

The logo features a stylized green and black geometric shape, possibly representing a roof or a structural element, set against a background of light green curved lines.

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Consulting Engineers

# **THORNBURY ROAD INFRASTRUCTURE PROJECT STORMWATER MANAGEMENT NEEDS STUDY**

**Town of the Blue Mountains**

## **SWM Needs Report**

prepared by:

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prepared for

Town of the Blue Mountains

October 28, 2016

CCTA File 115128

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# 1 Introduction

C.C. Tatham & Associates Ltd. (CCTA) has been retained by the Town of the Blue Mountains (Town) to undertake a Stormwater Management (SWM) Needs Study for the Thornbury Road Infrastructure Project (TRIP). This report covers Task 3 of the SWM Needs Study and includes the preparation of the following SWM Needs Report focused on identifying and evaluating alternative design concepts to improve the identified drainage deficiencies within each drainage system and identify alternatives to improve the drainage systems in the TRIP study area. Specifically, this report has been prepared to prioritize the recommended preferred alternatives considering the benefits, construction synergies, and risks based on a risk based approach to capital planning.

## 1.1 Site Description

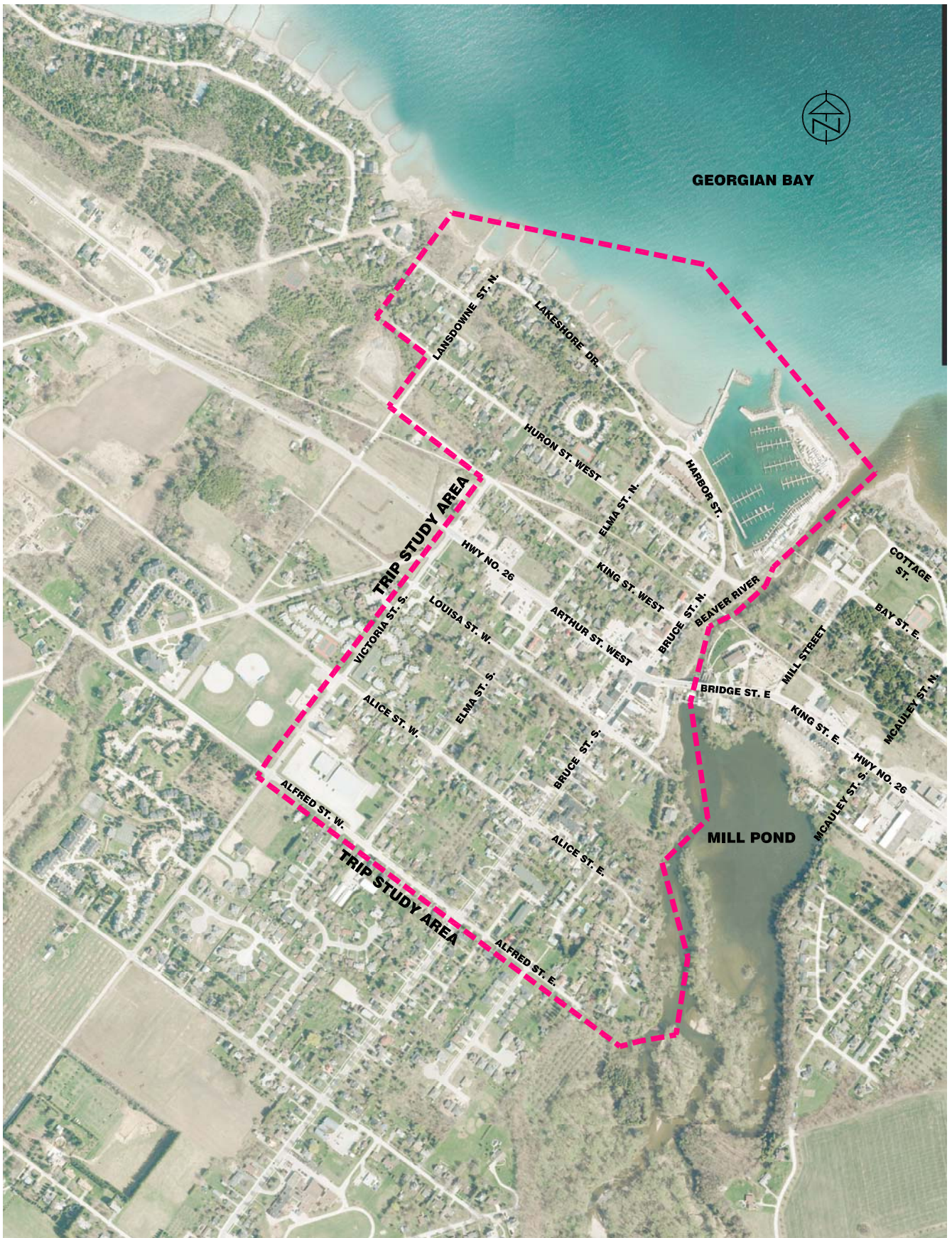
The TRIP Study Area is located within the community of Thornbury, Ontario in the Town of the Blue Mountains. The study area encompasses the downtown core and the primary land uses are residential and commercial. It is generally bounded by Alfred Street to the south, Georgian Bay to the north, Victoria Street to the west and the Beaver River to the east. The location of the study area is illustrated on Figure 1: Site Location Plan provided overleaf.

## 1.2 Existing Drainage Systems

As described in the SWM Infrastructure Conditions Assessment Report (C.C. Tatham & Associates Ltd., March 2016), the existing minor and major drainage systems within the TRIP study area were identified as part of the previously completed Task 2 of the SWM Needs Study. The minor drainage systems are defined as networks of storm sewer collecting and conveying surface runoff from private and municipal lands to Georgian Bay, the Beaver River, the Little Beaver River, or tributaries of the rivers during frequent (minor) storm events. The major drainage systems are defined as municipal roadways, overland flow routes, drainage channels and the river tributaries conveying surface runoff to the outlets described above during less frequent (major) storm events.

Nine minor drainage systems, three networks of undocumented SWM infrastructure and two significant major drainage systems have been identified within the TRIP study area for study as described in detail in the SWM Infrastructure Conditions Assessment Report. The nine minor drainage systems, three undocumented systems and two major drainage systems are illustrated on the Minor/Major Drainage Systems Plan (Figure 2) provide overleaf. A summary of the minor drainage systems is provided in Table 1: Minor Drainage System Summary provided next.





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# **THORNBURY ROADS INFRASTRUCTURE PROJECT SITE LOCATION PLAN**

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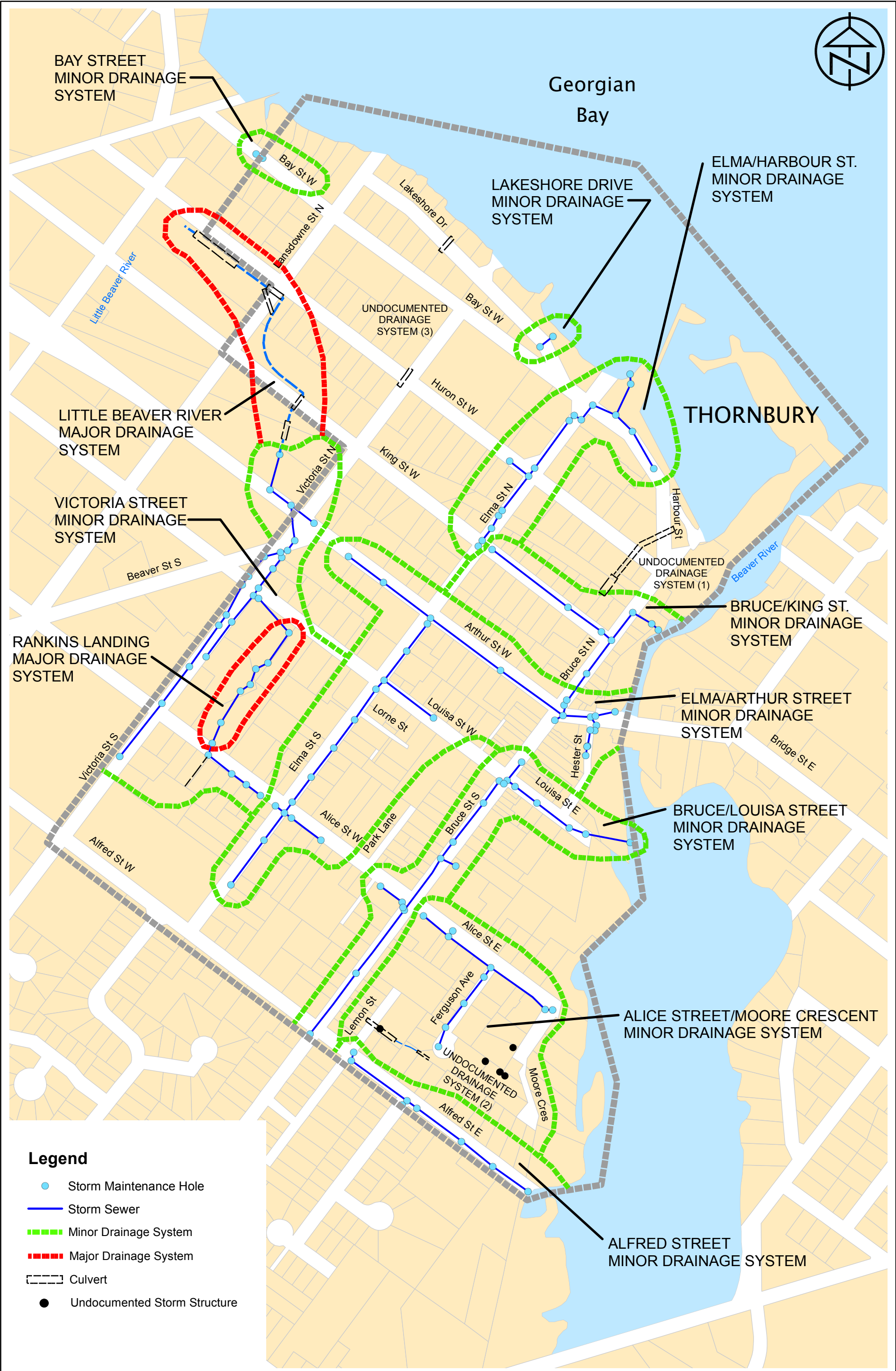
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DWG. No.

**FIG. 1**

JOB NO. 115128





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**TRIP SWM NEEDS STUDY**  
TOWN OF THE BLUE MOUNTAINS  
**MINOR/MAJOR DRAINAGE SYSTEMS PLAN**

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DATE: MAR 2016

DWG. No.

**FIG-2**

JOB NO.

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**Table 1: Minor Drainage System Summary**

Drainage System	Outlet	Outlet ID	Contributing Area (ha)
Alfred Street	Beaver River	BR 095	7.3
Alice Street/Moore Crescent	Beaver River	BR 086	6.3
Bruce/Louisa Street	Beaver River	BR 041	13.1
Elma/Arthur Street	Beaver River	BR 057	15.8
Bruce/King Street	Beaver River	BR 074	2.4
Elma/Harbour Street	Georgian Bay	GB 067	6.7
Victoria Street	Tributary Watercourse (Little Beaver River)	HW1	22.1
Lakeshore Drive	Georgian Bay	GB 097	2.4
Bay Street	Little Beaver River	LBR 096	0.4
<b>Total Area</b>			<b>76.5</b>

A summary of the major drainage systems studied is provided in Table 2: Major Drainage System Summary provided next.

**Table 2: Major Drainage System Summary**

Drainage System	Outlet	Outlet ID	Contributing Area (ha)
Little Beaver River Tributary Watercourse	Little Beaver River	1200 mm dia. conc. culvert	63.0
Rankin's Landing	Little Beaver River	CB 113	36.5
<b>Total Area</b>			<b>99.5</b>

The three networks of undocumented SWM infrastructure are described as follows:

1. South of the Georgian Trail approximately 20 m west of Bruce Street, a 900 mm diameter concrete storm sewer collects surface runoff from approximately 0.6 ha and drains northeast. Roughly 10 m from the inlet of the 900 mm storm sewer, the storm sewer changes size and material to a 375 mm diameter CSP pipe. This pipe continues to drain northeast approximately 100 m, crossing Huron and Harbour Streets and discharging to the Beaver River.
2. At the rear of the properties north of Alfred Street is a system of culverts, open channels, catch basins and storm sewer that collect and convey both municipal and private drainage east to the

Alice Street/Moore Crescent minor drainage system. The drainage system originates at Lemon Street, drains east to the rear of 98 Moore Crescent and a series of catch basins and storm sewer that conveys surface runoff northeast to the Alice Street/Moore Crescent minor drainage system and the Beaver River.

3. Surface runoff generated north of King Street west of Huron Street drains overland through a series of drainage ditches, culverts and channels to Lakeshore Drive. At Lakeshore Drive a 600 mm diameter CSP culvert conveys the surface runoff north to Georgian Bay.

### **1.3 Objectives**

The primary objectives of this SWM Needs Report are as follows:

- Identification and evaluation of alternative design concepts to improve deficiencies within each drainage system;
- Prioritize the alternatives considering benefits, construction synergies, and risk;
- Recommend preferred alternatives to improve the drainage systems;
- Provide a capital implementation plan for the preferred alternatives; and
- Identify any approval requirements associated with each alternative.

The Town will use the study findings to prepare a multi-year capital plan to renew the municipal infrastructure in a significant portion of Thornbury.

### **1.4 Background and Guidelines**

The Town provided background information related to stormwater infrastructure in the TRIP study area as a basis for the study. This information included a map of the stormwater infrastructure for the minor system, engineering drawings for the stormwater infrastructure, and inspection reports for undocumented infrastructure within the study area.

In addition to the background data provided by the Town, this Capital Implementation Plan was prepared recognizing the pertinent municipal and provincial SWM guidelines and relevant background SWM reports within the TRIP study area as follows:

- Design Guidelines for Sewage Works. Ministry of the Environment (2008);
- Engineering Standards. Town of the Blue Mountains (April 2009);
- Low Impact Development Stormwater Management Planning and Design Guide. Toronto and Region Conservation Authority, Credit Valley Conservation Authority (2010);
- Official Plan. Town of the Blue Mountains (March 2007);

- Stormwater Management Practices Planning and Design Manual. Ministry of the Environment (2003);
- Thornbury Road Infrastructure Project Stormwater Management Needs Study – SWM Infrastructure Conditions Assessment Report. C.C. Tatham & Associates Ltd. (March 2016); and
- Town of the Blue Mountains Thornbury West Road Improvements Project – External Drainage Analysis. R.J. Burnside & Associates Limited (2015).

## 2 Improvement Opportunities

Alternative design concepts to improve the deficiencies in the minor and major drainage systems and improve water quality and conveyance under existing and future drainage conditions within the TRIP study area have been identified and evaluated. The alternative design concepts are described in the sections that follow.

### 2.1 Minor Drainage Systems

The improvement opportunities for the minor drainage systems focus on increasing conveyance capacity to satisfy municipal design standards and reduce the flow of municipal stormwater through private property. This is to be accomplished by redirecting surface runoff to municipal infrastructure located in the municipal road allowance. The alternative design concepts for each minor drainage system are outlined in the following sections.

#### 2.1.1 Alfred Street

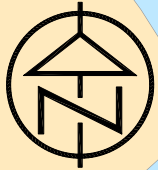
Three alternative design concepts were considered to improve the Alfred Street minor drainage system as follows and illustrated on Figure 3 – Alfred Street Minor Drainage System Improvement Opportunities provided overleaf.

##### **Option 1 – Storm Sewer Conveyance Capacity Upgrades (ALF1)**

Improving the conveyance capacity of the existing Alfred Street storm sewer and lowering the storm sewer to provide sufficient frost cover. Existing deficiencies related to conveyance capacity can be eliminated by upsizing sections of storm sewer to convey the required design flows. Sufficient fall is available at the outlet of the storm sewer to allow the upstream sections to be lowered to provide sufficient cover and frost protection.

##### **Option 2 – Lemon Street Flow Diversion (ALF2)**

Extending the Alfred Street minor drainage system northeast on Lemon Street to intercept municipal drainage that currently drains through the undocumented drainage system through the properties north of Alfred Street and convey this stormwater to the Beaver River via the Alfred Street minor drainage system. This option reduces flow through the undocumented drainage system and across private property. The upgrades described in Option 1 are required under Option 2.








THORNBURY

Beaver River

# Alfred Street Minor Drainage System Improvement Opportunities

## Legend

-   New Maintenance Hole
-  Existing Maintenance Hole
-  New Storm Sewer
-  Existing Storm Sewer



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### **Option 3 – Undocumented Drainage System Flow Diversion (ALF3)**

Extending a storm sewer from Alfred Street across private property to the rear of 94 Ferguson Avenue and 96 Moore Crescent to collect and convey the stormwater in the undocumented drainage system to the Beaver River via the Alfred Street minor drainage system. This option reduces flow through the undocumented drainage system and across private property. An easement in favour of the Town is required under this option. The upgrades described in Option 1 are required under Option 3.

#### **2.1.2 Alice Street/Moore Crescent**

Similar to the Alfred Street minor drainage system, three alternative design concepts were considered to improve the Alice Street / Moore Crescent minor drainage system as follows and illustrated on Figure 4 – Alice Street/Moore Crescent Minor Drainage System Improvement Opportunities provided overleaf.

##### **Option 1- Moore Crescent Storm Sewer (AMC1)**

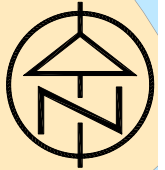
The existing Alice Street / Moore Crescent minor drainage system has adequate conveyance capacity. However, the existing storm sewer on Ferguson Avenue has limited cover. Sufficient fall is available at the outlet of the downstream storm sewer to allow the Ferguson Avenue storm sewer to be lowered to provide sufficient cover and frost protection. Also, a storm sewer should be extended southwest on Moore Crescent to service an area that currently has no minor drainage system.

##### **Option 2 – Lemon Street Flow Diversion (AMC2)**

Extending a storm sewer from Ferguson Avenue across private property to Lemon Street to intercept municipal drainage that currently drains through the undocumented drainage system through the properties north of Alfred Street and convey this stormwater to the Beaver River via the Ferguson Avenue and Alice Street storm sewer. This option reduces flow through the undocumented drainage system and across private property. An easement in favour of the Town is required under this option. To divert the stormwater from Lemon Street, the storm sewer on Ferguson Avenue and downstream on Alice Street requires upsizing to provide the requisite conveyance capacity to convey the additional flows. The upgrades described in Option 1 are required under Option 2.

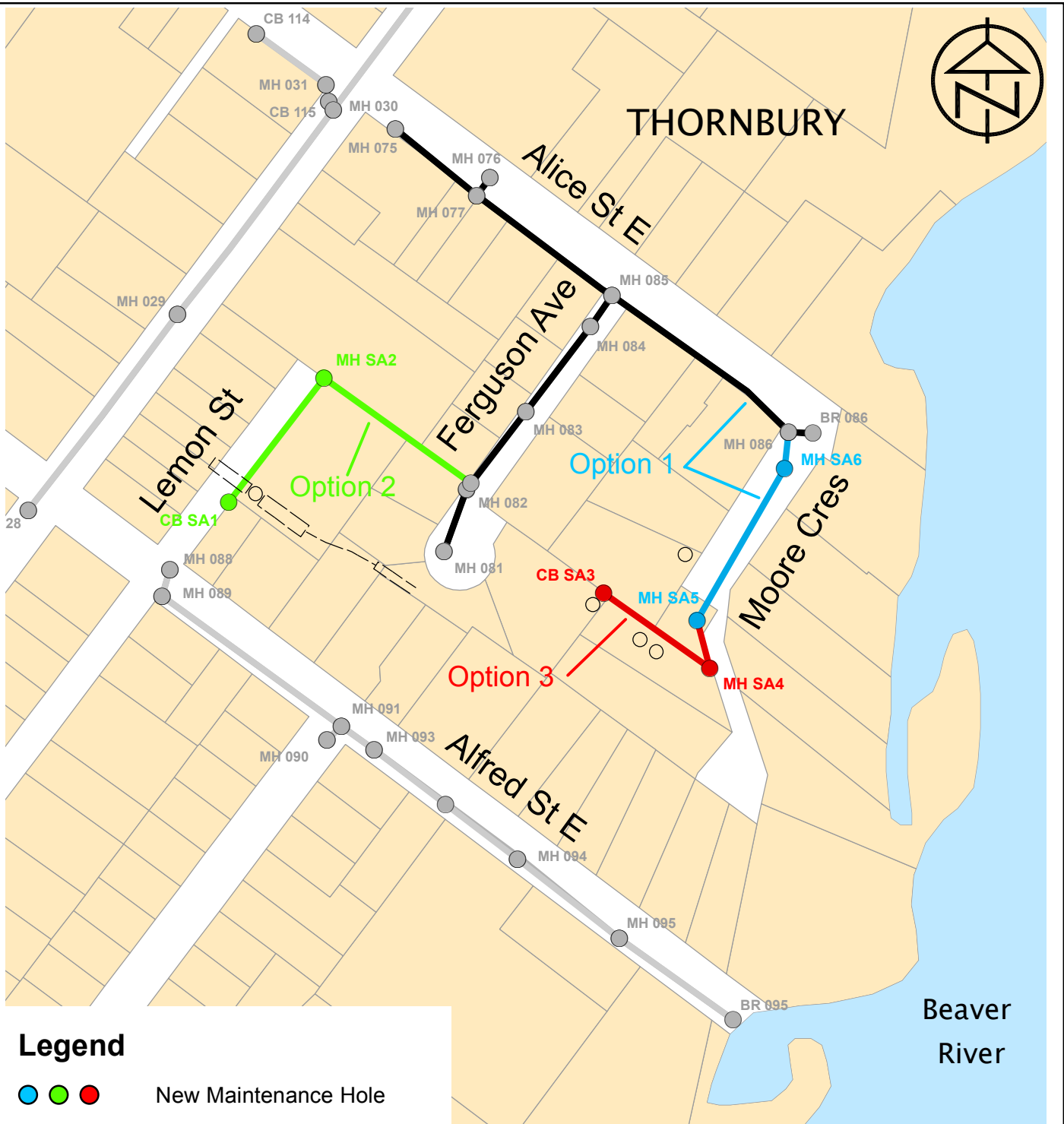
##### **Option 3 – Undocumented Drainage System Flow Diversion (AMC3)**

Extend the proposed Moore Crescent storm sewer west across private property to the rear of 96 Moore Crescent and 94 Ferguson Avenue to collect and convey the stormwater from the undocumented drainage system to the Beaver River via the Alice Street/Moore Crescent minor drainage system. An easement in favour of the Town is required under this option. The upgrades described in Option 1 are required under Option 3.



THORNBURY

Beaver River



### Legend

- ● ● New Maintenance Hole
- Existing Maintenance Hole
- — — New Storm Sewer
- Existing Storm Sewer

## Alice Street/Moore Crescent Minor Drainage System Improvement Opportunities



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### **2.1.3 Victoria Street**

The Victoria Street minor drainage system requires conveyance capacity upgrades to satisfy municipal design standards. The Victoria Street minor drainage system currently consists of a combination of storm sewer, culverts and ditches on both sides of the roadway from Alice Street West to Beaver Street South and the recently constructed storm sewer servicing the Beaver Street South, Arthur Street West and Victoria Street North intersection. The recommended improvements for the Victoria Street minor drainage system include extending a storm sewer sized to convey the required design flows from Beaver Street South southwest along Victoria Street. Storm sewer should be extended east along Alice Street West to intercept the municipal drainage that currently drains through Rankin's Landing and convey it through the municipal road allowance via the Victoria Street minor drainage system, reducing flows through private property. The recommended improvements are illustrated on Figure 5 – Victoria Street Minor Drainage System Improvement Opportunities provided overleaf.

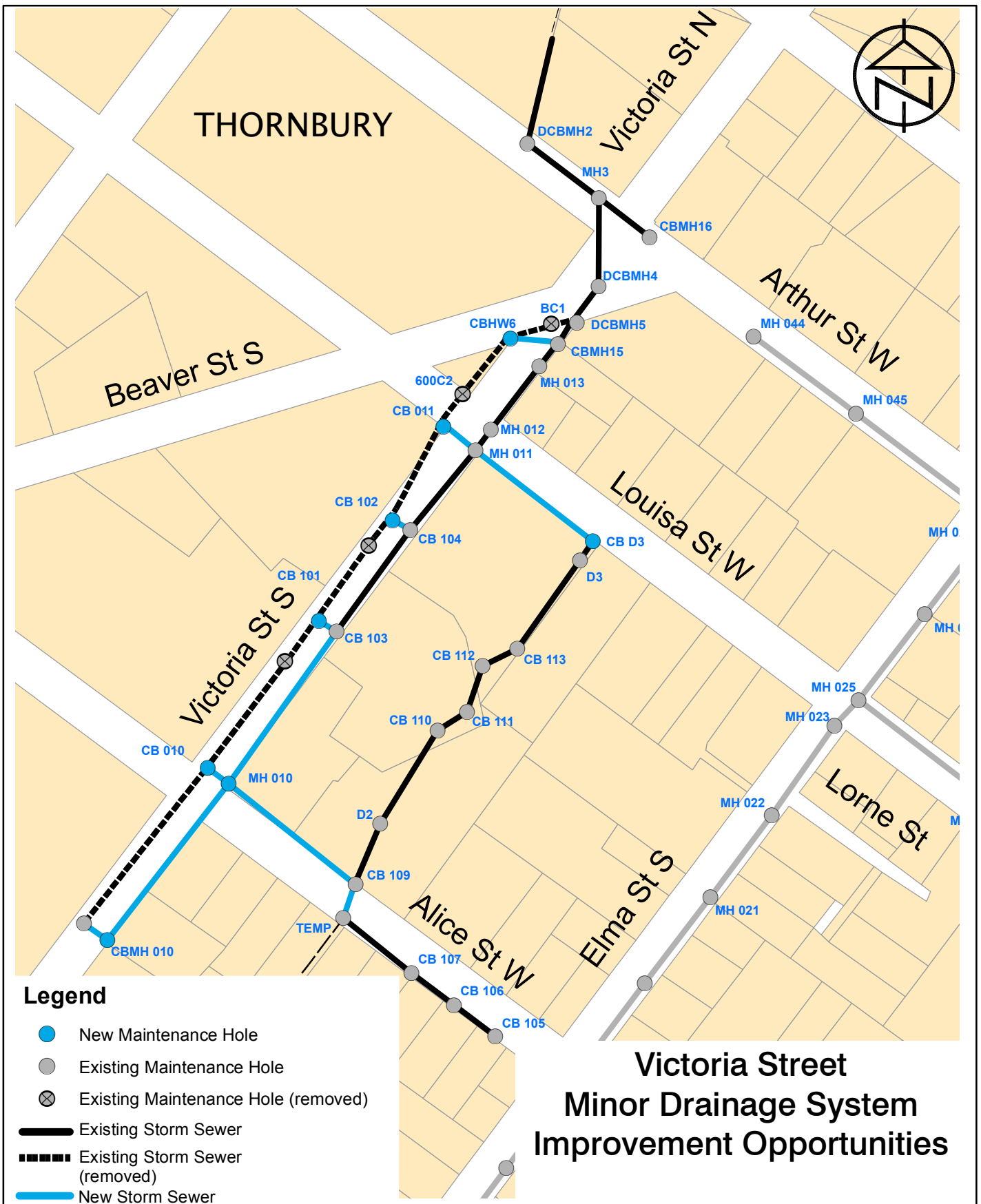
### **2.1.4 Bruce/King Street**

The undocumented drainage system south of the Georgian Trail that ultimately discharges north of Huron Street can be diverted to the Bruce/King Street minor drainage system. The existing Bruce/King Street minor drainage system has sufficient capacity to convey the drainage from the undocumented system to the Beaver River. Extending storm sewer west on Huron Street West to intercept the municipal drainage before it enters the undocumented drainage system and convey it east to the Bruce/King Street minor drainage system will reduce the flow of municipal stormwater across private property. This option also provides a proper outlet for the stormwater.

### **2.1.5 Remaining Documented Minor Drainage Systems**

The remaining documented minor drainage systems described in Table 1 required conveyance capacity improvements to eliminate maintenance hole and storm sewer surcharging and/or upgrades to increase cover and improve hydraulics.

The Elma/Harbour Street minor drainage system requires conveyance capacity improvements to satisfy municipal design standards. Extending storm sewer from Harbour Street south on Elma Street designed to convey the required design flows is recommended. The existing Elma/Harbour Street minor drainage system outlet to Georgian Bay has minimal cover and insufficient frost protection. This section of storm sewer also requires upsizing to convey the required flows. There is limited opportunity to increase the cover on this section of storm sewer. To maintain the existing cover provided while maximizing the conveyance capacity of the pipe, alternative pipe shapes such as horizontal ellipse or pipe arch storm sewer should be explored.



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DWG. **FIG.5**

The Elma/Arthur Street minor drainage system requires conveyance capacity improvements and needs to be lowered to provide sufficient cover and frost protection. The existing grades along the storm sewer will allow the Elma/Arthur Street minor drainage system to be lowered to improve cover while upsizing the sewer to convey the required flows. It is noted that achieving minimum Town Standard cover is not feasible for the Elma/Arthur Street minor drainage system.

For the remaining minor drainage systems, the required conveyance capacity improvements can be achieved while satisfying the Town's minimum cover requirements.

## **2.2 Major Drainage Systems**

The improvement opportunities for the major drainage systems focus on increasing conveyance capacity to satisfy municipal design standards and reduce flooding on both municipal and private property. The alternative design concepts for the major drainage systems are outlined in the following sections.

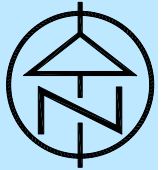
### **2.2.1 Rankin's Landing Major Drainage System**

The conveyance capacity of the Rankin's Landing major drainage system is currently limited by pipe obstruction and is undersized for major storm events. To alleviate these issues, municipal drainage should be intercepted at Alice Street West and diverted to Victoria Street as described in Section 2.1.3. Diverting the minor drainage system to Victoria Street will reduce both the minor and major flows through Rankin's Landing and reduce the flow of municipal stormwater across private property.

Rankin's Landing is a private development responsible for the operation and maintenance of its drainage systems. Removing the culvert obstructions and performing general maintenance on the drainage system will increase the conveyance capacity and the function of the culverts/channels. It is recommended that the Town approach Rankin's Landing about maintaining their existing drainage system.

### **2.2.2 Little Beaver River Tributary Watercourse**

As described in the SWM Infrastructure Conditions Assessment Report, significant conveyance capacity deficiencies were identified along the Little Beaver River tributary watercourse. Under existing conditions there are two key spill areas. The first spill occurs north of the King Street crossing and travels through the backyards of the properties fronting Huron Street. The second spill occurs at a low point on Huron Street, west of Lansdowne Street. This spill flows through a number of private properties as it travels north towards Georgian Bay. The alternative design concepts to address the conveyance capacity deficiencies of the watercourse are described as follows and illustrated on Figure 6 – Little Beaver River Tributary Watercourse Improvement Options provided overleaf:



THORNBURY

Bay St W

Lakeshore Dr

Lansdowne St N

Option 3

2400 x 1200 Conc. Box

6000 CSP

12000 CONCRETE

2400 x 1200 Conc. Box

Option 1

WATERCOURSE 1

1950 x 1300 CSP

Option 2

4500 CSP

Huron St W

1950 x 1300 CSP

Victoria St N

15000 CSP

# Little Beaver River Tributary Watercourse Improvement Opportunities



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### **Option 1 – Culvert/Channel Improvements**

Upsizing the road crossing culverts to satisfy municipal design standards and improving the channel between King Street and Lansdowne Street to convey the 100 year design will eliminate the spill north of King Street. Channel improvements downstream of Lansdowne Street will improve drainage. However, with the low point in Huron Street West being lower than the invert of the outlet culvert, the spill north across the roadway and private properties will continue during major storm events.

### **Option 2 – Channel Diversion**

A new channel can be constructed on the west side of Lansdowne Street and south side of King Street to convey the required major flows, eliminate the spill north of King Street and reduce the number of culvert crossing required in the area. Similar to Option 1, channel improvements downstream of Lansdowne Street will improve drainage. However, with the low point in Huron Street West being lower than the invert of the outlet culvert, the spill north across the roadway and private properties will continue during major storm events.

### **Option 3 – Relief Channel**

To reduce the spill north across Huron Street West and the private properties to the north, a relief channel can be constructed along Lansdowne Street to convey the storm water surcharging the existing system downstream to Georgian Bay. Under this option, the existing channel and outlet culvert would remain in place. The relief channel would convey the flow exceeding the existing channel and outlet culvert capacity along the north side of Lansdowne Street north to Georgian Bay. Alone, this option will not address the deficiencies upstream. However, completed in combination with either Option 1 or Option 2, the deficiencies in the major drainage system can be addressed.

It is understood the property east of the King Street West and Lansdowne Street North intersection is contemplated for development. Any development of the property needs to recognize the potential for flood spill from the watercourse. Development of the property likely requires channel improvements to remove it from the regulatory floodplain.

## 2.3 Low Impact Development (LID) Measures

There are a number of LID measures that can be incorporated into road improvement projects in the TRIP study area. LID measures are a more sustainable approach to stormwater management that focus on providing quality and quantity control of stormwater at the runoff source. In February 2015, the MOECC issued an Interpretive Bulletin that clarified that the ministry's preferred approach to stormwater management is to control surface runoff at the source, or as close to it as possible, through lot level and LID techniques to mimic the natural hydrology of the landscape.

The TRIP project provides an excellent opportunity to consider the application of LID measures. For road improvement projects, the most applicable LID measures are bioretention swales and perforated pipe systems. Bioretention swales can be incorporated within rural road cross-sections, while perforated pipe systems are best suited for urban road cross-sections. A large portion of the TRIP study area consists of sandy loam soils. Therefore, it is expected that infiltration characteristics will be favourable for both bioretention swales and perforated pipe systems. Additional LID measures, including bioretention areas and infiltration trenches, are applicable as lot level controls and should be recommended for future development.

Bioretention swales generally consist of a conveyance swale or ditch overtopping a filter media and a gravel storage layer. An underdrain is sometimes required if infiltration characteristics are unfavourable. To reduce the maintenance requirements, pretreatment in the form of sediment forebays or grass filter strips can be incorporated into the design. Bioretention swales require routine monitoring and inspection to ensure proper function. Bioretention swales are well-suited within a rural road cross-section.

There are a variety of design options for perforate pipe systems, however they generally consist of a perforated pipe, a gravel storage layer and a solid overflow conveyance pipe. Stormwater is designed to enter the perforated pipe, exfiltrate into the gravel storage layer and infiltrate into the underlying native soils during frequent minor storm events (typically 25 mm storms or less). During less frequent minor storm events, stormwater surcharging the perforated pipe flows through the overflow conveyance pipe sized as per municipal standards similar to traditional storm sewer. As with bioretention swales, pretreatment can reduce future maintenance requirements. Leaf screens, goss traps, grass filter strips and oil/grit separators are the most applicable options. Expected maintenance includes flushing the perforated pipes and removal of debris from pretreatment devices.

In general, incorporation of LID measures into the roadway provides additional complications with utility co-ordination and the suitability of this system varies based on infiltration rates of the native soils and the extent of the existing/proposed underground infrastructure. The life expectancy of the LID measures (typically 20 years) is generally less than the life expectancy of the roadway and the storm, sanitary and water services installed in the roadway. As such, the LID measures generally have to be replaced at greater frequencies than the roadway.



The suitability of using LID measures within the TRIP study area has been considered and is recommended where feasible. However, given the extent of existing services and utilities within the road allowance throughout the TRIP study area, we expect the use of LID measures will be limited.

## **2.4 Regional Stormwater Management Facilities**

A review of the suitability of constructing regional stormwater management facilities within the TRIP study area to attenuate peak flows and provide water quality treatment has been completed while identifying the improvement options.

The implementation of regional stormwater management facilities in the TRIP study area is limited without the significant redirection of flows. Each minor drainage system services a defined area and discharges at a specific location to either the Beaver River or directly to Georgian Bay. Redirecting the storm infrastructure to a regional stormwater management facility would be difficult and expensive given the existing topography and stormwater flow directions. Also, the TRIP study area is primarily developed with no suitable large area of land available for the construction of a regional stormwater management facility.

Given that the minor drainage systems in the TRIP study area all service relatively small drainage areas and improvements/upgrades to the existing storm infrastructure will address the known drainage deficiencies, regional stormwater management facilities do not appear to be a preferred solution to the identified drainage deficiencies.

## **2.5 Water Quality**

LID measures have the potential to improve water quality in the TRIP study area. In addition to the LID measures, mechanical devices such as oil grit separators (OGS) may provide water quality treatment. Implementing LID measures in a treatment train approach or in combination with oil grit separators would improve the level of water quality treatment provided across the TRIP study area.

The suitability of LID measures in the TRIP study area was previously discussed. LID measures should be implemented where feasible, however, their use is anticipated to be limited.

The effectiveness of oil grit separators in large drainage areas is typically limited, as such they are generally recommended for catchments smaller than 2 hectares. For larger catchments, oil grit separators installed in series or at multiple locations in the minor drainage system can be effective in treating stormwater. The minor drainage system catchments in the TRIP study area are larger than 2 hectares. As such, oil grit separators in series or multiple oil grit separators installed as part of the minor drainage systems will be required to improve the stormwater quality in the TRIP study area.

Similar to LID measures, oil grit separators would only be recommended where feasible. Oil grit separators should be designed as per the manufactures specifications to treat the flow rate produced by the water quality storm.

## 3 Improvement Opportunities Evaluation

Integral to the planning process is the consideration and evaluation of the improvement opportunities to address the identified deficiencies. The evaluation of the improvement opportunities is summarized in the following sections.

### 3.1 Evaluation Methodology

For each improvement opportunity, the flows from four hydrologic analyses scenarios were considered. Details of the hydrologic analyses are included in the SWM Infrastructure Conditions Assessment Report. The hydrologic scenarios are described as follows:

1. Scenario 1 – Existing Conditions Existing Design Storms – Predicted flows represent existing land use conditions and the current Owen Sound Chicago design storms.
2. Scenario 2 – Existing Conditions Climate Adjusted Design Storms – Predicted flows represent existing land use conditions and the current Owen Sound Chicago designs storms adjusted (increased) by 15% to account for potential climate change.
3. Scenario 3 – Future Conditions Existing Design Storms – Predicted flows represent future land use conditions based on Official Plan land use designations and the current Owen Sound Chicago design storms.
4. Scenario 4 – Future Conditions Climate Adjusted Design Storms – Predicted flows represent future land use conditions based on Official Plan land use designations and the current Owen Sound Chicago design storms adjusted (increased) by 15% to account for potential climate change.

As part of the SWM Infrastructure Conditions Assessment Report, the drainage deficiencies in each minor and major drainage system were identified for all four hydrologic scenarios. The minor drainage system deficiencies were identified through the PCSWMM and HEC RAS hydraulic models of the drainage systems.

For the purpose of this study, the hydraulic models were revised for all four hydrologic scenarios to determine the required infrastructure improvements to address the noted deficiencies, convey the requisite design storm peak flows and satisfy the Town's Engineering Standards. The improvements generally consist of pipe size increases, pipe slope adjustments, increased cover and drops across maintenance holes. The results of the revised hydraulic models and required infrastructure improvements are included in Appendix A for reference.

After identifying the required infrastructure improvements for each hydrologic scenario, preliminary construction cost estimates were developed for each minor/major drainage system. The preliminary construction cost estimates are provided in Appendix B for reference.

To evaluate the alternatives and identify the preferred improvement option, a risk based approach was taken. The risk based approach considered the preliminary construction costs against the overall risks/benefits of each improvement option.

Construction cost ratios were developed from the preliminary construction cost estimates for each improvement option (hydrologic scenarios 1 through 4) compared to the cost to improve the system to address the noted deficiencies under existing conditions (hydrologic scenario 1). For the purpose of this study, the benefits or reductions in flood risk were identified as reductions in pipe surcharging, reductions in maintenance hole surcharging, and the diversion of municipal drainage from private property. The sum of the benefits and construction cost ratio establish the score for each improvement alternative. The improvement option with the greatest score is the preferred option for each minor/major drainage system. The improvement option evaluation for the minor and major drainage systems are summarized in the following sections and provided in detail in Appendix C.

## 3.2 Minor Drainage Systems

### 3.2.1 Alfred Street and Alice Street/Moore Crescent Private System Diversion

As described in Section 2 and illustrated on Figures 3 and 4, the Alfred Street and Alice Street/Moore Crescent municipal drainage systems have potential to divert flows that currently drain through private properties via an undocumented underground pipe system. An analysis of these systems was completed to determine the preferred improvement option. The results of this analysis under hydrologic scenario 1 is summarized in Table 4 provided next.

**Table 3: Alfred Street and Alice Street/Moore Crescent Improvement Option Evaluation**

Option	Construction Cost Ratio	Benefits Score	Total Score (Benefits)
AMC1 & ALF1	1.00	0	1.00
AMC1 & ALF1/2	0.94	0.5	1.44
AMC1 & ALF1/3	0.77	0.5	1.27
AMC1 & ALF1/2/3	0.72	1	1.72
AMC1/2 & ALF1	0.68	0.5	1.18
AMC1/2 & ALF1/3	0.56	1	1.56
AMC1/2/3 & ALF1	0.57	1	1.57
AMC1/3 & ALF1	0.79	0.5	1.29
AMC1/3 & ALF1/2	0.75	1	<b>1.75</b>

Notes: 1) Pipe upsizing costs under baseline conditions shown as Option 1 in Figures 3 and 4  
 2) Pipe upsizing costs with diversion of Lemon Street drainage shown as Option 2 in Figures 3 and 4  
 3) Pipe upsizing costs with diversion of backyard drainage shown as Option 3 in Figures 3 and 4

As shown in Table 4, diverting stormwater runoff from Lemon Street to the Alfred Street minor drainage system and diverting the remaining backyard drainage to the Alice Street/Moore Crescent minor drainage system is the preferred solution (AMC1/3 & ALF1/2). Further analysis to determine the preferred hydrologic scenario for the Alfred Street and Alice Street/Moore Crescent minor drainage systems improvements considers AMC1/3 and ALF1/2.

### 3.2.2 Minor Drainage Systems Improvement Evaluation

As described in Section 2, the minor drainage systems are best suited for quantity conveyance improvements through upgrades to the existing storm sewer systems. Each improvement option has been evaluated considering the four hydrologic scenarios to establish which hydrologic scenario the proposed improvement options should be designed to. The hydrologic scenarios for the Alfred Street and Alice Street/Moore Crescent minor drainage systems have been evaluated considering the preferred improvement option identified in section 3.2.1. Table 5 provided next presents the respective scores for the improvement options under each hydrologic scenario.

**Table 4: Minor Drainage Systems Improvement Evaluation**

Drainage System	Total Score (Benefits)			
	Hydrologic Scenario 1	Hydrologic Scenario 2	Hydrologic Scenario 3	Hydrologic Scenario 4
Alfred Street	1.85	2.12	1.94	<b>2.27</b>
Alice Street/Moore Crescent	1.60	1.64	1.59	<b>1.64</b>
Bruce/Louisa Street	2.30	2.71	2.54	<b>2.96</b>
Elma/Arthur Street	2.00	3.82	4.10	<b>4.59</b>
Bruce/King Street	1.00	1.00	1.00	<b>1.00</b>
Elma/Harbour Street	2.45	2.92	2.92	<b>3.13</b>
Victoria Street	2.65	2.87	3.37	<b>3.84</b>
Lakeshore Drive	1.20	1.20	1.37	<b>1.37</b>
Bay Street	1.00	1.00	1.00	<b>1.00</b>

### 3.3 Major Drainage Systems

Hydrologic scenario 4 produces the greatest peak flows for the watershed. As the objective of the major drainage system improvement options is to reduce flooding and protect private property, the major drainage system improvement options have been evaluated considering hydrologic scenario 4.

### 3.3.1 Rankin's Landing Major Drainage System

The Rankin's Landing major drainage system is primarily located on private land. As previously discussed, there are significant issues with rip rap blocking the culverts and channel overgrowth reducing conveyance capacity. Diversion of the minor system flow to Victoria Street as discussed in Section 3.1.2 and cleanout/ongoing maintenance of the existing system is considered sufficient to reduce the risk of flooding for this system.

### 3.3.2 Little Beaver River Tributary Watercourse

As outlined in Section 2.2.2 and illustrated on Figure 6, three key improvement options have been identified for the Little Beaver River Tributary watercourse. An evaluation of the improvement options was completed to determine the preferred improvement option. The improvement evaluation results are summarized in Table 6: Little Beaver River Tributary Watercourse Improvement Evaluation shown below.

**Table 5: Little Beaver River Tributary Watercourse Improvement Options Evaluation**

Improvement Option	Construction Cost Ratio	Benefits Score	Total Score (Benefits)
1	1.00	0.50	1.50
2	1.57	0.50	<b>2.07</b>
1 & 3	0.28	0.75	1.03
2 & 3	0.31	0.75	1.06

As shown in Table 5, the benefits of improvement option 3 are outweighed by the associated costs. Therefore, the recommended improvement to the Little Beaver River Tributary watercourse is improvement option 2; realignment of the watercourse south of King Street and west of Lansdowne Street.

## 4 Preferred Alternatives

As detailed in Section 3, the total benefits were determined under each hydrologic scenario for the minor drainage systems. From this analysis, the preferred improvement options were determined as the scenario with the highest total benefits score. A summary of these results is included in Table 6: Minor Drainage Systems Preferred Scenario Upgrades.

**Table 6: Minor Drainage Systems Preferred Scenario Upgrades**

Drainage System	Total Benefits Score	Preferred Option (Hydrologic Scenario)
Alfred Street	2.27	Option 2/Scenario 4
Alice Street/Moore Crescent	1.64	Option 3/Scenario 4
Bruce/Louisa Street	2.96	Conveyance Capacity Upgrades/Scenario 4
Elma/Arthur Street	4.59	Conveyance Capacity Upgrades/Scenario 4
Bruce/King Street	1.00	Conveyance Capacity Upgrades/Scenario 4
Elma/Harbour Street	3.13	Conveyance Capacity Upgrades/Scenario 4
Victoria Street	3.84	Conveyance Capacity Upgrades/Scenario 4
Lakeshore Drive	1.37	Conveyance Capacity Upgrades/Scenario 4
Bay Street	1.00	Conveyance Capacity Upgrades/Scenario 4

The preferred major drainage system improvements are to clean out the Rankin's Landing private system and realign the Little Beaver River tributary watercourse as described in Sections 2 and 3 and illustrated on Figure 6.

## 5 Capital Implementation Plan

As described in Sections 3 and 4, the improvement opportunities were evaluated in terms of potential benefits and associated costs to determine the preferred improvement option for each drainage system. To determine the priority of implementing these improvements, the total benefits score from Section 4 for each improvement option was multiplied by factors based on the road classification and land use. The results of the evaluation and order of priority are summarized in Table 7: Minor Drainage Systems Capital Implementation Plan.

**Table 7: Minor Drainage Systems Capital Implementation Plan**

Priority	Drainage System	Total Benefits Score	Roadway Importance Factor	Total Priority Score
1	Elma/Arthur Street	4.59	1.25	5.73
2	Victoria Street	3.84	1.13	4.33
3	Elma/Harbour Street	3.13	1.23	3.84
4	Bruce/Louisa Street	2.96	1.12	3.30
5	Alfred Street	1.80	1.00	1.80
6	Lakeshore Drive	1.37	1.00	1.37
7	Bruce/King Street	1.00	1.30	1.30
8	Alice Street/Moore Crescent	1.15	1.00	1.15
9	Bay Street	1.00	1.00	1.00

## 6 Approval Requirements

Each of the drainage system improvements is subject to approval from various approval agencies. Most of the drainage systems involve reconstruction within areas regulated by the Grey Sauble Conservation Authority (GSCA). As such, a GSCA permit is required.

Each minor drainage system improvement is also subject to MOECC approval and must go through the Environmental Compliance Approval (ECA) process. Upgrades to the Little Beaver River tributary watercourse are also subject to the ECA process.

In general, most of the drainage system improvements are activities defined under Schedule A+ of the Municipal Class Environmental Assessment (EA) process and as such the activities are pre-approved. For Schedule A+ activities, the public must be advised prior to project implementation. The drainage system improvements that fall outside existing road allowances and utility corridors are subject to Schedule B activity requirements and are subject to the screening process.

The drainage system improvements that involve temporary or permanent works below the waterbody's (Beaver River, Georgian Bay, Little Beaver River) High Water Mark must be reviewed by the Department of Fisheries and Oceans Canada (DFO).

Similarly, a work permit from the Ministry of Natural Resources and Forestry (MNR) is required for any expansion to an existing storm infrastructure on shore lands. If the existing footprint, length and width of the original infrastructure is being maintained, the work must be registered; however, a work permit is not required. The outlet at the marina is on federal land and therefore does not fall under MNR jurisdiction. The MNR does require consultation with project specific details for the Lakeshore Drive outlet to confirm if the work extends to shore lands, in which case a work permit may be required. Any work that may affect an endangered or threatened species will also trigger MNR involvement.

A full summary of the expected approval requirements for each of the drainage system improvement options is included in Table 8: Approval Requirements for Recommended Improvement.



**Table 8: Approval Requirements for Recommended Improvement**

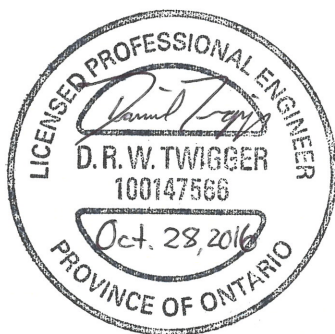
Drainage System	GSCA Permit	ECA Application	Municipal Class EA	DFO Approval	MNR Approval
Elma/Arthur Street	Outlet Regulated	Required	Schedule A+	Not Required	Not Required
Victoria Street	Outlet Regulated	Required	Schedule A+	Not Required	Not Required
Elma/Harbour Street	Outlet Regulated	Required	Schedule A+	Required	Not Required
Bruce/Louisa Street	Outlet Regulated	Required	Schedule A+	Not Required	Not Required
Alfred Street	Outlet Regulated	Required	Schedule A+	Not Required	Not Required
Lakeshore Drive	Outlet Regulated	Required	Schedule A+	Required	Consultation Required
Alice Street/Moore Crescent	Outlet Regulated	Required	Schedule B	Not Required	Not Required
Bruce/King Street	Outlet Regulated	Required	Schedule A+	Not Required	Not Required
Bay Street	Outlet Regulated	Required	Schedule A+	Not Required	Not Required
Rankin's Landing	Not Required	Not Required	Not Required	Not Required	Not Required
Little Beaver River Tributary Watercourse	Required	Required	Schedule B	Not Required	Not Required

## 7 Conclusions


From the analysis completed, the preferred improvement options have been identified for the minor and major drainage system deficiencies in the TRIP study area. For the preferred options, the drainage systems have been ranked according to priority and the approval requirements have been summarized.

The recommended conveyance capacity improvements generally include upsizing the existing sewers, adding sections of storm sewer or ditches in areas that do not have a defined drainage system and adding sewers to divert municipal drainage from private lands. An analysis of water quality improvement opportunities within the TRIP study area identifies that LID measures and mechanical devices (oil grit separators) may be implemented to improve stormwater quality where feasible. The implementation of these measures is to be considered further during detailed design.

This study provides the Town with a storm infrastructure capital implementation plan allowing the Town to prepare a multi-year capital plan to renew the municipal infrastructure in the TRIP study area.



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**APPENDIX A:**  
**PRELIMINARY CONSTRUCTION COST ESTIMATES**

THORNBURY ROAD INFRASTRUCTURE PROJECT  
 SWM NEEDS STUDY  
 OCTOBER 28, 2016

PRELIMINARY CONSTRUCTION COST ESTIMATES

Bay Street		Ex./Prop. Length	Ex. Diam.	Required Diameters (m)				S1		S2		S3		S4	
Name				S1	S2	S3	S4	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price
MH_096-LBR_096		11	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 2,475.00	\$ 225.00	\$ 2,475.00	\$ 225.00	\$ 2,475.00	\$ 225.00	\$ 2,475.00
Structures								Price/ea	Total Price	Price/ea	Total Price	Price/ea	Total Price	Price/ea	Total Price
Replacement 1200 MHs				1	1	1	1	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00
								Total Price	\$ 7,975.00	Total Price	\$ 7,975.00	Total Price	\$ 7,975.00	Total Price	\$ 7,975.00
Lakeshore Drive		Ex./Prop. Length	Ex. Diam.	Required Diameters (m)				S1		S2		S3		S4	
Name				S1	S2	S3	S4	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price
MH_097-GB_097		23.5	0.3	0.75	0.75	0.75	0.675	\$ 650.00	\$ 15,275.00	\$ 650.00	\$ 15,275.00	\$ 525.00	\$ 12,337.50	\$ 525.00	\$ 12,337.50
Structures								Price/ea	Total Price	Price/ea	Total Price	Price/ea	Total Price	Price/ea	Total Price
Replacement 1200 MHs				1	1	1	1	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00	\$ 5,500.00
								Total Price	\$ 20,775.00	Total Price	\$ 20,775.00	Total Price	\$ 17,837.50	Total Price	\$ 17,837.50
								Total Price	\$ 20,775.00	Total Price	\$ 20,775.00	Total Price	\$ 17,837.50	Total Price	\$ 17,837.50

THORNHURST ROAD INFRASTRUCTURE PROJECT  
SWM NEEDS STUDY  
OCTOBER 28, 2016

PRELIMINARY CONSTRUCTION COST ESTIMATES

Eims/Harbour		Ex./Prop. Length	Ex. Diam.	Required Diameters (m)				S1		S2		S3		S4	
Name				S1	S2	S3	S4	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price
CB_116-CB_117	9.6	0.3	0.375	0.45	0.6	0.6	\$ 275.00	\$ 2,640.00	\$ 300.00	\$ 2,880.00	\$ 450.00	\$ 4,320.00	\$ 450.00	\$ 4,320.00	
CB_117-CB_118	21.5	0.3	0.375	0.45	0.6	0.6	\$ 275.00	\$ 5,912.50	\$ 300.00	\$ 6,450.00	\$ 450.00	\$ 9,675.00	\$ 450.00	\$ 9,675.00	
CB_118-850C1	20.3	0.3	0.375	0.45	0.6	0.6	\$ 275.00	\$ 5,582.50	\$ 300.00	\$ 6,090.00	\$ 450.00	\$ 9,135.00	\$ 450.00	\$ 9,135.00	
850C1-850C2	9.1	0.85	0.45	0.45	0.6	0.6	\$ 300.00	\$ 2,730.00	\$ 300.00	\$ 2,730.00	\$ 450.00	\$ 4,095.00	\$ 450.00	\$ 4,095.00	
850C2-MH_060	61.1	0.5	0.45	0.45	0.6	0.6	\$ 300.00	\$ 18,330.00	\$ 300.00	\$ 18,330.00	\$ 450.00	\$ 27,495.00	\$ 450.00	\$ 27,495.00	
MH_059-MH_060	34	0.3	0.375	0.375	0.45	0.45	\$ 275.00	\$ 9,350.00	\$ 275.00	\$ 9,350.00	\$ 300.00	\$ 10,200.00	\$ 300.00	\$ 10,200.00	
MH_060-600C3	13.8	0.6	0.6	0.675	0.75	0.75	\$ 450.00	\$ 6,210.00	\$ 450.00	\$ 6,210.00	\$ 525.00	\$ 7,245.00	\$ 525.00	\$ 7,245.00	
600C3-CB_119	82.8	0.5	0.6	0.675	0.675	0.75	\$ 450.00	\$ 37,260.00	\$ 525.00	\$ 43,470.00	\$ 525.00	\$ 43,470.00	\$ 525.00	\$ 43,470.00	
CB_119-MH_061	10.3	0.6	0.6	0.675	0.675	0.75	\$ 450.00	\$ 4,635.00	\$ 525.00	\$ 5,407.50	\$ 525.00	\$ 5,407.50	\$ 525.00	\$ 5,407.50	
MH_061-MH_062	11.6	0.45	0.6	0.675	0.675	0.75	\$ 450.00	\$ 5,220.00	\$ 525.00	\$ 6,090.00	\$ 525.00	\$ 6,090.00	\$ 525.00	\$ 6,090.00	
MH_062-MH_063	26	0.45	0.6	0.675	0.675	0.75	\$ 450.00	\$ 11,700.00	\$ 525.00	\$ 13,650.00	\$ 525.00	\$ 13,650.00	\$ 525.00	\$ 13,650.00	
MH_063-MH_066	35.5	0.525	0.6	0.675	0.675	0.75	\$ 450.00	\$ 15,975.00	\$ 525.00	\$ 18,637.50	\$ 525.00	\$ 18,637.50	\$ 525.00	\$ 18,637.50	
MH_064-MH_065	60.4	0.3	0.375	0.375	0.375	0.45	\$ 275.00	\$ 16,610.00	\$ 275.00	\$ 16,610.00	\$ 275.00	\$ 16,610.00	\$ 300.00	\$ 18,120.00	
MH_065-MH_066	32.7	0.375	0.375	0.375	0.45	0.525	\$ 275.00	\$ 8,992.50	\$ 275.00	\$ 8,992.50	\$ 300.00	\$ 9,810.00	\$ 325.00	\$ 10,627.50	
MH_066-MH_067	48.7	0.75	0.795	0.795	0.795	0.795	\$ 1,200.00	\$ 58,440.00	\$ 1,200.00	\$ 58,440.00	\$ 1,200.00	\$ 58,440.00	\$ 1,200.00	\$ 58,440.00	
MH_067-MH_067	13.7	0.75	0.795	0.795	0.795	0.795	\$ 1,200.00	\$ 16,440.00	\$ 1,200.00	\$ 16,440.00	\$ 1,200.00	\$ 16,440.00	\$ 1,200.00	\$ 16,440.00	
Structures							Price/ea	Total Price	Price/ea	Total Price	Price/ea	Total Price	Price/ea	Total Price	
Replacement 1200 MHS			14	14	14	8	\$ 5,500.00	\$ 77,000.00	\$ 5,500.00	\$ 77,000.00	\$ 5,500.00	\$ 77,000.00	\$ 5,500.00	\$ 77,000.00	
Replacement 1500 MHS			0	0	0	6	\$ 9,000.00	\$ -	\$ 9,000.00	\$ -	\$ 9,000.00	\$ -	\$ 9,000.00	\$ -	\$ 9,000.00
Replacement 2400 MHS			2	2	2	2	\$ 16,000.00	\$ 32,000.00	\$ 16,000.00	\$ 32,000.00	\$ 16,000.00	\$ 32,000.00	\$ 16,000.00	\$ 32,000.00	
Replacement CBs			15	15	15	15	\$ 4,000.00	\$ 60,000.00	\$ 4,000.00	\$ 60,000.00	\$ 4,000.00	\$ 60,000.00	\$ 4,000.00	\$ 60,000.00	
							Total Price	\$ 395,027.50	Total Price	\$ 408,777.50	Total Price	\$ 425,720.00	Total Price	\$ 475,547.50	
Bruce/King															
MH_048-MH_069	55	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 24,750.00	\$ 450.00	\$ 24,750.00	\$ 450.00	\$ 24,750.00	\$ 450.00	\$ 24,750.00	
MH_069-MH_072	58.2	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 26,190.00	\$ 450.00	\$ 26,190.00	\$ 450.00	\$ 26,190.00	\$ 450.00	\$ 26,190.00	
MH_058-MH_070	134.6	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 60,570.00	\$ 450.00	\$ 60,570.00	\$ 450.00	\$ 60,570.00	\$ 450.00	\$ 60,570.00	
MH_070-MH_071	58.2	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 26,190.00	\$ 450.00	\$ 26,190.00	\$ 450.00	\$ 26,190.00	\$ 450.00	\$ 26,190.00	
MH_071-MH_072	18.6	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 8,370.00	\$ 450.00	\$ 8,370.00	\$ 450.00	\$ 8,370.00	\$ 450.00	\$ 8,370.00	
MH_072-MH_073	49.2	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 22,140.00	\$ 450.00	\$ 22,140.00	\$ 450.00	\$ 22,140.00	\$ 450.00	\$ 22,140.00	
MH_073-MH_074	10.7	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 4,815.00	\$ 450.00	\$ 4,815.00	\$ 450.00	\$ 4,815.00	\$ 450.00	\$ 4,815.00	
MH_074-BR_074	6.1	0.525	0.525	0.525	0.525	0.525	\$ 325.00	\$ 1,982.50	\$ 325.00	\$ 1,982.50	\$ 325.00	\$ 1,982.50	\$ 325.00	\$ 1,982.50	
Structures							Price/ea	Total Price	Price/ea	Total Price	Price/ea	Total Price	Price/ea	Total Price	
Replacement 1200 MHS			8	8	8	8	\$ 5,500.00	\$ 44,000.00	\$ 5,500.00	\$ 44,000.00	\$ 5,500.00	\$ 44,000.00	\$ 5,500.00	\$ 44,000.00	
Replacement CBs			8	8	8	8	\$ 4,000.00	\$ 32,000.00	\$ 4,000.00	\$ 32,000.00	\$ 4,000.00	\$ 32,000.00	\$ 4,000.00	\$ 32,000.00	
							Total Price	\$ 251,007.50	Total Price	\$ 251,007.50	Total Price	\$ 251,007.50	Total Price	\$ 251,007.50	

THORNBURY ROAD INFRASTRUCTURE PROJECT  
SWM NEEDS STUDY  
OCTOBER 28, 2016

PRELIMINARY CONSTRUCTION COST ESTIMATES

Elma/Arthur Name	Ex./Prop. Length	Ex. Diam.	Required Diameters (m)				S1		S2		S3		S4	
			S1	S2	S3	S4	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price
MH_014-MH_015	78.2	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 17,595.00	\$ 225.00	\$ 17,595.00	\$ 225.00	\$ 17,595.00	\$ 225.00	\$ 17,595.00
MH_015-MH_016	47.9	0.375	0.375	0.375	0.525	0.675	\$ 275.00	\$ 13,172.50	\$ 275.00	\$ 13,172.50	\$ 325.00	\$ 15,567.50	\$ 525.00	\$ 25,147.50
MH_017-MH_018	16.1	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 3,622.50	\$ 225.00	\$ 3,622.50	\$ 225.00	\$ 3,622.50	\$ 225.00	\$ 3,622.50
MH_019-MH_020	52	0.3	0.375	0.45	0.6	0.675	\$ 275.00	\$ 14,300.00	\$ 300.00	\$ 15,600.00	\$ 450.00	\$ 23,400.00	\$ 525.00	\$ 27,300.00
MH_020-MH_021	12.1	0.375	0.375	0.45	0.6	0.675	\$ 275.00	\$ 3,327.50	\$ 300.00	\$ 3,630.00	\$ 450.00	\$ 5,445.00	\$ 525.00	\$ 6,352.50
MH_021-MH_022	18.7	0.45	0.45	0.45	0.6	0.675	\$ 300.00	\$ 5,610.00	\$ 300.00	\$ 5,610.00	\$ 450.00	\$ 8,415.00	\$ 525.00	\$ 9,817.50
MH_022-MH_023	44.5	0.45	0.45	0.45	0.6	0.675	\$ 300.00	\$ 13,350.00	\$ 300.00	\$ 13,350.00	\$ 450.00	\$ 20,025.00	\$ 525.00	\$ 23,362.50
MH_023-MH_024	51.9	0.45	0.45	0.45	0.6	0.675	\$ 300.00	\$ 15,570.00	\$ 300.00	\$ 15,570.00	\$ 450.00	\$ 22,095.00	\$ 525.00	\$ 25,777.50
MH_024-MH_025	49.1	0.375	0.375	0.45	0.6	0.675	\$ 300.00	\$ 14,730.00	\$ 300.00	\$ 14,730.00	\$ 450.00	\$ 22,095.00	\$ 525.00	\$ 25,777.50
MH_025-MH_026	52.5	0.375	0.375	0.45	0.6	0.675	\$ 300.00	\$ 15,750.00	\$ 300.00	\$ 15,750.00	\$ 450.00	\$ 23,625.00	\$ 525.00	\$ 27,562.50
MH_026-MH_027	16.9	0.375	0.375	0.45	0.6	0.675	\$ 300.00	\$ 5,070.00	\$ 300.00	\$ 5,070.00	\$ 450.00	\$ 7,605.00	\$ 525.00	\$ 8,872.50
MH_027-MH_028	87	0.45	0.45	0.45	0.6	0.675	\$ 300.00	\$ 26,100.00	\$ 300.00	\$ 26,100.00	\$ 450.00	\$ 39,150.00	\$ 525.00	\$ 45,675.00
MH_028-MH_029	52.1	0.3	0.45	0.525	0.675	0.75	\$ 300.00	\$ 15,630.00	\$ 325.00	\$ 16,932.50	\$ 525.00	\$ 27,352.50	\$ 650.00	\$ 33,865.00
MH_029-MH_030	48	0.3	0.525	0.6	0.675	0.75	\$ 325.00	\$ 15,600.00	\$ 450.00	\$ 21,600.00	\$ 525.00	\$ 25,200.00	\$ 650.00	\$ 31,200.00
MH_030-MH_031	9	0.3	0.525	0.6	0.675	0.75	\$ 325.00	\$ 2,925.00	\$ 450.00	\$ 4,050.00	\$ 525.00	\$ 4,725.00	\$ 650.00	\$ 5,850.00
MH_031-MH_032	61.3	0.375	0.45	0.45	0.525	0.6	\$ 300.00	\$ 18,390.00	\$ 300.00	\$ 18,390.00	\$ 325.00	\$ 19,922.50	\$ 450.00	\$ 27,585.00
MH_032-MH_033	83.1	0.375	0.45	0.45	0.525	0.6	\$ 300.00	\$ 24,930.00	\$ 300.00	\$ 24,930.00	\$ 325.00	\$ 27,007.50	\$ 450.00	\$ 37,395.00
MH_033-MH_034	123	0.525	0.9	1.05	1.2	1.35	\$ 700.00	\$ 86,100.00	\$ 750.00	\$ 92,250.00	\$ 850.00	\$ 104,550.00	\$ 1,000.00	\$ 123,000.00
MH_034-MH_035	108.4	0.6	0.9	1.05	1.2	1.35	\$ 700.00	\$ 75,880.00	\$ 750.00	\$ 81,300.00	\$ 850.00	\$ 92,140.00	\$ 1,000.00	\$ 108,400.00
MH_035-MH_036	13.1	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 2,947.50	\$ 225.00	\$ 2,947.50	\$ 225.00	\$ 2,947.50	\$ 225.00	\$ 2,947.50
MH_036-MH_037	22.8	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 5,130.00	\$ 225.00	\$ 5,130.00	\$ 225.00	\$ 5,130.00	\$ 225.00	\$ 5,130.00
MH_037-MH_038	39.1	0.6	0.9	1.05	1.2	1.35	\$ 700.00	\$ 27,370.00	\$ 750.00	\$ 29,325.00	\$ 850.00	\$ 33,235.00	\$ 1,000.00	\$ 39,100.00
MH_038-MH_039	12.8	0.3	0.375	0.375	0.375	0.375	\$ 275.00	\$ 3,520.00	\$ 275.00	\$ 3,520.00	\$ 275.00	\$ 3,520.00	\$ 275.00	\$ 3,520.00
MH_039-MH_040	1.1	0.3	0.375	0.375	0.375	0.375	\$ 275.00	\$ 302.50	\$ 275.00	\$ 302.50	\$ 275.00	\$ 302.50	\$ 275.00	\$ 302.50
MH_040-MH_041	23	0.3	0.375	0.375	0.375	0.375	\$ 275.00	\$ 6,325.00	\$ 275.00	\$ 6,325.00	\$ 275.00	\$ 6,325.00	\$ 275.00	\$ 6,325.00
MH_041-MH_042	6.5	0.3	0.375	0.375	0.45	0.45	\$ 275.00	\$ 1,787.50	\$ 275.00	\$ 1,787.50	\$ 300.00	\$ 1,950.00	\$ 300.00	\$ 1,950.00
MH_042-MH_043	6.8	0.3	0.375	0.375	0.45	0.45	\$ 275.00	\$ 1,870.00	\$ 275.00	\$ 1,870.00	\$ 300.00	\$ 2,040.00	\$ 300.00	\$ 2,040.00
MH_043-MH_044	14.4	0.3	0.375	0.375	0.45	0.45	\$ 275.00	\$ 3,960.00	\$ 275.00	\$ 3,960.00	\$ 300.00	\$ 4,320.00	\$ 300.00	\$ 4,320.00
MH_044-MH_045	7.1	0.6	0.9	1.05	1.2	1.35	\$ 700.00	\$ 4,970.00	\$ 750.00	\$ 5,325.00	\$ 850.00	\$ 6,035.00	\$ 1,000.00	\$ 7,100.00
MH_045-MH_046	27.9	0.9	0.9	1.05	1.2	1.35	\$ 700.00	\$ 19,530.00	\$ 750.00	\$ 20,925.00	\$ 850.00	\$ 23,715.00	\$ 1,000.00	\$ 27,900.00
Structures														
Replacement 1200 MHS			25	25	25	22	\$ 5,500.00	\$ 137,500.00	\$ 5,500.00	\$ 137,500.00	\$ 5,500.00	\$ 137,500.00	\$ 5,500.00	\$ 121,000.00
Replacement 1500 MHS			0	0	0	3	\$ 9,000.00	\$ -	\$ 9,000.00	\$ -	\$ 9,000.00	\$ -	\$ 9,000.00	\$ 27,000.00
Replacement 1800 MHS			5	5	5	0	\$ 12,000.00	\$ 60,000.00	\$ 12,000.00	\$ 60,000.00	\$ 12,000.00	\$ 60,000.00	\$ 12,000.00	\$ -
Replacement 2400 MHS			0	0	0	5	\$ 16,000.00	\$ -	\$ 16,000.00	\$ -	\$ 16,000.00	\$ -	\$ 16,000.00	\$ 80,000.00
Replacement Cbs			30	30	30	30	\$ 4,000.00	\$ 120,000.00	\$ 4,000.00	\$ 120,000.00	\$ 4,000.00	\$ 120,000.00	\$ 4,000.00	\$ 120,000.00
			Total Price	Total Price	Total Price	Total Price	\$ 782,865.00	\$ 808,170.00	Total Price	\$ 917,817.50	Total Price	\$ 1,064,262.50	Total Price	\$

THORNHURRY ROAD INFRASTRUCTURE PROJECT  
SWM NEEDS STUDY  
OCTOBER 28, 2016

PRELIMINARY CONSTRUCTION COST ESTIMATES

Structure Name	Ex./Prop. Length	Ex. Diam.	Required Diameters (m)				S1		S2		S3		S4	
			S1	S2	S3	S4	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price
MH_028-MH_029	107.1	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 48,195.00	\$ 450.00	\$ 48,195.00	\$ 450.00	\$ 48,195.00	\$ 450.00	\$ 48,195.00
MH_029-MH_030	111.9	0.6	0.675	0.75	0.75	0.75	\$ 525.00	\$ 58,747.50	\$ 650.00	\$ 72,735.00	\$ 650.00	\$ 72,735.00	\$ 650.00	\$ 72,735.00
CB_114-MH_031	37.5	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 8,437.50	\$ 225.00	\$ 8,437.50	\$ 225.00	\$ 8,437.50	\$ 225.00	\$ 8,437.50
MH_031-CB_115	7.6	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 2,090.00	\$ 275.00	\$ 2,090.00	\$ 275.00	\$ 2,090.00	\$ 275.00	\$ 2,090.00
CB_115-MH_030	4.1	0.4	0.4	0.4	0.4	0.4	\$ 275.00	\$ 1,127.50	\$ 275.00	\$ 1,127.50	\$ 275.00	\$ 1,127.50	\$ 275.00	\$ 1,127.50
MH_030-MH_032	88.7	0.6	0.675	0.75	0.75	0.75	\$ 525.00	\$ 46,567.50	\$ 650.00	\$ 57,655.00	\$ 650.00	\$ 57,655.00	\$ 650.00	\$ 57,655.00
P1-MH_032	23.4	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 5,265.00	\$ 225.00	\$ 5,265.00	\$ 225.00	\$ 5,265.00	\$ 225.00	\$ 5,265.00
MH_032-MH_033	29.1	0.6	0.675	0.75	0.75	0.75	\$ 525.00	\$ 15,277.50	\$ 650.00	\$ 18,915.00	\$ 650.00	\$ 18,915.00	\$ 650.00	\$ 18,915.00
MH_033-MH_034	69.3	0.6	0.675	0.75	0.75	0.75	\$ 525.00	\$ 36,382.50	\$ 650.00	\$ 45,045.00	\$ 650.00	\$ 45,045.00	\$ 650.00	\$ 45,045.00
MH_034-MH_035	38.7	0.6	0.675	0.75	0.75	0.75	\$ 525.00	\$ 20,317.50	\$ 650.00	\$ 25,155.00	\$ 650.00	\$ 25,155.00	\$ 650.00	\$ 25,155.00
MH_035-MH_036	7.5	0.6	0.675	0.75	0.75	0.75	\$ 525.00	\$ 3,897.50	\$ 650.00	\$ 4,875.00	\$ 650.00	\$ 4,875.00	\$ 650.00	\$ 4,875.00
MH_036-MH_037	6.6	0.6	0.675	0.75	0.75	0.75	\$ 525.00	\$ 3,465.00	\$ 650.00	\$ 4,290.00	\$ 650.00	\$ 4,290.00	\$ 650.00	\$ 4,290.00
MH_100-MH_037	32.6	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 7,335.00	\$ 225.00	\$ 7,335.00	\$ 225.00	\$ 7,335.00	\$ 225.00	\$ 7,335.00
MH_037-MH_038	14	0.6	0.75	0.75	0.75	0.75	\$ 650.00	\$ 9,100.00	\$ 650.00	\$ 9,100.00	\$ 650.00	\$ 9,100.00	\$ 650.00	\$ 9,100.00
MH_038-MH_039	39.3	0.6	0.75	0.9	0.75	0.9	\$ 650.00	\$ 25,545.00	\$ 700.00	\$ 27,510.00	\$ 650.00	\$ 25,545.00	\$ 700.00	\$ 27,510.00
MH_039-MH_040	57	0.6	0.75	0.9	0.75	0.9	\$ 650.00	\$ 37,050.00	\$ 700.00	\$ 39,900.00	\$ 650.00	\$ 37,050.00	\$ 700.00	\$ 39,900.00
MH_040-MH_041	24.5	0.6	0.75	0.9	0.75	0.9	\$ 650.00	\$ 15,925.00	\$ 700.00	\$ 17,150.00	\$ 650.00	\$ 15,925.00	\$ 700.00	\$ 17,150.00
MH_041-BK_041	63.4	0.6	0.75	0.9	0.75	0.9	\$ 650.00	\$ 41,210.00	\$ 700.00	\$ 44,380.00	\$ 650.00	\$ 41,210.00	\$ 700.00	\$ 44,380.00
Structures							Price/ea	Total Price	Price/ea	Total Price	Price/ea	Total Price	Price/ea	Total Price
Replacement 1200 MHs			13	6	6	6	\$ 5,500.00	\$ 71,500.00	\$ 5,500.00	\$ 33,000.00	\$ 5,500.00	\$ 33,000.00	\$ 5,500.00	\$ 33,000.00
Replacement 1500 MHs			5	8	12	7	\$ 9,000.00	\$ 45,000.00	\$ 9,000.00	\$ 72,000.00	\$ 9,000.00	\$ 108,000.00	\$ 9,000.00	\$ 63,000.00
Replacement 1800 MHs			0	4	0	5	\$ 12,000.00	\$ -	\$ 12,000.00	\$ 48,000.00	\$ 12,000.00	\$ -	\$ 12,000.00	\$ 60,000.00
Replacement Cbs			17	17	17	17	\$ 4,000.00	\$ 68,000.00	\$ 4,000.00	\$ 68,000.00	\$ 4,000.00	\$ 68,000.00	\$ 4,000.00	\$ 68,000.00
							Total Price	\$ 570,475.00	Total Price	\$ 650,160.00	Total Price	\$ 638,950.00	Total Price	\$ 663,860.00

THORNBURY ROAD INFRASTRUCTURE PROJECT  
SWM NEEDS STUDY  
OCTOBER 28, 2016

PRELIMINARY CONSTRUCTION COST ESTIMATES

Victoria Street Name	Ex./Prop. Length	Ex. Diam.	Required Diameters (m)				S1		S2		S3		S4	
			S1	S2	S3	S4	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price	Price/m	Sewer Price
CB_100-CB_MH_100	8.5	0.525	0.3	0.3	0.3	0.3	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50
CB_MH_100-MH_010	95.11		0.525	0.525	0.525	0.525	\$ 325.00	\$ 30,910.75	\$ 325.00	\$ 30,910.75	\$ 325.00	\$ 30,910.75	\$ 325.00	\$ 30,910.75
CB_105-CB_106	25	0.2	0.3	0.3	0.3	0.3	\$ 225.00	\$ 5,625.00	\$ 225.00	\$ 5,625.00	\$ 225.00	\$ 5,625.00	\$ 225.00	\$ 5,625.00
CB_106-CB_107	25.4	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 5,715.00	\$ 225.00	\$ 5,715.00	\$ 225.00	\$ 5,715.00	\$ 225.00	\$ 5,715.00
CB_107-TEMP	42.1	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 9,472.50	\$ 225.00	\$ 9,472.50	\$ 225.00	\$ 9,472.50	\$ 225.00	\$ 9,472.50
TEMP-DCBMH_109	17.3	0.9	0.9	0.9	0.9	0.9	\$ 700.00	\$ 12,110.00	\$ 700.00	\$ 12,110.00	\$ 700.00	\$ 12,110.00	\$ 700.00	\$ 12,110.00
CB_109-MH_010	83.6		0.375	0.45	0.375	0.45	\$ 275.00	\$ 22,990.00	\$ 300.00	\$ 25,080.00	\$ 275.00	\$ 22,990.00	\$ 300.00	\$ 25,080.00
CB_MH_010-MH_010	8.5		0.3	0.375	0.375	0.375	\$ 225.00	\$ 1,912.50	\$ 275.00	\$ 2,337.50	\$ 275.00	\$ 2,337.50	\$ 275.00	\$ 2,337.50
MH_010-CB_103	89.7	600	0.6	0.6	0.675	0.675	\$ 450.00	\$ 40,365.00	\$ 450.00	\$ 40,365.00	\$ 525.00	\$ 47,092.50	\$ 525.00	\$ 47,092.50
CB_101-CB_103	8.5		0.3	0.3	0.3	0.3	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50
CB_103-CB_104	60.3	600	0.6	0.6	0.675	0.675	\$ 450.00	\$ 27,135.00	\$ 450.00	\$ 27,135.00	\$ 525.00	\$ 31,657.50	\$ 525.00	\$ 31,657.50
CB_102-CB_104	8.5		0.3	0.3	0.3	0.3	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50
CB_104-MH_011	49.2	0.5	0.6	0.6	0.675	0.675	\$ 450.00	\$ 22,140.00	\$ 450.00	\$ 22,140.00	\$ 525.00	\$ 25,830.00	\$ 525.00	\$ 25,830.00
CB_011-MH_011	8.5		0.3	0.3	0.3	0.3	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50	\$ 225.00	\$ 1,912.50
CB_109-02	31.5	0.8	0.8	0.8	0.8	0.8	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout
D2-CB_110	52.6	0.5	0.5	0.5	0.5	0.5	\$ 300.00	Cleanout	\$ 300.00	Cleanout	\$ 300.00	Cleanout	\$ 300.00	Cleanout
CB_110-CB_111	16.7	0.8	0.8	0.8	0.8	0.8	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout
CB_111-CB_112	23.2	0.8	0.8	0.8	0.8	0.8	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout
CB_112-CB_113	18.7	0.8	0.8	0.8	0.8	0.8	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout
CB_113-03	52	0.82	0.82	0.82	0.82	0.82	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout	\$ 1,200.00	Cleanout
D3-CB_03	11	0.5	0.5	0.5	0.5	0.5	\$ 300.00	Cleanout	\$ 300.00	Cleanout	\$ 300.00	Cleanout	\$ 300.00	Cleanout
CB_D3-MH_011	71.2	600	0.45	0.45	0.6	0.6	\$ 300.00	\$ 21,360.00	\$ 300.00	\$ 21,360.00	\$ 450.00	\$ 32,040.00	\$ 450.00	\$ 32,040.00
MH_011-MH_012	12.5	600	0.675	0.75	0.75	0.75	\$ 525.00	\$ 6,562.50	\$ 650.00	\$ 8,125.00	\$ 650.00	\$ 8,125.00	\$ 700.00	\$ 8,750.00
MH_012-MH_013	38.3	600	0.75	0.9	0.9	1.05	\$ 650.00	\$ 24,895.00	\$ 700.00	\$ 26,810.00	\$ 700.00	\$ 26,810.00	\$ 750.00	\$ 28,725.00
MH_013-CB_MH15	18.1	600	0.75	0.9	0.9	1.05	\$ 650.00	\$ 11,765.00	\$ 700.00	\$ 12,670.00	\$ 700.00	\$ 12,670.00	\$ 750.00	\$ 13,575.00
CB_MH16-CB_MH15	17.5	600	0.375	0.375	0.525	0.6	\$ 275.00	\$ 4,812.50	\$ 275.00	\$ 4,812.50	\$ 325.00	\$ 5,687.50	\$ 450.00	\$ 7,875.00
CB_MH15-DCBMH5	5.5	0.9	0.75	0.9	1.05	1.05	\$ 650.00	\$ 3,575.00	\$ 700.00	\$ 3,850.00	\$ 750.00	\$ 4,125.00	\$ 750.00	\$ 4,125.00
DCBMH5-DCBMH4	24	1.2	1.2	1.2	1.2	1.2	\$ 850.00	No Upgrade	\$ 850.00	No Upgrade	\$ 850.00	No Upgrade	\$ 850.00	No Upgrade
DCBMH4-MH3	42.5	1.2	1.2	1.2	1.2	1.2	\$ 850.00	No Upgrade	\$ 850.00	No Upgrade	\$ 850.00	No Upgrade	\$ 850.00	No Upgrade
CB_MH16-MH3	41	0.3	0.3	0.3	0.3	0.3	\$ 225.00	No Upgrade	\$ 225.00	No Upgrade	\$ 225.00	No Upgrade	\$ 225.00	No Upgrade
MH5-DCBMH2	43	1.2	1.2	1.2	1.2	1.2	\$ 850.00	No Upgrade	\$ 850.00	No Upgrade	\$ 850.00	No Upgrade	\$ 850.00	No Upgrade
DCBMH2-HW1	51.7	1.5	1.5	1.5	1.5	1.5	\$ 1,200.00	No Upgrade	\$ 1,200.00	No Upgrade	\$ 1,200.00	No Upgrade	\$ 1,200.00	No Upgrade
Structures							Total Price	Total Price	Total Price	Total Price	Total Price	Total Price	Total Price	Total Price
Replacement 1200 MHS			7	4	4	4	\$ 5,500.00	\$ 38,500.00	\$ 5,500.00	\$ 22,000.00	\$ 5,500.00	\$ 22,000.00	\$ 5,500.00	\$ 22,000.00
Replacement 1500 MHS			1	1	1	0	\$ 9,000.00	\$ 9,000.00	\$ 9,000.00	\$ 9,000.00	\$ 9,000.00	\$ 9,000.00	\$ 9,000.00	\$ 9,000.00
Replacement 1800 MHS			2	5	5	6	\$ 12,000.00	\$ 24,000.00	\$ 12,000.00	\$ 60,000.00	\$ 12,000.00	\$ 60,000.00	\$ 12,000.00	\$ 72,000.00
Replacement Cbs			10	10	10	10	\$ 4,000.00	\$ 40,000.00	\$ 4,000.00	\$ 40,000.00	\$ 4,000.00	\$ 40,000.00	\$ 4,000.00	\$ 40,000.00
							Total Price	\$ 370,495.75	Total Price	\$ 397,168.25	Total Price	\$ 421,848.25	Total Price	\$ 432,570.75



THORNBURY ROAD INFRASTRUCTURE PROJECT  
SWM NEEDS STUDY  
OCTOBER 28, 2016

PRELIMINARY CONSTRUCTION COST ESTIMATES

Little Beaver River Tributary Watercourse		Unit	Unit Price	Quantity			Construction Cost		
Item				Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
Excavation and Grading		m <sup>3</sup>	\$ 18.00	255	760	285	\$ 4,590.00	\$ 13,680.00	\$ 5,130.00
Clearing and Grubbing		m <sup>2</sup>	\$ 10.00	0	1300	500	\$ -	\$ 13,000.00	\$ 5,000.00
Hydroseed		m <sup>2</sup>	\$ 4.00	1400	1630	525	\$ 5,600.00	\$ 6,520.00	\$ 2,100.00
1950x1300 CSPA		m	\$ 700.00	16	21	0	\$ 11,200.00	\$ 14,700.00	\$ -
Concrete Headwall		ea.	\$ 25,000.00	2	2	0	\$ 50,000.00	\$ 50,000.00	\$ -
Road Reinstatement		m <sup>2</sup>	\$ 40.00	45	125	0	\$ 1,800.00	\$ 5,000.00	\$ -
2400x1200 Conc. Box		m	\$ 2,500.00	12.4	0	0	\$ 31,000.00	\$ -	\$ -
1270x790 CSPA		m	\$ 300.00	12.4	0	0	\$ 3,720.00	\$ -	\$ -
Concrete Headwall		ea.	\$ 25,000.00	2	0	0	\$ 50,000.00	\$ -	\$ -
Road Reinstatement		m <sup>2</sup>	\$ 40.00	80	0	0	\$ 3,200.00	\$ -	\$ -
2400x1200 Conc. Box		m	\$ 2,500.00	0	0	140	\$ -	\$ -	\$ 350,000.00
Concrete Headwall		ea.	\$ 25,000.00	0	0	2	\$ -	\$ -	\$ 50,000.00
Road Reinstatement		m <sup>2</sup>	\$ 40.00	0	0	100	\$ -	\$ -	\$ 4,000.00
TOTAL							\$ 161,110.00	\$ 102,900.00	\$ 416,230.00

THORNBURY ROAD INFRASTRUCTURE PROJECT  
SWM NEEDS STUDY  
OCTOBER 28, 2016

PRELIMINARY CONSTRUCTION COST ESTIMATES

Alice Street/Moore Crescent		Ex. Diam.	Required Diameters (m)				AMC1		AMC1/2	
Name	Ex./Prop. Length		AMC1	AMC1/2	AMC1/3	AMC1/2/3	Price/m	Sewer Price	Price/m	Sewer Price
MH_075-MH_077	45.6	0.3	0.375	0.375	0.375	0.375	\$ 275.00	\$ 12,540.00	\$ 275.00	\$ 12,540.00
MH_076-MH_077	9.6	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 2,160.00	\$ 225.00	\$ 2,160.00
MH_077-MH_085	73.4	0.45	0.45	0.45	0.45	0.45	\$ 300.00	\$ 22,020.00	\$ 300.00	\$ 22,020.00
CB_SA1-MH_SA2	60.7		N/A	0.3	N/A	0.3	N/A	N/A	\$ 225.00	\$ 13,657.50
MH_SA2-MH_082	78.9		N/A	0.375	N/A	0.375	N/A	N/A	\$ 275.00	\$ 21,697.50
MH_081-MH_082	28.7	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 7,892.50	\$ 275.00	\$ 7,892.50
MH_082-MH_083	42.7	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 11,742.50	\$ 275.00	\$ 11,742.50
MH_083-MH_084	46.5	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 12,787.50	\$ 275.00	\$ 12,787.50
MH_084-MH_085	16.4	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 4,510.00	\$ 275.00	\$ 4,510.00
MH_085-MH_086	97.5	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 43,875.00	\$ 450.00	\$ 43,875.00
CB_SA3-MH_SA4	54.1		N/A	N/A	0.45	0.45	N/A	N/A	N/A	N/A
MH_SA4-MH_SA5	21.5		N/A	N/A	0.45	0.45	N/A	N/A	N/A	N/A
MH_SA5-MH_SA6	76.7		0.3	0.3	0.45	0.45	\$ 225.00	\$ 17,257.50	\$ 225.00	\$ 17,257.50
MH_SA6-MH_086	15.8		0.375	0.375	0.45	0.45	\$ 275.00	\$ 4,345.00	\$ 275.00	\$ 4,345.00
MH_086-BR_086	10.5	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 4,725.00	\$ 450.00	\$ 4,725.00
<b>Structures</b>										
Replacement 1200 MHs		9	11	13	13	15	Price/ea \$ 5,500.00	Total Price \$ 60,500.00	Price/ea \$ 5,500.00	Total Price \$ 71,500.00
Replacement CBs		8	10	12	11	13	\$ 4,000.00	\$ 40,000.00	\$ 4,000.00	\$ 48,000.00
<b>Private Land Acquisition</b>										
			0	0.5	0.5	1	Total Price \$ -		Total Price \$ 155,431.00	
							AMC1 Price	\$ 244,355.00	Alc Price	\$ 454,141.00

Alfred Street		Ex. Diam.	Required Diameters (m)				ALF1		ALF1	
Name	Ex./Prop. Length		ALF1	ALF1/2	ALF1/3	ALF1/2/3	Price/m	Sewer Price	Price/m	Sewer Price
CB_SA1-MH_088	60.7		N/A	0.3	N/A	0.3	N/A	N/A	N/A	N/A
MH_088-MH_089	12.1	0.375	0.375	0.45	0.375	0.45	\$ 275.00	\$ 3,327.50	\$ 275.00	\$ 3,327.50
MH_089-MH_091	96.7	0.375	0.45	0.525	0.45	0.525	\$ 300.00	\$ 29,010.00	\$ 300.00	\$ 29,010.00
MH_090-MH_091	8.8	0.45	0.525	0.525	0.525	0.525	\$ 325.00	\$ 2,860.00	\$ 325.00	\$ 2,860.00
MH_091-MH_093	17.4	0.525	0.6	0.6	0.6	0.6	\$ 450.00	\$ 7,830.00	\$ 450.00	\$ 7,830.00
MH_093-MH_094	78.6	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 35,370.00	\$ 450.00	\$ 35,370.00
CB_SA3-J4	114.5		N/A	N/A	0.45	0.45	N/A	N/A	N/A	N/A
MH_094-MH_095	56.1	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 25,245.00	\$ 450.00	\$ 25,245.00
MH_095-BR_095	61	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 27,450.00	\$ 450.00	\$ 27,450.00
<b>Structures</b>										
Replacement 1200 MHs		7	7	8	8	9	Price/ea \$ 5,500.00	Total Price \$ 38,500.00	Price/ea \$ 5,500.00	Total Price \$ 38,500.00
Replacement 1500 MHs		0	0	0	0	0	\$ 9,000.00	-	\$ 9,000.00	-
Replacement CBs		7	7	8	7	8	\$ 4,000.00	\$ 28,000.00	\$ 4,000.00	\$ 28,000.00
<b>Private Land Acquisition</b>										
			0	0	0.5	0.5	Total Price \$ -		Total Price \$ -	
							ALF1 Price	\$ 197,592.50	ALF1 Price	\$ 197,592.50
							Total Price	\$ 441,947.50	Total Price	\$ 651,733.50

New Storm Sewer

THORNBURY ROAD INFRASTRUCTURE PROJECT  
SWM NEEDS STUDY  
OCTOBER 28, 2016

PRELIMINARY CONSTRUCTION COST ESTIMATES

Alice Street/Moore Crescent		Ex. Diam.	Required Diameters (m)				AMC1/3		AMC1/2/3	
Name	Ex./Prop. Length		AMC1	AMC1/2	AMC1/3	AMC1/2/3	Price/m	Sewer Price	Price/m	Sewer Price
MH_075-MH_077	45.6	0.3	0.375	0.375	0.375	0.375	\$ 275.00	\$ 12,540.00	\$ 275.00	\$ 12,540.00
MH_076-MH_077	9.6	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 2,160.00	\$ 225.00	\$ 2,160.00
MH_077-MH_085	73.4	0.45	0.45	0.45	0.45	0.45	\$ 300.00	\$ 22,020.00	\$ 300.00	\$ 22,020.00
CB_SA1-MH_SA2	60.7		N/A	0.3	N/A	0.3	N/A	N/A	\$ 225.00	\$ 13,657.50
MH_SA2-MH_082	78.9		N/A	0.375	N/A	0.375	N/A	N/A	\$ 275.00	\$ 21,697.50
MH_081-MH_082	28.7	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 7,892.50	\$ 275.00	\$ 7,892.50
MH_082-MH_083	42.7	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 11,742.50	\$ 275.00	\$ 11,742.50
MH_083-MH_084	46.5	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 12,787.50	\$ 275.00	\$ 12,787.50
MH_084-MH_085	16.4	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 4,510.00	\$ 275.00	\$ 4,510.00
MH_085-MH_086	97.5	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 43,875.00	\$ 450.00	\$ 43,875.00
CB_SA3-MH_SA4	54.1		N/A	N/A	0.45	0.45	\$ 300.00	\$ 16,230.00	\$ 300.00	\$ 16,230.00
MH_SA4-MH_SA5	21.5		N/A	N/A	0.45	0.45	\$ 300.00	\$ 6,450.00	\$ 300.00	\$ 6,450.00
MH_SA5-MH_SA6	76.7		0.3	0.3	0.45	0.45	\$ 300.00	\$ 23,010.00	\$ 300.00	\$ 23,010.00
MH_SA6-MH_086	15.8		0.375	0.375	0.45	0.45	\$ 300.00	\$ 4,740.00	\$ 300.00	\$ 4,740.00
MH_086-BR_086	10.5	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 4,725.00	\$ 450.00	\$ 4,725.00
Structures							Price/ea	Total Price	Price/ea	Total Price
Replacement 1200 MHs		9	11	13	13	15	\$ 5,500.00	\$ 71,500.00	\$ 5,500.00	\$ 82,500.00
Replacement CBs		8	10	12	11	13	\$ 4,000.00	\$ 44,000.00	\$ 4,000.00	\$ 52,000.00
Private Land Acquisition			0	0.5	0.5	1		Total Price \$ 73,812.00		Total Price \$ 229,243.00
							Alc Price	\$ 361,994.50	Alc Price	\$ 571,780.50

Alfred Street		Ex. Diam.	Required Diameters (m)				ALF1		ALF1	
Name	Ex./Prop. Length		ALF1	ALF1/2	ALF1/3	ALF1/2/3	Price/m	Sewer Price	Price/m	Sewer Price
CB_SA1-MH_088	60.7		N/A	0.3	N/A	0.3	N/A	N/A	N/A	N/A
MH_088-MH_089	12.1	0.375	0.375	0.45	0.375	0.45	\$ 275.00	\$ 3,327.50	\$ 275.00	\$ 3,327.50
MH_089-MH_091	96.7	0.375	0.45	0.525	0.45	0.525	\$ 300.00	\$ 29,010.00	\$ 300.00	\$ 29,010.00
MH_090-MH_091	8.8	0.45	0.525	0.525	0.525	0.525	\$ 325.00	\$ 2,860.00	\$ 325.00	\$ 2,860.00
MH_091-MH_093	17.4	0.525	0.6	0.6	0.6	0.6	\$ 450.00	\$ 7,830.00	\$ 450.00	\$ 7,830.00
MH_093-MH_094	78.6	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 35,370.00	\$ 450.00	\$ 35,370.00
CB_SA3-J4	114.5		N/A	N/A	0.45	0.45	N/A	N/A	N/A	N/A
MH_094-MH_095	56.1	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 25,245.00	\$ 450.00	\$ 25,245.00
MH_095-BR_095	61	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 27,450.00	\$ 450.00	\$ 27,450.00
Structures							Price/ea	Total Price	Price/ea	Total Price
Replacement 1200 MHs		7	7	8	8	9	\$ 5,500.00	\$ 38,500.00	\$ 5,500.00	\$ 38,500.00
Replacement 1500 MHs		0	0	0	0	0	\$ 9,000.00	\$ -	\$ 9,000.00	\$ -
Replacement CBs		7	7	8	7	8	\$ 4,000.00	\$ 28,000.00	\$ 4,000.00	\$ 28,000.00
Private Land Acquisition			0	0	0.5	0.5		Total Price \$ -		Total Price \$ -
							ALF1 Price	\$ 197,592.50	ALF1 Price	\$ 197,592.50
							Total Price	\$ 559,587.00	Total Price	\$ 769,373.00

New Storm Sewer

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PRELIMINARY CONSTRUCTION COST ESTIMATES

Alice Street/Moore Crescent		Ex. Diam.	Required Diameters (m)				AMC1		AMC1	
Name	Ex./Prop. Length		AMC1	AMC1/2	AMC1/3	AMC1/2/3	Price/m	Sewer Price	Price/m	Sewer Price
MH_075-MH_077	45.6	0.3	0.375	0.375	0.375	0.375	\$ 275.00	\$ 12,540.00	\$ 275.00	\$ 12,540.00
MH_076-MH_077	9.6	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 2,160.00	\$ 225.00	\$ 2,160.00
MH_077-MH_085	73.4	0.45	0.45	0.45	0.45	0.45	\$ 300.00	\$ 22,020.00	\$ 300.00	\$ 22,020.00
CB_SA1-MH_SA2	60.7		N/A	0.3	N/A	0.3	N/A	N/A	N/A	N/A
MH_SA2-MH_082	78.9		N/A	0.375	N/A	0.375	N/A	N/A	N/A	N/A
MH_081-MH_082	28.7	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 7,892.50	\$ 275.00	\$ 7,892.50
MH_082-MH_083	42.7	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 11,742.50	\$ 275.00	\$ 11,742.50
MH_083-MH_084	46.5	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 12,787.50	\$ 275.00	\$ 12,787.50
MH_084-MH_085	16.4	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 4,510.00	\$ 275.00	\$ 4,510.00
MH_085-MH_086	97.5	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 43,875.00	\$ 450.00	\$ 43,875.00
CB_SA3-MH_SA4	54.1		N/A	N/A	0.45	0.45	N/A	N/A	N/A	N/A
MH_SA4-MH_SA5	21.5		N/A	N/A	0.45	0.45	N/A	N/A	N/A	N/A
MH_SA5-MH_SA6	76.7		0.3	0.3	0.45	0.45	\$ 225.00	\$ 17,257.50	\$ 225.00	\$ 17,257.50
MH_SA6-MH_086	15.8		0.375	0.375	0.45	0.45	\$ 275.00	\$ 4,345.00	\$ 275.00	\$ 4,345.00
MH_086-BR_086	10.5	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 4,725.00	\$ 450.00	\$ 4,725.00
Structures							Price/ea	Total Price	Price/ea	Total Price
Replacement 1200 MHs		9	11	13	13	15	\$ 5,500.00	\$ 60,500.00	\$ 5,500.00	\$ 60,500.00
Replacement CBs		8	10	12	11	13	\$ 4,000.00	\$ 40,000.00	\$ 4,000.00	\$ 40,000.00
Private Land Acquisition			0	0.5	0.5	1		Total Price \$ -		Total Price \$ -
							Alc Price	\$ 244,355.00	Alc Price	\$ 244,355.00

Alfred Street		Ex. Diam.	Required Diameters (m)				ALF1/2		ALF1/3	
Name	Ex./Prop. Length		ALF1	ALF1/2	ALF1/3	ALF1/2/3	Price/m	Sewer Price	Price/m	Sewer Price
CB_SA1-MH_088	60.7		N/A	0.3	N/A	0.3	\$ 225.00	\$ 13,657.50	N/A	N/A
MH_088-MH_089	12.1	0.375	0.375	0.45	0.375	0.45	\$ 300.00	\$ 3,630.00	\$ 275.00	\$ 3,327.50
MH_089-MH_091	96.7	0.375	0.45	0.525	0.45	0.525	\$ 325.00	\$ 31,427.50	\$ 300.00	\$ 29,010.00
MH_090-MH_091	8.8	0.45	0.525	0.525	0.525	0.525	\$ 325.00	\$ 2,860.00	\$ 325.00	\$ 2,860.00
MH_091-MH_093	17.4	0.525	0.6	0.6	0.6	0.6	\$ 450.00	\$ 7,830.00	\$ 450.00	\$ 7,830.00
MH_093-MH_094	78.6	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 35,370.00	\$ 450.00	\$ 35,370.00
CB_SA3-J4	114.5		N/A	N/A	0.45	0.45	N/A	N/A	\$ 300.00	\$ 34,350.00
MH_094-MH_095	56.1	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 25,245.00	\$ 450.00	\$ 25,245.00
MH_095-BR_095	61	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 27,450.00	\$ 450.00	\$ 27,450.00
Structures							Price/ea	Total Price	Price/ea	Total Price
Replacement 1200 MHs		7	7	8	8	9	\$ 5,500.00	\$ 44,000.00	\$ 5,500.00	\$ 44,000.00
Replacement 1500 MHs		0	0	0	0	0	\$ 9,000.00	\$ -	\$ 9,000.00	\$ -
Replacement CBs		7	7	8	7	8	\$ 4,000.00	\$ 32,000.00	\$ 4,000.00	\$ 28,000.00
Private Land Acquisition			0	0	0.5	0.5		Total Price \$ -		Total Price \$ 93,942.00
							Alf Price	\$ 223,470.00	Alf Price	\$ 331,384.50
							Total Price	\$ 467,825.00	Total Price	\$ 575,739.50

New Storm Sewer

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PRELIMINARY CONSTRUCTION COST ESTIMATES

Alice Street/Moore Crescent		Ex. Diam.	Required Diameters (m)				AMC1		AMC1/2	
Name	Ex./Prop. Length		AMC1	AMC1/2	AMC1/3	AMC1/2/3	Price/m	Sewer Price	Price/m	Sewer Price
MH_075-MH_077	45.6	0.3	0.375	0.375	0.375	0.375	\$ 275.00	\$ 12,540.00	\$ 275.00	\$ 12,540.00
MH_076-MH_077	9.6	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 2,160.00	\$ 225.00	\$ 2,160.00
MH_077-MH_085	73.4	0.45	0.45	0.45	0.45	0.45	\$ 300.00	\$ 22,020.00	\$ 300.00	\$ 22,020.00
CB_SA1-MH_SA2	60.7		N/A	0.3	N/A	0.3	N/A	N/A	\$ 225.00	\$ 13,657.50
MH_SA2-MH_082	78.9		N/A	0.375	N/A	0.375	N/A	N/A	\$ 275.00	\$ 21,697.50
MH_081-MH_082	28.7	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 7,892.50	\$ 275.00	\$ 7,892.50
MH_082-MH_083	42.7	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 11,742.50	\$ 275.00	\$ 11,742.50
MH_083-MH_084	46.5	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 12,787.50	\$ 275.00	\$ 12,787.50
MH_084-MH_085	16.4	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 4,510.00	\$ 275.00	\$ 4,510.00
MH_085-MH_086	97.5	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 43,875.00	\$ 450.00	\$ 43,875.00
CB_SA3-MH_SA4	54.1		N/A	N/A	0.45	0.45	N/A	N/A	N/A	N/A
MH_SA4-MH_SA5	21.5		N/A	N/A	0.45	0.45	N/A	N/A	N/A	N/A
MH_SA5-MH_SA6	76.7		0.3	0.3	0.45	0.45	\$ 225.00	\$ 17,257.50	\$ 225.00	\$ 17,257.50
MH_SA6-MH_086	15.8		0.375	0.375	0.45	0.45	\$ 275.00	\$ 4,345.00	\$ 275.00	\$ 4,345.00
MH_086-BR_086	10.5	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 4,725.00	\$ 450.00	\$ 4,725.00
Structures							Price/ea	Total Price	Price/ea	Total Price
Replacement 1200 MHs		9	11	13	13	15	\$ 5,500.00	\$ 60,500.00	\$ 5,500.00	\$ 71,500.00
Replacement CBs		8	10	12	11	13	\$ 4,000.00	\$ 40,000.00	\$ 4,000.00	\$ 48,000.00
Private Land Acquisition			0	0.5	0.5	1		Total Price \$ -		Total Price \$ 155,431.00
							Alc Price	\$ 244,355.00	Alc Price	\$ 454,141.00

Alfred Street		Ex. Diam.	Required Diameters (m)				ALF1/2/3		ALF1/3	
Name	Ex./Prop. Length		ALF1	ALF1/2	ALF1/3	ALF1/2/3	Price/m	Sewer Price	Price/m	Sewer Price
CB_SA1-MH_088	60.7		N/A	0.3	N/A	0.3	\$ 225.00	\$ 13,657.50	N/A	N/A
MH_088-MH_089	12.1	0.375	0.375	0.45	0.375	0.45	\$ 300.00	\$ 3,630.00	\$ 275.00	\$ 3,327.50
MH_089-MH_091	96.7	0.375	0.45	0.525	0.45	0.525	\$ 325.00	\$ 31,427.50	\$ 300.00	\$ 29,010.00
MH_090-MH_091	8.8	0.45	0.525	0.525	0.525	0.525	\$ 325.00	\$ 2,860.00	\$ 325.00	\$ 2,860.00
MH_091-MH_093	17.4	0.525	0.6	0.6	0.6	0.6	\$ 450.00	\$ 7,830.00	\$ 450.00	\$ 7,830.00
MH_093-MH_094	78.6	0.525	0.6	0.6	0.6	0.675	\$ 525.00	\$ 41,265.00	\$ 450.00	\$ 35,370.00
CB_SA3-J4	114.5		N/A	N/A	0.45	0.45	\$ 300.00	\$ 34,350.00	\$ 300.00	\$ 34,350.00
MH_094-MH_095	56.1	0.525	0.6	0.6	0.6	0.675	\$ 525.00	\$ 29,452.50	\$ 450.00	\$ 25,245.00
MH_095-BR_095	61	0.525	0.6	0.6	0.6	0.675	\$ 525.00	\$ 32,025.00	\$ 450.00	\$ 27,450.00
Structures							Price/ea	Total Price	Price/ea	Total Price
Replacement 1200 MHs		7	7	8	8	9	\$ 5,500.00	\$ 49,500.00	\$ 5,500.00	\$ 44,000.00
Replacement 1500 MHs		0	0	0	0	0	\$ 9,000.00	\$ -	\$ 9,000.00	\$ -
Replacement CBs		7	7	8	7	8	\$ 4,000.00	\$ 32,000.00	\$ 4,000.00	\$ 28,000.00
Private Land Acquisition			0	0	0.5	0.5		Total Price \$ 93,942.00		Total Price \$ 93,942.00
							Alf Price	\$ 371,939.50	Alf Price	\$ 331,384.50
							Total Price	\$ 616,294.50	Total Price	\$ 785,525.50

New Storm Sewer

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PRELIMINARY CONSTRUCTION COST ESTIMATES

Alice Street/Moore Crescent		Ex./Prop. Length	Ex. Diam.	Required Diameters (m)				AMC1/3	
Name				AMC1	AMC1/2	AMC1/3	AMC1/2/3	Price/m	Sewer Price
MH_075-MH_077		45.6	0.3	0.375	0.375	0.375	0.375	\$ 275.00	\$ 12,540.00
MH_076-MH_077		9.6	0.3	0.3	0.3	0.3	0.3	\$ 225.00	\$ 2,160.00
MH_077-MH_085		73.4	0.45	0.45	0.45	0.45	0.45	\$ 300.00	\$ 22,020.00
CB_SA1-MH_SA2		60.7		N/A	0.3	N/A	0.3	N/A	N/A
MH_SA2-MH_082		78.9		N/A	0.375	N/A	0.375	N/A	N/A
MH_081-MH_082		28.7	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 7,892.50
MH_082-MH_083		42.7	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 11,742.50
MH_083-MH_084		46.5	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 12,787.50
MH_084-MH_085		16.4	0.375	0.375	0.375	0.375	0.375	\$ 275.00	\$ 4,510.00
MH_085-MH_086		97.5	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 43,875.00
CB_SA3-MH_SA4		54.1		N/A	N/A	0.45	0.45	\$ 300.00	\$ 16,230.00
MH_SA4-MH_SA5		21.5		N/A	N/A	0.45	0.45	\$ 300.00	\$ 6,450.00
MH_SA5-MH_SA6		76.7		0.3	0.3	0.45	0.45	\$ 300.00	\$ 23,010.00
MH_SA6-MH_086		15.8		0.375	0.375	0.45	0.45	\$ 300.00	\$ 4,740.00
MH_086-BR_086		10.5	0.6	0.6	0.6	0.6	0.6	\$ 450.00	\$ 4,725.00
<b>Structures</b>								<i>Price/ea</i>	<i>Total Price</i>
Replacement 1200 MHs			9	11	13	13	15	\$ 5,500.00	\$ 71,500.00
Replacement CBs			8	10	12	11	13	\$ 4,000.00	\$ 44,000.00
<b>Private Land Acquisition</b>				0	0.5	0.5	1		<i>Total Price</i> \$ 73,812.00
								<b>Alc Price</b>	<b>\$ 361,994.50</b>

Alfred Street		Ex./Prop. Length	Ex. Diam.	Required Diameters (m)				ALF1/2	
Name				ALF1	ALF1/2	ALF1/3	ALF1/2/3	Price/m	Sewer Price
CB_SA1-MH_088		60.7		N/A	0.3	N/A	0.3	\$ 225.00	\$ 13,657.50
MH_088-MH_089		12.1	0.375	0.375	0.45	0.375	0.45	\$ 300.00	\$ 3,630.00
MH_089-MH_091		96.7	0.375	0.45	0.525	0.45	0.525	\$ 325.00	\$ 31,427.50
MH_090-MH_091		8.8	0.45	0.525	0.525	0.525	0.525	\$ 325.00	\$ 2,860.00
MH_091-MH_093		17.4	0.525	0.6	0.6	0.6	0.6	\$ 450.00	\$ 7,830.00
MH_093-MH_094		78.6	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 35,370.00
CB_SA3-J4		114.5		N/A	N/A	0.45	0.45	N/A	N/A
MH_094-MH_095		56.1	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 25,245.00
MH_095-BR_095		61	0.525	0.6	0.6	0.6	0.675	\$ 450.00	\$ 27,450.00
<b>Structures</b>								<i>Price/ea</i>	<i>Total Price</i>
Replacement 1200 MHs			7	7	8	8	9	\$ 5,500.00	\$ 44,000.00
Replacement 1500 MHs			0	0	0	0	0	\$ 9,000.00	\$ -
Replacement CBs			7	7	8	7	8	\$ 4,000.00	\$ 32,000.00
<b>Private Land Acquisition</b>				0	0	0.5	0.5		<i>Total Price</i> \$ -
								<b>Alf Price</b>	<b>\$ 223,470.00</b>
								<b>Total Price</b>	<b>\$ 585,464.50</b>

New Storm Sewer

## **APPENDIX B:**

### **DETAILED IMPROVEMENT OPTION EVALUATION**

**THORNBURY ROAD INFRASTRUCTURE PROJECT**  
**SWM NEEDS STUDY**  
**OCTOBER 28, 2016**

**DRAINAGE SYSTEM IMPROVEMENT OPTION EVALUATION**

<i>Alternative</i>	<i>Estimated Construction Cost</i>	<i>Construction Cost Ratio</i>	<i>Private Land Benefit</i>	<i>Score</i>
ALC 1, ALF 1	\$441,948	1.00	0	1.00
ALC 1, ALF 1,2	\$467,825	0.94	0.5	1.44
ALC 1, ALF 1,3	\$575,740	0.77	0.5	1.27
ALC 1, ALF 1,2,3	\$616,295	0.72	1	1.72
ALC 1,2, ALF 1	\$651,734	0.68	0.5	1.18
ALC 1,2, ALF 1,3	\$785,526	0.56	1	1.56
ALC 1,2,3 ALF 1	\$769,373	0.57	1	1.57
ALC 1,3, ALF 1	\$559,587	0.79	0.5	1.29
ALC 1,3, ALF 1,2	\$585,465	0.75	1	1.75



## DRAINAGE SYSTEM IMPROVEMENT OPTION EVALUATION

[illegible]

Alternative	Estimated Construction Cost	Construction Cost Ratio	Private Land Benefit	Pipes Under Capacity	Pipe Capacity Benefit	Pipe Surcharge	Pipe Surcharge Benefit	Maintenance Hole Surcharge	Maintenance Hole Surcharge Benefit	Total Benefit	Score
1	\$20,800	1.00	0	1	0.05	1	0.05	1	0.1	0.2	1.20
2	\$20,800	1.00	0	1	0.05	1	0.05	1	0.1	0.2	1.20
3	\$17,800	1.17	0	1	0.05	1	0.05	1	0.1	0.2	1.37
4	\$17,800	1.17	0	1	0.05	1	0.05	1	0.1	0.2	1.37

Elma / Harbour Street Minor Drainage System											
Alternative	Estimated Construction Cost	Construction Cost Ratio	Private Land Benefit	Pipes Under Capacity	Pipe Capacity Benefit	Pipe Surcharge	Pipe Surcharge Benefit	Maintenance Hole Surcharge	Maintenance Hole Surcharge Benefit	Total Benefit	Score
1	\$395,000	1.00	0	8	0.4	15	0.75	3	0.3	1.45	2.45
2	\$408,800	0.97	0	10	0.5	15	0.75	7	0.7	1.95	2.92
3	\$429,700	0.92	0	11	0.55	15	0.75	7	0.7	2	2.92
4	\$475,500	0.83	0	11	0.55	15	0.75	10	1	2.3	3.13

Bruce / King Street Minor Drainage System											
Alternative	Estimated Construction Cost	Construction Cost Ratio	Private Land Benefit	Pipes Under Capacity	Pipe Capacity Benefit	Pipe Surcharge	Pipe Surcharge Benefit	Maintenance Hole Surcharge	Maintenance Hole Surcharge Benefit	Total Benefit	Score
1	\$251,000	1.00	0	0	0	0	0	0	0	0	1.00
2	\$251,000	1.00	0	0	0	0	0	0	0	0	1.00
3	\$251,000	1.00	0	0	0	0	0	0	0	0	1.00
4	\$251,000	1.00	0	0	0	0	0	0	0	0	1.00

THORNBURY ROAD INFRASTRUCTURE PROJECT  
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DRAINAGE SYSTEM IMPROVEMENT OPTION EVALUATION

Elma / Arthur Street Minor Drainage System

Alternative	Estimated Construction Cost	Construction Cost Ratio	Private Land Benefit	Pipes Under Capacity	Pipe Capacity Benefit	Pipe Surcharge	Pipe Surcharge Benefit	Maintenance Hole Surcharge	Maintenance Hole Surcharge Benefit	Total Benefit	Score
1	\$782,900	1.00	0	10	0.5	20	1	5	0.5	2	2.00
2	\$808,200	0.97	0	16	0.8	27	1.35	7	0.7	2.85	3.82
3	\$917,800	0.85	0	19	0.95	26	1.3	10	1	3.25	4.10
4	\$1,064,300	0.74	0	19	0.95	28	1.4	15	1.5	3.85	4.59

Bruce / Louisa Street Minor Drainage System

Alternative	Estimated Construction Cost	Construction Cost Ratio	Private Land Benefit	Pipes Under Capacity	Pipe Capacity Benefit	Pipe Surcharge	Pipe Surcharge Benefit	Maintenance Hole Surcharge	Maintenance Hole Surcharge Benefit	Total Benefit	Score
1	\$570,500	1.00	0	9	0.45	13	0.65	2	0.2	1.3	2.30
2	\$660,200	0.86	0	9	0.45	18	0.9	5	0.5	1.85	2.71
3	\$639,000	0.89	0	8	0.4	15	0.75	5	0.5	1.65	2.54
4	\$663,900	0.86	0	10	0.5	18	0.9	7	0.7	2.1	2.96

Victoria Street Minor Drainage System

Alternative	Estimated Construction Cost	Construction Cost Ratio	Private Land Benefit	Pipes Under Capacity	Pipe Capacity Benefit	Pipe Surcharge	Pipe Surcharge Benefit	Maintenance Hole Surcharge	Maintenance Hole Surcharge Benefit	Total Benefit	Score
1	\$368,100	1.00	1	3	0.15	8	0.4	1	0.1	1.65	2.65
2	\$401,600	0.92	1	5	0.25	8	0.4	3	0.3	1.95	2.87
3	\$423,000	0.87	1	6	0.3	14	0.7	5	0.5	2.5	3.37
4	\$435,800	0.84	1	9	0.45	19	0.95	6	0.6	3	3.84

Alfred Street Minor Drainage System

Alternative	Estimated Construction Cost	Construction Cost Ratio	Private Land Benefit	Pipes Under Capacity	Pipe Capacity Benefit	Pipe Surcharge	Pipe Surcharge Benefit	Maintenance Hole Surcharge	Maintenance Hole Surcharge Benefit	Total Benefit	Score
1	\$221,295	1.00	0.5	2	0.1	5	0.25	0	0	0.85	1.85
2	\$255,675	0.87	0.5	4	0.2	5	0.25	3	0.3	1.25	2.12
3	\$223,470	0.99	0.5	2	0.1	5	0.25	1	0.1	0.95	1.94
4	\$255,675	0.87	0.5	4	0.2	6	0.3	4	0.4	1.4	2.27

THORNBURY ROAD INFRASTRUCTURE PROJECT  
SWM NEEDS STUDY  
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DRAINAGE SYSTEM IMPROVEMENT OPTION EVALUATION

Alice Street / Moore Crescent Minor Drainage System

Alternative	Estimated Construction Cost	Construction Cost Ratio	Private Land Benefit	Pipes Under Capacity	Pipe Capacity Benefit	Pipe Surcharge	Pipe Surcharge Benefit	Maintenance Hole Surcharge	Maintenance Hole Surcharge Benefit	Total Benefit	Score
1	\$361,995	1.00	0.5	1	0.05	1	0.05	0	0	0.6	1.60
2	\$364,307	0.99	0.5	1	0.05	2	0.1	0	0	0.65	1.64
3	\$364,307	0.99	0.5	1	0.05	1	0.05	0	0	0.6	1.59
4	\$364,307	0.99	0.5	1	0.05	2	0.1	0	0	0.65	1.64

**THORNBURY ROAD INFRASTRUCTURE PROJECT**  
**SWM NEEDS STUDY**  
**OCTOBER 28, 2016**

**DRAINAGE SYSTEM IMPROVEMENT OPTION EVALUATION**

<i>Drainage System</i>	<i>Preferred Scenario</i>	<i>Benefits Score</i>	<i>Commercial Fraction (1.50)</i>	<i>Residential Fraction (1.00)</i>	<i>Priority Score</i>	<i>Total Score</i>
Alfred Street	4	2.27	0.00	1.00	1.00	2.27
Alice Street/Moore Crescent	4	1.64	0.00	1.00	1.00	1.64
Bay Street	4	1.00	0.00	1.00	1.00	1.00
Bruce/King Street	4	1.00	0.64	0.34	1.30	1.30
Bruce/Louisa Street	4	2.96	0.23	0.77	1.12	3.30
Elma/Arthur Street	4	4.59	0.50	0.50	1.25	5.73
Elma/Harbour Street	4	3.13	0.45	0.55	1.23	3.84
Lakeshore Drive	4	1.37	0.00	1.00	1.00	1.37
Victoria Street	4	3.84	0.25	0.75	1.13	4.33