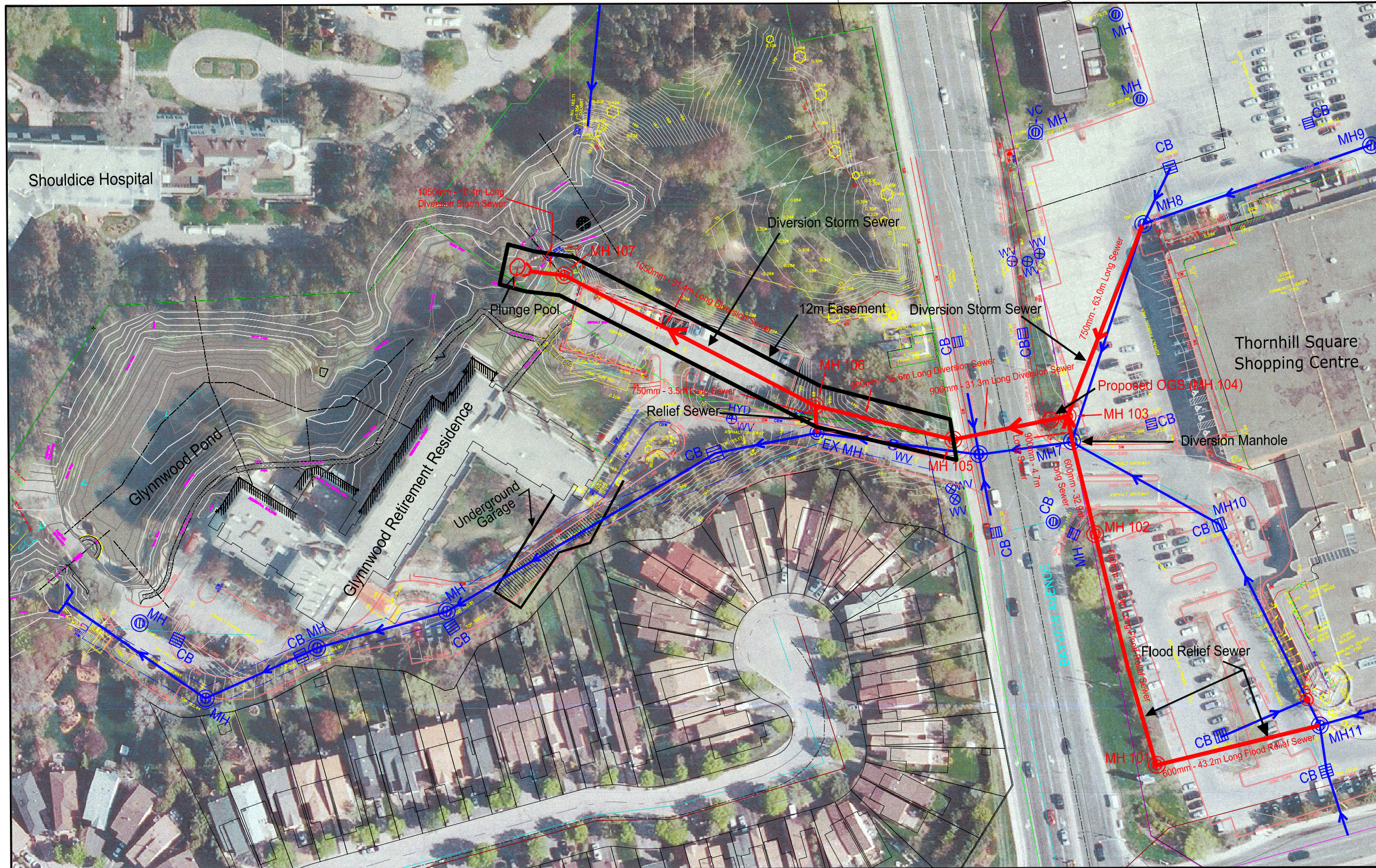
Project 121-15461-00

Glynnwood Tributary Class EA

Scale: N.T.S.

Figure 4-6

**GLYNNWOOD TRIBUTARY AREA  
SEWER SURCHARGE STUDY  
ALTERNATIVE # 6**



**LEGEND**

EXISTING STORM SEWER	
PROPOSED STORM SEWER	
EXISTING MANHOLE	
PROPOSED MANHOLE	
OIL/GRIT SEPARATOR (OGS)	
BUILDING	



Project 121-15461-00

Glynnwood Tributary Class EA

Scale: N.T.S.

FIGURE 6-1

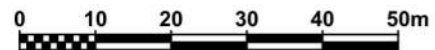
GLYNNWOOD TRIBUTARY AREA  
SEWER SURCHARGE STUDY  
RECOMMENDED ALTERNATIVE

FIGURE X4.R3.dwg - Glymwood Tributary Class EA - Preferred Alternative #2 (February 2020) C:\Users\ZhugeA\Documents\2020121-15461-00 Glymwood\REPORT\FIGURE\CAD\_1 May 13, 2021 - 10:37pm



**LEGEND**

-  EXISTING STORM SEWER
-  PROPOSED STORM SEWER
-  EXISTING MANHOLE
-  PROPOSED MANHOLE
-  OIL/GRIT SEPARATOR (OGS)



CLIENT	CITY OF MARKHAM		
TITLE	GLYNWOOD TRIBUTARY CLASS EA		
<b>ALTERNATIVE #7</b>			
Checked	A.Z.Z.	Drawn	AutoCAD/B.K.B./A.Z.Z.
Date	JANUARY 2021	Proj. No.	121-15461-00
Scale	AS SHOWN	Figure No.	4.7
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