SECONDARY PLAN
SCOPED SERVICING STUDY

ALLOA CALEDON SECONDARY PLAN

TOWN OF CALEDON
REGION OF PEEL

PREPARED FOR
ALLOA LANDOWNERS GROUP INC.

Urbantech File No.: 20-665

1ST SUBMISSION – JULY 2024

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1 INTRODUCTION

1.1. PROJECT BACKGROUND

Urbantech Consulting was retained by the Alloa Landowners Group to prepare a Scoped Servicing Study in support of the Alloa Community Secondary Plan. This document is meant to provide a general overview of the servicing strategy for the Alloa Secondary Plan (water, sanitary, stormwater management) and a framework for further block-level analysis (EIR/FSR). Additional reports will be prepared to support future planning and development approvals.

This report should be read in conjunctions with the Alloa Scoped Subwatershed Study and Secondary Plan information package. This report has been prepared to satisfy the following:

- Town of Caledon Development Standards Manual (2019)
- Peel Public Works Stormwater Design Criteria and Procedures Manual (June, 2019)
- Consolidated Linear Infrastructure Environmental Compliance Approval (CLI ECA) Stormwater Management Criteria (September, 2022)
- Region of Peel Public Works Watermain Design Criteria (June, 2010)
- Region of Peel Public Works Linear Wastewater Standards (March, 2023)
- Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC) Authority Guidelines

Applicable site-specific background information, guidelines, policies, and design criteria have been considered in the development of this report.

1.2. STUDY AREA

The Alloa Secondary Plan study area is approximately 724 hectares (ha). The study area is bounded by Mayfield Road to the south, Chinguacousy Road to the east, Heritage Road to the west and the preferred route of the future Highway 413 to the north. The area is bisected (north to south) by Creditview Road and Mississauga Road and east-west by the Alloa Municipal Drain. Refer to **Figure 1.2** for additional details. Under existing conditions, the land is predominantly agricultural with a few small farm and residence structures.

The Alloa Secondary Plan is situated at a drainage divide between the Etobicoke Creek watershed, Fletcher’s Creek watershed and Huttonville Creek watershed. As such, the lands fall within the jurisdiction of both Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC). The TRCA boundary includes the Etobicoke Creek watershed (northern portion of the site), and the CVC jurisdiction includes the Fletcher’s Creek watershed and Huttonville Creek watershed (southern portion of the site). The adjacent watersheds are shown in **Figure 1.1**. **Table 1-1** summarizes the total area of the Alloa Secondary Plan within each watershed.

Table 1-1: Watershed Drainage Divide (Alloa Secondary Plan)

Description	Area (ha)	Percent of Total
Etobicoke Creek	542	75.7%

Description	Area (ha)	Percent of Total
Fletcher's Creek	141	19.7%
East Huttonville Creek	19	2.7%
West Huttonville Creek	14	1.9%

There is a small area in the northeast corner of the site designated as Greenbelt Outer Boundary. In addition, there are woodlands and wetland features across the landscape. The Secondary Plan concept maintains these natural features and associated connectivity where required, although future work may address alignment and refinement to these features. Both the Alloa Municipal Drain and some connecting Etobicoke Creek headwater features also have existing associated floodplain. **Drawing 2.1** provides information on Secondary Plan features and constraint limits.

1.3. BACKGROUND DOCUMENTATION

In preparation of the Scoped Servicing Study, the following reports and documents were referenced:

- Huttonville and Fletcher's Creeks Subwatershed Study (AMEC, 2011)
- Etobicoke Creek Hydrology Update Study (MMM Group, 2013)
- Etobicoke Creek Synthesis Study (AMEC, December 2014)
- Mount Pleasant Sub-Area 51-2 EIR/FSR (2016)
- Region of Peel SABE Scoped Subwatershed Study (2022)
- Region of Peel Development Charges Background Study – Consolidated Report (November, 2020)
- Region of Peel Water and Wastewater Master Plan for the Lake-Based System (2020)
- Region of Peel Settlement Area Boundary Expansion Water and Wastewater Service Analysis (August, 2021)
- Region of Peel Wastewater Development Charges 2024 (Mapping)
- Region of Peel Water Development Charges 2024 (Mapping)

1.4. POPULATION PROJECTIONS

Residential and employment population forecasts have been prepared by GSAI based on the Secondary Plan preferred land use plan (see **Figure 1.4**). Population estimates are used for the purposes of calculating preliminary servicing quantities (i.e., water demand and wastewater generation rates). **Table 1-2** summarizes the Secondary Plan land use categories and associated area and population projections.

Table 1-2: Alloa Secondary Plan – Projected Area and Population

Description	Area (ha)	Population	Jobs
Low Density Residential	132.95	14,518	-
Medium Density Residential	78.56	15,555	-
Medium – High Density	30.22	9,382	-

Description	Area (ha)	Population	Jobs
Mixed Use (Apartments)	10.74	4,446	476
Natural Heritage System	108.43	-	-
Roads	154.49	-	-
Stormwater Management Ponds	38.21	-	-
Schools	19.20	-	300
Parks	32.65	-	-
Major Commercial	12.49	-	550
Employment Area	106.38	-	2,766
TOTAL	**724.32**	**43,901**	**4,092**

2 STORMWATER MANAGEMENT STRATEGY

2.1. BACKGROUND

The Alloa Secondary Plan Scoped Subwatershed Study (Scoped SWS, under separate cover) provides guidance for the management of stormwater under post development land use conditions. The guidelines established in the Scoped SWS form the foundation for the integrated stormwater management strategy proposed for the Secondary Plan area.

2.2. EXISTING CONDITIONS

Existing (pre-development) overland flow is split between the Fletcher's Creek, Huttonville Creek, and Etobicoke Creek watersheds (see **Figure 1.1**). The north portion of the site drains to the Alloa Municipal Drain, which discharges to Etobicoke Creek east of Chingaucousy Road. Municipal drains, while naturalized, are man-made municipal infrastructure constructed to improve drainage and reduce flooding of agricultural lands. The Alloa Municipal Drain is owned and maintained by the municipality. The future requirements and ownership of the municipal drain will be discussed with the Town of Caledon as work proceeds.

The south portion of the site drains to Mayfied Road. Adjacent to the site, Mayfield Road consists of a rural road right-of-way, which drains via existing roadside ditches and culverts to a storm sewer system in the neighbourhood to the south. This sewer network outlets to the Fletcher's Creek and Huttonville Creek watersheds.

A large portion of the site currently has tile drains. For the most part, the tile drain system directs flow to the Alloa Municipal Drain.

Pre-development drainage catchments, overland flow direction and ultimate discharge locations are shown in **Figure 2.2A**.

TRCA updated the 2013 Etobicoke Creek Hydrology model in 2022 and provided the calibrated Visual OTTHYMO model for the study area to the Alloa study team (Urbantech Consulting) in 2024. This model forms the basis of the Secondary Plan and Local Subwatershed Study hydrologic analysis, including flow estimation, continuous modelling, and water balance assessments. This model uses the 2-year to 100-year 12-hour AES storm distribution (AMC II conditions), as well as the final 12 hours of Hurricane Hazel for the Regional event (AMC III conditions).

2.3. STORMWATER MANAGEMENT DESIGN CRITERIA

The stormwater management requirements for the Alloa Secondary Plan Area are based on the criteria as specified in the Etobicoke Creek Hydrology Update (April 2013), the Subwatershed Study for the Huttonville and Fletcher's Creeks (June 2011) and the Heritage Heights Subwatershed Study Phase 2 Report (March 2022). The Scoped Subwatershed Study for the Settlement Area Boundary Expansion in the Region of Peel (January 2022) was also referenced to confirm that SWM criteria proposed in this report align with the SABE study.

The following sections outline the specific SWM criteria for the various outlets from the subject area to Etobicoke Creek, Huttonville Creek and Fletchers Creek, as per the applicable studies.

2.3.1. Quality Control Requirements

Etobicoke Creek, Huttonville Creek and Fletcher's Creek require Enhanced (Level 1) Quality Control for the removal of 80% Total Suspended Solids (TSS), based on the MOE (2003) SWMF & Design Guidelines. This is required for the Subject Lands through the implementation of end-of-pipe SWM facilities and/or LID measures (also see **Section 2.5.2**).

2.3.2. Erosion Control Requirements

Settlement Area Boundary Expansion

The SABE Scoped Subwatershed Study provided recommended ranges of unit volumes for Extended Detention erosion control for Huttonville Creek, Fletcher's Creek and Etobicoke Creek. The erosion control recommendations from the SABE study are summarized in **Table 2-1** below.

Table 2-1: Erosion Criteria, Unit Volumes (SABE)

	Unit Volume (Ranges) (m^3/impervious ha)		
	Huttonville Creek	**Fletcher's Creek**	**Etobicoke Creek**
Extended Detention	200 - 325	250	325

A summary of the erosion control recommendations from the SABE Scoped Subwatershed Study is provided in **Appendix B**. The SABE report targets have been further confirmed / refined based on the studies completed for the respective watersheds including the Mayfield West Comprehensive EIS, the Huttonville-Fletchers Subwatershed Study, the Block 51-1 / East Huttonville Creek EIR/FSR and the Block 51-2 / Fletchers Creek EIR/FSR studies.

Etobicoke Creek

Erosion targets for Etobicoke Creek were established in the Mayfield West Comprehensive Environmental Impact Study and Management Plan (December 2014). As per the Mayfield West EIS, the erosion unitary target flow to be applied to the subject Alloa area within the Etobicoke Creek subwatershed is 0.00031 m^3/s/ha, and the target unitary storage for erosion control is 325 m^3/impervious ha.

Huttonville & Fletchers Creek

As per the Subwatershed Study for the Huttonville and Fletcher's Creeks (June 2011), the subject Alloa area outlets to Flow Node H3 of East Huttonville Creek and Flow Nodes F2 and F3 of Fletcher's Creek. As per the Heritage Heights Subwatershed Study Phase 2 Report (March 2022), part of the subject lands also drain to Flow Node HW (Huttonville West). Table 2-5 below summarizes the unit target rates and unit target volumes for the required erosion control for the portion of the subject site draining to the West Huttonville Creek, East Huttonville Creek and Fletcher's Creek, as per the HFSWS and HHSWS.

It should be noted that the erosion threshold for East Huttonville Creek and Fletcher's Creek was subsequently updated and further refined, based on discussions with CVC as part of the Mount Pleasant Sub-Area 51-1 and 51-2 EIR-FSR (August 2016). The agreed-upon erosion target unit flow rate for East Huttonville and Fletcher's Creek was revised to 0.00041 m3/s/ha. The updated unit flow rate for erosion control is to be applied to the portion of subject Alloa area discharging to East Huttonville Creek and Fletcher's Creek.

Table 2-2: Erosion Control Criteria (East Huttonville Creek & Fletcher's Creek)

Subwatershed	Unit Flow Rates (m^3/s/ha)	Unit Volume (m^3/impervious ha)
West Huttonville Creek	0.00061 (HHSWS)	425
East Huttonville Creek	0.00052 (HFWS – superseded) 0.00041 (EIR/FSS – approved)	200
Fletcher's Creek	0.00025 (HFWS – superseded) 0.00041 (EIR/FSS – approved)	250

The proposed SWM plan for the subject Alloa area will be designed according to the erosion control criteria outlined in the subwatershed studies for Etobicoke Creek, Huttonville Creek and Fletcher's Creek (as discussed above).

2.3.3. Quantity Control Requirements

Settlement Area Boundary Expansion

The Settlement Area Boundary Expansion (SABE) Scoped Subwatershed Study provided recommended ranges of unit volumes for 100-year and Regional level quantity control for Huttonville Creek, Fletcher's Creek and Etobicoke Creek. The quantity control recommendations from the SABE study are summarized in **Table 2-3** below.

Table 2-3: Quantity Control Criteria, Unit Volumes (SABE)

Design Storm	Unit Flow Rates (Ranges) (m^3/impervious ha)		
	Huttonville Creek	Fletcher's Creek	Etobicoke Creek
100-Year Storm	550 - 1150	600 - 1250	400 – 1250
Regional Storm	975 - 1200	0 - 1225	0 - 1200

The SABE report targets have been further confirmed / refined based on the studies completed for the respective watersheds including the Mayfield West Comprehensive EIS, the Huttonville-Fletchers Subwatershed Study, the Block 51-1 / East Huttonville Creek EIR/FSR and the Block 51-2 / Fletchers Creek EIR/FSR studies as described below.

Etobicoke Creek

As per the Etobicoke Creek Hydrology Update (MMM Group, April 2013), the subject area falls within the Etobicoke Creek Headwater (Basin 1) and contributes drainage to flow nodes A, B and D, as per Figure J-1 of the hydrology study. The 12-hour AES storm distribution was used for the Etobicoke Creek hydrology model to assess the 2 to 100-year peak flows under existing and future conditions. The last 12 hours of the Regional storm (Hurricane Hazel) was also simulated with AMC III conditions. Based on this assessment, target unit flow rates were determined for each catchment within Basin 1 of the Etobicoke subwatershed. These unit target rates reflect controlling post-development flows to 60% of existing flows, which was the criteria identified for the Etobicoke Creek headwater basins to ensure mitigation of downstream flow increases.

As there are several catchments within Basin 1, each with specific unit target flow rates, catchment 89 was selected as the basis for the quantity control criteria for the 2 to 100-year storms for the portion of the subject Alloa area within the Etobicoke Creek subwatershed, as this catchment has the most conservative unit flow rates. Similarly, the unit flow rate for catchment 85 was selected for the Regional storm, as it was the most conservative. **Table 2-4** below summarizes the unit target rates for the required quantity control for the portion of the subject site draining to Etobicoke Creek Basin 1.

Table 2-4: Selected Quantity Control Criteria, Unit Flow Rates (Etobicoke Creek, Basin 1)

Design Storm	Unit Flow Rates (m^3/s/ha)
2-Year Storm	0.00272
5-Year Storm	0.00483
10-Year Storm	0.00648
25-Year Storm	0.00877
50-Year Storm	0.01059
100-Year Storm	0.01255
Regional Storm	0.05155

In addition to the required storage to control the subject Alloa area within the Etobicoke Creek subwatershed to the unit flow rate for the Regional storm event, an additional unit storage of 214 m^3/ha is required for Regional controls to account for the first 36 hours of the Regional event preceding the peak during the last 12 hours.

A summary of the Basin 1 quantity control requirements and unit flow rates from the Etobicoke Creek Hydrology Update is provided in **Appendix B.**

Huttonville & Fletcher's Creeks

As per the Subwatershed Study for the Huttonville and Fletcher's Creeks (June 2011), the subject area contributes drainage to flow nodes HW, H3, F2 and F3, as per Figure 3G of the subwatershed study. As per the Heritage Heights Subwatershed Study Phase 2 Report (March 2022), part of the subject lands also drain to flow node HW (Huttonville West). **Table 2-5** and **Table 2-6** below summarizes the unit target rates for the required quantity control for the portion of the subject site draining to Huttonville Creek and Fletcher's Creek.

Table 2-5: Quantity Control Criteria, Unit Flow Rates (Huttonville Creek and Fletcher's Creek)

Design Storm	Unit Flow Rates [1] ($m^3/s/ha$)			
	Flow Node HW	Flow Node H3	Flow Node F2	Flow Node F3
25-Year Storm	0.0096	0.0068	0.0083	0.0083
100-Year Storm	0.017	0.0250	0.0250	0.0260
Regional Storm	0.0618	N/A		

[1] While only the 25-year and 100-year targets were provided in the HFSWS, the other storms targets have historically been determined through interpolation and subsequently confirmed through model verification. No targets for the regional storm were provided in the HFSWS; only the model verification determined if the provided storage and flow control adequately mitigated the post-development flow increase.

Table 2-6: Quantity Control Criteria, Unit Volumes (Huttonville Creek and Fletcher's Creek)

Design Storm	Unit Flow Rates [1] (m^3/impervious ha)			
	Flow Node HW	Flow Node H3	Flow Node F2	Flow Node F3
25-Year Storm	675	550	500	700
100-Year Storm	1000	975	850	900
Regional Storm	925	841	446	Not required

[1] While only the 25-year and 100-year targets were provided in the HFSWS, the other storms targets have historically been determined through interpolation and subsequently confirmed through model verification.

A summary of the quantity control requirements from the Subwatershed Study for the Huttonville and Fletcher's Creeks is provided in **Appendix B.**

The proposed SWM plan for the subject Alloa area will be designed according to the quantity control criteria outlined for Etobicoke Creek and Huttonville / Fletcher's Creek (**Table 2-4, Table 2-5** and **Table 2-6**). The proposed SWM design, based on the subwatershed studies for Etobicoke Creek, Huttonville Creek and Fletcher's Creek will then be verified against the recommended ranges for quantity control volumes in the SABE Scoped Subwatershed Study.

2.3.4. Thermal Mitigation

Thermal mitigation practices are recommended in the Subwatershed Study for the Huttonville and Fletcher's Creeks and in the SABE Scoped Subwatershed Study. Thermal mitigation can be achieved by implementing effective stormwater management facility measures (shading, orientation, outlet design, floating islands, etc.), including LIDs. The target SWM facility discharge temperature for thermal mitigation is 24ºC. Thermal mitigation options will be further reviewed at the Block Plan stage and refined through Draft Plans.

2.4. PROPOSED STORMWATER MANAGEMENT PLAN

The stormwater management plan proposed in support of the Alloa Secondary Plan is designed to satisfy the required SWM criteria, as outlined in **Section 2.3**. Stormwater management, including quantity, quality and erosion control will be provided for the Secondary Plan area by several SWM pond facilities, on-site controls and LID measures.

As per **Drawing 2.4**, the preliminary storm servicing plan identifies eleven (11) proposed SWM pond facilities to achieve the SWM requirements for the proposed neighbourhood/residential areas. Two (2) of the SWM pond facilities are located in the Fletcher's Creek subwatershed, which will be designed to meet the SWM criteria from the HFSWS. Nine (9) of the SWM pond facilities are located in the Etobicoke Creek subwatershed, which will be designed to meet the SWM criteria as per the Etobicoke Creek Hydrology Update and Mayfield West EIS. The proposed SWM pond locations have been selected based on the following criteria:

- To make use of existing / natural low points in terrain to minimize earthworks/cut and fill operations and maintain existing drainage patterns as much as possible.
- To maintain a permanent pool and drain into the receiving watercourse.
- To maintain flow input locations along the receiving watercourse.
- To minimize storm sewer infrastructure size.
- To efficiently use land and maximize serviceable area.

Drawing 2.4 also shows multiple employment blocks in the southwest corner of the subject area, which drain to flow node H3 in the East Huttonville Creek, and flow node F2 in Fletcher's Creek. These employment blocks are to be controlled by private on-site controls to achieve the required SWM criteria.

Similarly, there are blocks of medium and high-rise development planned along the southeast boundary (adjacent to Chinguacousy Road) that will be controlled by private on-site SWM facilities and / or LIDs, discharging to a new clean water pipe running south on Chinguacousy Road to Mayfield Road. There is an existing clean water storm sewer connection on Mayfield Road which runs east to an existing culvert. The approved drainage plans for both the Mayfield West Phase 2 and Mount Pleasant Block 51-2 lands included provision for drainage from this area of Alloa to the clean water pipe on Mayfield Road.

The minor and major drainage systems for the subject lands will be designed to convey storm runoff to the proposed SWM facilities described above, prior to the outlets at Huttonville Creek, Fletcher's Creek and Etobicoke Creek. The minor storm system will be designed to convey flows up to the 10-year design storm (via storm sewers) without surcharge, in accordance with the Town of Caledon's standards and IDF parameters. The major storm system will use to the internal road network, designed with sufficient capacity to allow excess flows up to the 100-year design storm to be conveyed via overland flow within the proposed ROW limits.

Ultimate storm outlets across boundary roads will be coordinated with coincident road widening projects by the Region of Peel and Town of Caledon (e.g., Mayfield Road and Chinguacousy Road improvement projects).

2.5. WATER BALANCE AND LOW IMPACT DEVELOPMENT

In addition to meeting the quantity, quality, and erosion control targets, the SWM strategy will address water balance requirements for the site and adjacent wetlands. The site water balance aims to mimic pre-development groundwater recharge rates to maintain groundwater as a source of flow. Feature-based water balance aims to mimic pre-development wetland hydroperiods to maintain their ecological function.

2.5.1. Site Water Balance

A site water balance has been conducted for the Alloa Secondary Plan by Crozier (under separate cover) in order to determine local pre-development infiltration volumes, impacts of proposed development and potential mitigation measures to preserve groundwater recharge.

Development of an area affects the natural water balance. The most significant difference is the addition of impervious surfaces as a type of surface cover (i.e., roads, parking lots, driveways, and rooftops). Impervious surfaces prevent infiltration of water into the soils and the removal of the vegetation removes the evapotranspiration component of the natural water balance. The evaporation component from impervious surfaces is relatively minor compared to the evapotranspiration component that occurs with a healthy vegetation cover. The net effect of the development of a property is expected to be an increase in the water surplus resulting in a decrease in infiltration and an increase in runoff.

It is important to note that the proposed development will be serviced by municipal water supply and wastewater services. Therefore, there will be no impact on the water balance and local groundwater or surface water quantity and quality conditions related to any on-site groundwater taking or from septic effluent.

To assess the potential development impact on infiltration, the post development infiltration volume was calculated for the Secondary Plan area based on the proposed development plan. Calculations assume no mitigation is in place, resulting in quantification of an infiltration target for the design of a LID strategy for stormwater management.

The estimated annual infiltration volumes are summarized in **Table 2-7**.

Table 2-7: Summary of Pre- and Post-Development Infiltration (No LID Measures)

Estimated Infiltration Volume		Infiltration Deficit	
Existing (m^3/year)	Post-Development (m^3/year)	m^3/year	%
1,099,000	438,000	661,000	60

Comparing the existing (pre-development) and post development values the water balance calculations show that the development has the potential to reduce the natural infiltration across the Secondary Plan area by about 60%. LID measures for stormwater management are recommended, where practical, to promote infiltration and make up the difference between these pre and post development infiltration conditions. It is important to note that there can be a wide margin of error associated with this type of analysis. As such, the infiltration deficit volume is considered as a reasonable estimate that is suitable as a target or guide for LID strategy design.

2.5.2. Low Impact Development Alternatives

While end of pipe facilities provide the minimum required SWM controls, the use of LID (Low Impact Design) stormwater management measures can be helpful to reduce the amount of runoff by increasing on site retention, infiltration, and evapotranspiration. The use of LIDs in a "treatment-train" approach has long been endorsed by the TRCA and CVC.

Drawing 2.5.2 shows the interpreted depth of groundwater throughout the Secondary Plan area. LID placement is typically best in areas where groundwater is at least 2+ m below proposed grade. From **Drawing 2.5.2** there are several area (denoted in blue) where LID placement is possible (i.e., groundwater levels are favourable). Further details will be provided as planning proceeds.

There are many LID measures available for use. Techniques to maximize the water availability in pervious areas such as designing grades to direct roof runoff towards open space areas throughout the development, where possible (e.g., yards, boulevards, landscaped areas, swales, green space in parking lots, etc.), can increase recharge in the developed area. Where possible, increasing topsoil depths in the pervious areas to retain more water in storage can also assist to reduce runoff volumes and increase the potential for infiltration. Other engineered LID measures such as infiltration and/or exfiltration trenches, HDFs, enhanced grass swales, and bioswales can be used to reduce runoff volumes and increase the potential for infiltration. Some examples of possible LIDs that are typical for this type of development include:

Downspout Disconnection:
Roof leader discharge to pervious surfaces such as lawns or to LID measures provides a source of clean water that can be infiltrated. This is a low / no maintenance, lot-level control that is typically implemented by default.

Infiltration Trench:
These are rectangular trenches lined with geotextile fabric, filled with clean granular stone or void-forming materials. They are suitable for sites with limited space for infiltration, such as narrow strips of land between buildings or properties, or along road rights-of-way. They primarily handle roof and walkway runoff.

Bioretention:
This infiltration practice utilizes the natural properties of soil and vegetation to treat runoff from paved areas and remove contaminants. Variations can include the inclusion or exclusion of an underdrain and impermeable liner. Bioretention can help achieve Stormwater Management (SWM) objectives related to water quality, water balance, and erosion control.

Rain Barrel:
Water collected in rain barrels can serve as a non-potable source for various purposes like toilet flushing, urinals, and irrigation. Rain barrels can contribute to meeting SWM objectives related to water quality, water balance, and erosion control.

Soil Cells:
A modular storage system designed to support the growth of large trees and provide effective stormwater management through processes like absorption, evapotranspiration, and interception.

Clean Water Collector/Exfiltration System (Perforated Pipe System):
This system involves using storm sewers or manholes with perforations and stone trenches to promote infiltration of stormwater.

Dry SWM Ponds:
Stormwater management dry ponds are similar to wet stormwater management ponds but without a permanent pool. These ponds are specifically designed to collect and temporarily store storm runoff, allowing sediments to settle at the bottom while excess water slowly drains away or infiltrates into the ground. By serving as a natural filtration system, dry ponds help reduce the risk of flooding, prevent erosion, and improve water quality in nearby bodies of water.

Infiltration Chambers:
Infiltration chambers provide large volume of underground void space, all the while maintaining the necessary structural stability for sub-surface Best Management Practices (BMPs). They consist of a variety of proprietary modular structures that can be installed beneath paved parking lots or landscaped areas. Typically featuring open bottoms, perforated side walls, and optional stone-filled reservoirs below, these chambers are versatile in treating runoff from roofs, walkways, parking lots, and roads, given proper sedimentation pre-treatment measures. Due to their significant storage capacity, this technology is often utilized in areas where little to no space is available for other stormwater BMP solutions.

During the next phases of planning the SWM Best Management Practices (BMPs) mentioned above will be further evaluated. The evaluation will consider technical feasibility, cost, maintenance requirements, and operational feasibility. While some LID approaches may be technically feasible, they may ultimately be cost-prohibitive or pose challenges in terms of maintenance and operation, particularly on a scale of this magnitude. Additional information is required regarding land use, phasing, built form, hydrogeology and geotechnical prior to further study. Additional geotechnical / hydrogeological studies may be required prior to finalizing and confirming the selection of LID techniques.

2.5.3. Feature Based Water Balance

As shown in **Drawing 2.5.3**, there are seven (7) existing wetlands throughout the Secondary Plan area. In the next phase of study (i.e., Block Plan phase), a water balance assessment for the wetland features within and downstream of the subject lands will be completed to understand the existing hydroperiod and potential hydrological impacts due to the proposed development. It is noted that:

- Wetland #6 is intended to be removed from its current location and replicated within the re-aligned watercourse in the same area. Features that are intended to be removed from the landscape will not be evaluated further in their current location.
- Several of the wetland features have large external drainage areas (i.e., Wetland 1, Wetland 2, Wetland 3) which typically makes changes due to the development of the study area catchments relatively insignificant.

- Several wetland features are within watercourse corridors and considered 'flow through' features. These will not need to be modelled.

At the next phase of study, a feature-based water balance will be undertaken, as required, for wetland features. The analysis will establish the current hydrologic function of each relevant feature and determine if LID measures are required to preserve the water balance under post-development conditions. This will be done using the calibrated Visual OTTHYMO model provided by TRCA (modified as described in the preceding section), run in continuous mode. This model is identical to the single event model, with the following additional parameters required for continuous mode:

- Continuous climate data set (temperatures and precipitation) – the Buttonville Airport climate data was used, in accordance with TRCA recommendations for other areas in Caledon.
- Soil type – clay loam soil type and associated properties were assigned based on the predominant Jeddo / Chinguacousy Clay Loam across the study area.

The continuous model has already been simulated for the period of 1986 to 2007. For the purposes of feature-based water balance, years of extreme precipitation have been identified by examining the total precipitation during the growing season (March to October). These extreme years were found to be 1992 (max precipitation) and 2007 (least precipitation). An average year was also computed.

The continuous model will also be used in the next phase of work to generate monthly runoff volumes for the feature-based water balance analysis. Where available, detailed survey and water level monitoring in the wetland areas will be used to simulate the wetland area as a reservoir and identify the changes in water levels. Wetland features which are considered to be "flow through / within a watercourse" or are on a significant slope cannot be modelled as a reservoir nor can water levels be easily determined.

2.5.4. Erosion and Sediment Control During Construction

Rigorous erosion and sediment control measures will be designed, implemented and maintained throughout the construction period. At detailed design, an Erosion and Sediment Control Plan will be prepared and designed in conformance with the Town and Conservation Authority guidelines (e.g., Guidelines for Erosion and Sediment Control for Urban Construction Sites (2006)). Erosion and sediment control will be implemented for all construction activities including topsoil stripping, earthworks, foundation excavation and stockpiling of materials and will remain in place and functional until bare surfaces are stabilized.

The following erosion and sediment control measures are typical for this type of development:

- Natural features will be staked, and temporary fencing provided to keep machinery out of sensitive areas.
- Sediment control fence and snow fence will be placed prior to earthworks.
- Logistics/construction plan will be implemented to limit the size of disturbed areas, minimizing the non-essential clearing and grading areas.

- Temporary sediment ponds.
- Rock check-dams and cut-off swales will be provided, where required, in order to control, slow down and direct runoff to sediment basins.
- Sediment traps will be provided.
- Gravel mud mats will be installed at construction vehicle access points to minimize off-site tracking of sediments.
- All temporary erosion and sediment control measures will be routinely inspected / monitored and repaired during construction. Temporary controls will not be removed until the areas they serve are restored and stable.
- The “multiple barrier approach” will be applied to all construction stages to ensure erosion is prevented rather than reduced. Recommended measures are to be installed prior to the initiation of the earthworks and grading.

3 PRELIMINARY SITE GRADING

3.1. SECONDARY PLAN PROPOSED GRADING

The future site grades required to service the Alloa Secondary Plan lands are influenced by:

- Existing and/or proposed grades along the boundary roads (Mayfield Road, Heritage Road, Mississauga Road, Creditview Road and Chinguacousy Road).
- Preliminary design information for future Hwy. 413.
- NHS boundaries and buffer limits.
- Downstream stormwater outlet invert elevations which will determine the elevation of future SWM facilities' normal water levels and, ultimately, storm sewer depth and serviceable drainage areas.

The preliminary grading design is shown in **Drawing 3.1**. Development of site grading has taken into consideration the following requirements and constraints:

- Conform to the Town's grading criteria.
- Minimize cut and fill operations and work towards a balanced site.
- Match existing boundary grading condition, where feasible.
- Match existing grades at woodland and wetland features and their buffers, where possible. Some transition grading has been proposed within buffers in order to avoid the use of retaining walls.
- Maintain subwatershed drainage boundaries, where possible.
- Provide suitable cover on proposed servicing.
- Provide overland flow conveyance for major storm conditions.

The majority of the existing Alloa Secondary Plan lands slope from the north to the south, towards either the Alloa Municipal Drain or towards existing culverts across Mayfield Road. There are some areas south of the Alloa Municipal Drain, within the Etobicoke Creek watershed, which drain from south to north, towards the Drain. The proposed development grading is generally consistent with the pre-development drainage pattern, and it is based on an overall SWM strategy that includes maximizing the lands that can drain by gravity to the proposed SWM facilities, while avoiding excessive sewer sizes and pipe conflicts.

Proposed road grades vary between the Town's minimum of 0.50% and will not exceed 5%. Sawtooth grading may be introduced to maximize overland flow drainage to SWM Ponds and minimize 100-year flow capture in the storm sewer. Sawtooth road grading will conform to the Town's minimum 0.50% road grade; however, the net grade over an extended length of road is reduced by introducing sections of road reversed graded at 0.50%. The net slope will not be less than 0.25% in this scenario and will accommodate major system flow conveyance. Proposed Grading Plans for the Subject Lands including road grades and overland flow routes are illustrated on **Drawing 3.1.**

3.1.1. Boundary Road Grades

Existing boundary roads are within the jurisdiction of either the Town of Caledon (i.e., Chinguacousy Road, Creditview Road) or the Region of Peel (Mayfield Road, Mississauga Road).

The Town and the Region have road widening projects either planned or on-going for all boundary roads associated with the Alloa Secondary Plan. Ultimately, internal development grades need to be compatible with the approved vertical alignment of the boundary road conditions after road urbanization projects are completed by the Region and the Town. For the purposes of this study, the following has been assumed:

- Mayfield Road – detailed design for Mayfield Road widening has been finalized by Peel Region. Region staff have provided detailed design drawings to the Secondary Plan study team. The grading plan shown in **Drawing 3.1** captures the design of Mayfield Road, as provided by Peel.
- Chinguacousy Road – the Town of Caledon is in the process of finalizing the Municipal Class Environmental Assessment (MCEA) Study for Chinguacousy Road. The Town has provided the road design as contemplated through the EA. Grading shown in **Drawing 3.1** reflects the most current EA design.
- Future widening projects are planned for both Creditview Road (Town of Caledon) and Mississauga Road (Region of Peel). MCEA studies have not been completed to-date. For the purposes of this study, preliminary road grades have been identified for both road corridors to ensure they are compatible with development and can be serviced by proposed storm infrastructure. Further coordination with the Town and Region will be required as work proceeds. Proposed preliminary plans for both Creditview Road and Mississauga Road can be found on **Drawing 3.3B(1 and 2)** and **Drawing 3.3C(1 and 2)** respectively.

3.1.2. Highway 413

The Alloa Secondary Plan is bounded on the north side by the future planned Highway 413 (see **Figure 1.2**). As development planning for Alloa proceeds, coordination of Alloa land use with MTO requirements (e.g., Stormwater Management Ponds, Transitway Stations, interchanges, etc.) is required.

As part of the initial site grading plan, Urbantech has reviewed the proposed Highway 413 grading and drainage implications as they relate to the Alloa Development Plan. Since full design details are not available, the following initial assumptions have been made:

- Flyovers are assumed across Mayfield and Chinguacousy Road, which set the highway grades at both end of the development (approximately 8.0 m above existing road grades).
- Underpasses below Highway 413 at Mississauga Road and Creditview Road crossings, to ensure drainage can be accommodated by gravity in the existing or realigned watercourses within the Alloa Secondary Plan. However, should those road crossings end up being overpasses, it does not appear that the Highway grades would be significantly impacted by this change.

Plan and profile drawings for Highway 413 are included as **Drawing 3.3A-1**, **Drawing 3.3A-2** and **Drawing 3.3A-3**, in **Appendix A**.

Recognizing that MTO's design work remains on-going, the grading concept proposed is preliminary and will need to be reviewed as development proceeds. It is noted, however, that an additional MTO pond is likely required north of the Mayfield Road flyover. This pond has been added to the plan (see **Drawing 3.1**). At this time, preliminary grading suggests that there is not sufficient fall to allow the MTO drainage to be carried all the way from Mayfield to the MTO SWM Pond proposed just west of Creditview Road.

4 NATURAL CHANNEL DESIGN

The existing floodplain limits shown in the Pre-Development Drainage Plan (**Drawing 2.2A**) and Pre-Development Flood Mapping (**Drawing 2.2B**) are built upon work completed as part of the 12300 Mississauga Road flood mapping as well as mapping recently completed for the FP Mayfield lands in Mayfield West Phase II, east of Chinguacousy Road. The existing flood hazard mapping for the Alloa Secondary Plan area informs the extent of the existing NHS and dictates the extent of future management strategies related to the development of the Alloa lands.

Under proposed conditions (see **Drawing 4.2** and **Drawing 4.2B-1**) floodplain limits and associated watercourses across the Secondary Plan area are intended to be regularized, realigned and improved. The NHS traversing the site under post-development conditions will include a corridor designed to contain erosion hazards, meander belt, flood hazard, crossings and other environmental features / considerations.

The sections that follow provide additional information on the development of both existing and proposed floodplain / channel conditions for the Alloa Secondary Plan. It is noted that hazards and regulatory allowances associated with natural features will be further reviewed and clarified as work proceeds.

4.1. EXISTING CONDITIONS

4.1.1. Existing Conditions Floodplain Mapping

Etobicoke Creek has undergone various flood mapping studies, including the Etobicoke Creek Synthesis Study (AMEC, December 2014), which was used as the basis for the Mayfield West Stage 1 and Stage 2 Functional Servicing Report, and accompanying CEISMP and EIR studies completed by Crozier in support of development in the Mayfield West Phase 2 area.

The Visual OTHYMO (2022 model by TRCA) introduced revisions to flow data, cross-section locations, naming conventions, and geometry based on presumably improved topographic mapping. As described in Section 2, this model was updated by Urbantech based on minor revisions to drainage areas. The updated “future” scenario was used for the existing conditions HEC-RAS analysis. Urbantech has further updated the TRCA flood mapping as described in the following sections.

West of Mississauga Road

The 2022 TRCA model did not extend west of Mississauga Road. As described in the May 11, 2023 report by Urbantech Consulting prepared for Area 10 / 12300 Mississauga Road, the existing regional floodplain in this area is best described as an extensive backwater system with a large, flat depression area. This type of system is difficult to analyze using standard / accepted modelling approaches. Through frequent consultation with TRCA and Town of Caledon staff and senior management in late 2022 to early 2023, the challenges with the hydraulic modelling and ultimate development of this area have been explored, and area-specific solutions have been developed and agreed to with the agencies to define a suitable approach to modelling the subject lands under existing and proposed conditions (specific to Area 10), including:

- The use of a 2D hydraulic model (with specific assumptions and parameters as prescribed by TRCA and noted herein); and,

- Acknowledgment that post-development flood storage does not have to match pre-development flood storage as agreed to with TRCA staff (although best efforts to do so should be explored).

The general approach to the proposed channel corridor sizing and model evaluation was also established in the May 11, 2023 report, and the supporting studies / model results are included therein. TRCA recommended the use of a quasi-steady state approach, in which hydrographs from the Visual OTTHYMO model were extended at the peak flow time until the end of the simulation. The ROUTE CHANNEL elements were removed from the Visual OTTHYMO model to avoid double-counting flow routing (i.e. in VO and in the 2D model).

Mississauga Road to Chinguacousy Road

The floodplain in this location is based on the September 2022 TRCA model, surface (2015 LiDAR) and flows, with minor refinements to incorporate the recent ground surveys for the surrounding lands (RPE, April 2024 / JD Barnes, April 2024) and which includes the low-flow channel survey of the Alloa Drain. The peak flows from the updated Visual OTTHYMO model were incorporated into the model. The Urbantech Regional floodplain is generally consistent with the TRCA Regional floodplain, with any difference attributed to refinements to the surface topography.

Chinguacousy Road to Downstream

The Urbantech HEC-RAS model completed through the Mayfield West Phase II FSR process was updated to incorporate the revised flow data and geometry west of Chinguacousy Road and downstream of the FP Mayfield lands to the nearest confluence downstream of the proposed channel works in Etobicoke Creek. The future configuration of the channel/floodplain near the FP Mayfield lands was assumed to be in place east of Chinguacousy Road, as the permitting process is currently underway. The proposed works and accompanying hydraulic modelling were described in a memo dated March 13, 2024. Therefore, the ultimate conditions for the FP Mayfield lands have been integrated to the existing (updated) TRCA model.

The floodplain limits shown on **Drawing 2.2B** is therefore a consolidation of:

- Existing May 11, 2023 2D Model west of Mississauga Road
- Updated September 2022 TRCA model between Mississauga Road to Chinguacousy Road
- Ultimate March 13, 2024 FP Mayfield Model east of Chinguacousy Road
- Existing September 2022 TRCA east of FP Mayfield.

In general, the floodplain through the Alloa study area is large and is governed by backwater conditions downstream of Chinguacousy Road. The channel slopes throughout the study area are relatively flat and the backwater impacts are significant, to the extent that the floodplain west of Mississauga Road spills west, over Heritage Road. This was demonstrated in the 2D model for existing conditions.

The refined existing conditions floodplain mapping and modeling was submitted to TRCA and the Town of Caledon for review on April 24, 2024. TRCA comments were received (via email) on May

27, 2024. In the email response TRCA confirms that the proposed refinements and existing floodplain mapping (as shown in **Drawing 2.2B**) are acceptable.

4.1.2. Existing Riparian / Flood Storage

The riparian storage represents the relationship between the volume of water in the floodplain and the discharge (flow rate) of the watercourse. This relationship is typically assessed without any human-made structures, such as culverts, to understand the natural behavior of the watercourse and its capacity to convey and store water during various flow conditions. However, culverts can influence the extent and depth of flooding in the surrounding floodplain area and can affect the volume of water that the floodplain can store during flood events, impacting the flood hazard downstream.

Given the significant floodplain and backwater in the Alloa system that is further affected by the culverts, a comprehensive analysis both with and without these structures in place was undertaken.

To evaluate the existing riparian storage and flood storage (with culverts in place), the study area was divided into two specific areas: west of Mississauga Road, which features a large depression or ponding area serving as a significant storage region during flood events and which has been characterized with a 2D HEC-RAS model, and the area between Mississauga Road and Chinguacousy Road, which is more characteristic of conveyance systems rather than a storage area. The 1D HEC-RAS model was employed for the hydraulic modeling east of Mississauga Road.

The results of the HEC-RAS model runs are presented in **Table 4-1** and **Table 4-2,** which show the differences in floodplain storage and discharge relationships for both scenarios (with and without culverts).

Table 4-1: Existing Riparian Storage (1D Model, No Culverts)

Location	Volume (m^3)						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
Eto Hdwtr S - South 6 to 10 (Main Channel)	35.31	63.75	83.18	107.48	125.45	144.21	502.74
Eto Hdwtr S - South M1	1.57	4.14	5.18	6.85	7.88	8.86	25.44
Eto Hdwtr S - South N1	9.01	15.72	21.16	28.61	34.17	40.11	134.93
Eto Hdwtr S - South O1	7.14	11.53	14.61	18.71	21.74	24.99	82.11
Eto Hdwtr S - South P1	3.82	6.47	8.61	11.31	13.41	15.68	59.26
TOTAL	56.85	101.61	132.74	172.96	202.65	233.85	804.48

Table 4-2: Existing Flood Storage (1D Steady-State Model, With Culverts)

Location	Volume (m^3)						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
Eto Hdwtr S - South 6 to 10 (Main Channel)	37.46	67.26	89.82	123.55	155.40	189.63	532.10
Eto Hdwtr S - South M1	1.57	4.14	5.18	6.85	7.88	8.86	25.45
Eto Hdwtr S - South N1	9.21	16.23	21.88	30.02	36.93	44.44	142.88
Eto Hdwtr S - South O1	7.16	11.54	14.62	18.73	21.76	25.03	82.09
Eto Hdwtr S - South P1	13.20	15.75	16.93	19.65	21.43	23.56	63.48
TOTAL	68.6	114.92	148.43	198.80	243.4	291.52	846.00

The storage volumes computed for each method are significant. As agreed to with TRCA staff through meetings regarding the 12300 Mississauga Road lands, matching the storage volumes west of Mississauga Road is impractical (although best efforts should be investigated). Furthermore, the large floodplain west of Mississauga Road will be partially filled by the future Highway 413 extension, reducing the floodplain storage.

Upon investigation of the conveyance of flows through the channel between Mississauga Road and Chinguacousy Road, it was also found that there are areas of zero velocity in the floodplain, suggesting that a portion of the volume does not contribute to conveyance. In other words, the storage in this area may not affect peak flow routing significantly.

To evaluate the importance of maintaining the flood plain storage as it relates to flow routing / attenuation along the reach, a 2D HEC-RAS model was completed for the reaches between Mississauga Road and Chinguacousy Road. This simulation establishes the “actual” volume occupied during the regional storm and demonstrates the total “routed” peak flow at Chinguacousy Road. This analysis was conducted for the regional storm only. The 2D model represents that entire study area including the lands west of Mississauga Road. It provides additional confirmation and utilizes quasi-steady-state flows as preferred by TRCA. A 1-D dynamic model is to be completed at the draft plan stage to confirm the 2D model results discussed as part of this study.

Table 4-3: Existing Riparian Storage (2D Dynamic Model, With Culverts)

Location	Regional Storage	Regional Peak Flows at Confluence East of Chinguacousy Road (VO6 model with no channel routing elements; adjusted for quasi-steady-state flow)	Actual Routed Regional Peak Flow at Confluence East of Chinguacousy Road (2D model)
	(m^3)	(m^3/s)	(m^3/s)
Entire Study Area (Heritage Road to Confluence East of Chinguacousy Road	1,478,937	131.66 TP = 11.25 hours	71.91 arrives at confluence TP = 19.92 hours 27.34 spills west over Heritage Road Total flow leaving site = 99.25

The 2D model indicates that there is a significant portion of flow leaving the study area west across Heritage Road, due to backwater / spill. This is not reflected in the Visual OTTHYMO model, which directs all of the flows generated towards Chinguacousy Road with no routing. The 2D flows are lower than the 1D steady state model. The significant difference in time to peak is due to the quasi-steady state approach to 2D modelling.

4.2. PROPOSED CONDITIONS

4.2.1. Proposed NHS and Channel Corridor

The proposed conditions hydrologic and hydraulic modelling builds upon the framework and data used in the existing conditions analysis, as well as the preliminary NHS corridor design, provided by Geo Morphix in consultation with Urbantech and Crozier.

The post-development channel defines the NHS limits for the watercourse corridors and fully contains the post-development floodplain, as shown in **Drawing 4.2B-1**. The design focusses on a pool and run channel typology mixed with wetland and wet meadow features. The proposed wetland features provide connection to the floodplain and help maintain moist habitats while functionally attenuating flows. The objective of these features is to provide retention and detention of flows over longer attenuated periods. The design also enhances aquatic and terrestrial habitat and increases corridor variability by creating a low flow channel with variable geometry. This variability provides benefits to the system by replicating conditions found in natural systems, adding diversity to the valley corridor and providing additional pockets of sediment sources.

Drawings 4.2A(1-3) and **Drawings 4.2C(1-6)** provide details on the proposed channel design and NHS limits from both a plan, profile and cross-section perspective at various locations throughout the Secondary Plan.

4.2.2. Proposed Hydrologic Model

The hydrologic model was further updated by Urbantech to reflect post-development conditions based on the Secondary Plan and proposed drainage area delineation (see **Drawing 2.4**). Similar to the updates for existing conditions, model parameters for external catchments under proposed conditions remained consistent with the original version provided by TRCA, except where larger, lumped catchments were split into smaller catchments to refine drainage patterns in areas requiring more resolution. Developed areas were modelled using the STANDHYD command. All model parameters are included in **Appendix C**.

The following scenarios were simulated for post-development conditions:

- 25mm, 2-year to 100-year storms (12-hour AES, AMC II conditions), with SWM facilities in place.
- Regional storm – Hurricane Hazel (AMC III conditions), uncontrolled (no SWM facilities), for use in hydraulic modelling.
- Regional storm – Hurricane Hazel (AMC III conditions), with SWM facilities in place.
- Continuous model, with SWM facilities in place (for use in the feature-based water balance and erosion analysis).

The Regional storm scenario (AMC III conditions) assuming no SWM facilities in place was used for hydraulic modelling. **Table 4-4** compares the proposed model flows to the existing flows at various key nodes.

Table 4-4: Proposed vs. Existing Peak Flows at Key Nodes

<table>
<tr><th>Location</th><th>NHYD</th><th>Area (ha)</th><th>2-yr</th><th>5-yr</th><th>10-yr</th><th>25-yr</th><th>50-yr</th><th>100-yr</th><th>Regional (no SWM)</th></tr>
<tr><td rowspan="4">Node 2167 (Mississauga Road)</td><td>Existing UT</td><td>301.2</td><td>1.525</td><td>2.732</td><td>3.550</td><td>4.522</td><td>5.317</td><td>6.154</td><td>24.736</td></tr>
<tr><td>Proposed UT</td><td>298.58</td><td colspan="6" rowspan="3">Post-development flows with SWM controls to be determined at Draft Plan / FSR Stage</td><td>29.998</td></tr>
<tr><td>Difference</td><td>2.62</td><td>5.262</td></tr>
<tr><td>%</td><td>-0.87%</td><td>21.27</td></tr>
<tr><td rowspan="4">Node 1125 (Creditview Road)</td><td>Existing UT</td><td>856.50</td><td>3.387</td><td>6.186</td><td>8.315</td><td>11.138</td><td>13.369</td><td>15.758</td><td>66.885</td></tr>
<tr><td>Proposed UT</td><td>867.67</td><td colspan="6" rowspan="3">Post-development flows with SWM controls to be determined at Draft Plan / FSR Stage</td><td>81.982</td></tr>
<tr><td>Difference</td><td>11.17</td><td>15.097</td></tr>
<tr><td>%</td><td>1.30%</td><td>22.57</td></tr>
<tr><td rowspan="2">Node 1105 (Chinguacousy Road)</td><td>Existing UT</td><td>1465.32</td><td>5.624</td><td>10.066</td><td>13.506</td><td>18.083</td><td>21.81</td><td>25.814</td><td>112.762</td></tr>
<tr><td>Proposed UT</td><td>1454.2</td><td colspan="6">Post-development flows with SWM controls to be determined at Draft Plan / FSR Stage</td><td>126.577</td></tr>
</table>

Location	NHYD	Area (ha)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Regional (no SWM)
	Difference	11.12							13.815
	%	-0.76%							12.25

Based on the uncontrolled Regional flow scenario, there is a ~12 to 23% increase in the peak flows approaching Chinguacousy Road. Regional storm control is recommended to mitigate this increase, and the target release rates in the Etobicoke Creek Hydrology Update Study are expected to reduce the Regional flows below the existing conditions values due to the requirement to control to 60% of existing conditions flows.

4.2.3. Proposed Hydraulic Model

The primary objective of the post-development hydraulic modeling exercise is to compare the existing and proposed conditions to identify changes and potential impacts on the floodplain, storage, and flow conveyance. The following sections provide a detailed overview of the proposed conditions modelling, highlighting significant changes and their implications. The proposed corridor has been sized to handle the post-development, uncontrolled flows resulting from the proposed drainage plan (see **Drawing 4.2**) and land use.

Proposed Hydraulic Structure Inventory

The preliminary span of proposed culverts and crossings are sized based on hydraulic conveyance requirements but have also been confirmed to meet geomorphological function and small mammal passage (as required by the Terrestrial Ecologist). See **Drawing 4.3** for a typical road crossing detail along the NHS corridor.

The HEC-RAS model was used to evaluate the proposed culvert infrastructure within the study area. The proposed conditions incorporate new or modified structures that are anticipated due to development or infrastructure projects. Smaller farm road crossings were not considered in this evaluation.

Table 4-5: Post-Development Channel Crossings / Culvert Sizing

Crossing Location & HEC-RAS Section	Crossing Type	Size of Opening [span x rise] or [diameter] (m)	Upstream Invert (m)	Downstream Invert (m)	Road Centerline Elevation (m)	Approx. Level of Service Prior to Overtopping
Creditview Road Eto Hdwtr S South 8 XS 237	3x CSP Circ.	1.35 / 1.40 / 1.40	258.87	258.84	261.09	50-year
Chinguacousy Eto Hdwtr S South 6 XS 267	Conc. Box	6.05 x 1.67	256.56	256.56	258.58	100-year

Crossing Location & HEC-RAS Section	Crossing Type	Size of Opening [span x rise] or [diameter] (m)	Upstream Invert (m)	Downstream Invert (m)	Road Centerline Elevation (m)	Approx. Level of Service Prior to Overtopping
Chinguacousy Eto Hdwtr S Trb H South H2 XS 180	Conc. Box	4.37 x 1.07	258.74	258.74	260.18	100-year
Chinguacousy Eto Hdwtr S Trb I South I1 XS 479	Conc. Box	3.00 x 0.86	261.27	261.27	262.22	100-year
Chinguacousy Eto Hdwtr S Trb F South F1 XS 824.71	Conc. Box	6.3 x 1.06	262.61	262.60	263.86	100-year
Creditview Road Eto Hdwtr S South 8 XS 237	3x CSP Circ.	1.35 / 1.40 / 1.40	258.87	258.84	261.09	50-year
Chinguacousy Eto Hdwtr S South 6 XS 267	Conc. Box	6.05 x 1.67	256.56	256.56	258.58	100-year
Chinguacousy Eto Hdwtr S Trb H South H2 XS 180	Conc. Box	4.37 x 1.07	258.74	258.74	260.18	100-year
Chinguacousy Eto Hdwtr S Trb I South I1 XS 479	Conc. Box	3.00 x 0.86	261.27	261.27	262.22	100-year
Chinguacousy Eto Hdwtr S Trb F South F1 XS 824.71	Conc. Box	6.3 x 1.06	262.61	262.60	263.86	100-year
Creditview Road Eto Hdwtr S South 8 XS 237	3x CSP Circ.	1.35 / 1.40 / 1.40	258.87	258.84	261.09	50-year
Chinguacousy Eto Hdwtr S South 6 XS 267	Conc. Box	6.05 x 1.67	256.56	256.56	258.58	100-year

Proposed Conditions Riparian / Flood Storage

The riparian storage under proposed conditions was assessed to understand the impact of planned developments and infrastructure modifications on floodplain storage capacity. The analysis considers scenarios both with and without culverts to capture the full range of potential impacts.

The results of the HEC-RAS model runs are presented in **Table 4-6** and **Table 4-7**, showcasing the differences in floodplain storage and discharge relationships for both scenarios (with and without culverts).

Table 4-6: Proposed vs. Existing Riparian Storage (1D Model, No Culverts)

Location	Scenario	Volume (m^3)						
		2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
Eto Hdwtr S - South 6 to 10 (Main Channel)	Existing	35.31	63.75	83.18	107.48	125.45	144.21	502.74
	Proposed	18.51	42.62	65.55	90.81	108.77	126.51	403.89
	Difference	-16.80	-21.13	-17.63	-16.67	-16.68	-17.70	-98.85
Eto Hdwtr S - South M1	Existing	1.57	4.14	5.18	6.85	7.88	8.86	25.44
	Proposed	0	0	0	0	0	0	0
	Difference	-1.57	-4.14	-5.18	-6.85	-7.88	-8.86	-25.44
Eto Hdwtr S - South N1	Existing	9.01	15.72	21.16	28.61	34.17	40.11	134.93
	Proposed	4.09	7.57	10.10	13.30	15.81	18.27	61.25
	Difference	-4.92	-8.15	-11.06	-15.31	-18.36	-21.84	-73.68
Eto Hdwtr S - South O1	Existing	7.14	11.53	14.61	18.71	21.74	24.99	82.11
	Proposed	0	0	0	0	0	0	0
	Difference	-7.14	-11.53	-14.61	-18.71	-21.74	-24.99	-82.11
Eto Hdwtr S - South P1	Existing	3.82	6.47	8.61	11.31	13.41	15.68	59.26
	Proposed	1.01	2.24	3.50	5.08	6.24	7.43	24.27
	Difference	-2.81	-4.23	-5.11	-6.23	-7.17	-8.25	-34.99
TOTAL	Existing	56.85	101.61	132.74	172.96	202.65	233.85	804.48 + 654.79 (2D model)
	Proposed	23.61	52.43	79.15	109.19	130.82	152.21	489.41 + 438.18
	Difference	-33.24	-49.18	-53.59	-63.77	-71.83	-81.64	-531.68

Table 4-7: Proposed vs Existing Flood Storage (1D Steady-State Model, With Culverts)

Location	Scenario	Volume (m^3)						
		2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
Eto Hdwtr S - South 6 to 10 (Main Channel)	Existing	37.46	67.26	89.82	123.55	155.40	189.63	532.10
	Proposed	23.35	44.93	66.00	90.41	108.69	126.97	474.14
	Difference	-14.11	-22.33	-23.82	-33.14	-46.71	-62.66	-57.96
Eto Hdwtr S - South M1	Existing	1.57	4.14	5.18	6.85	7.88	8.86	25.45
	Proposed	0	0	0	0	0	0	0
	Difference	-1.57	-4.14	-5.18	-6.85	-7.88	-8.86	-25.45
Eto Hdwtr S - South N1	Existing	9.21	16.23	21.88	30.02	36.93	44.44	142.88
	Proposed	4.11	7.24	9.79	13.16	15.80	18.51	71.44
	Difference	-5.10	-8.99	-12.09	-16.86	-21.13	-25.93	-71.44
Eto Hdwtr S - South O1	Existing	7.16	11.54	14.62	18.73	21.76	25.03	82.09
	Proposed	4.45	7.24	9.32	11.77	13.58	15.43	52.84
	Difference	-2.71	-4.30	-5.30	-6.96	-8.18	-9.60	-29.25
Eto Hdwtr S - South P1	Existing	13.20	15.75	16.93	19.65	21.43	23.56	63.48
	Proposed	1.08	2.33	3.58	5.15	6.28	7.42	27.07
	Difference	-12.12	-13.42	-13.35	-14.50	-15.15	-16.14	-36.41
TOTAL	Existing	68.6	114.92	148.43	198.80	243.4	291.52	846.00 + 654.79 (2D model)
	Proposed	32.99	61.74	88.69	120.49	144.35	168.33	625.49 + 438.18
	Difference	-35.61	-53.18	-59.74	-78.31	-99.05	-123.19	-437.12

The hydraulic modelling for proposed conditions reveals significant differences in riparian storage when comparing the 1D steady-state models both with and without culverts. This difference was anticipated for the lands west of Mississauga Road due to the presence of a large depression or ponding area and loss of storage attributed to the future Highway 413 corridor. However, a substantial difference was also observed between Mississauga Road and Chinguacousy Road despite the implementation of a formal channel.

The proposed channel design between Mississauga Road and Chinguacousy Road involves the creation of a more efficient trapezoidal channel, with the design based on fluvial geomorphologic criteria and conveyance of the uncontrolled regional storm. This type of channel is engineered to improve flow conveyance by having a uniform cross-sectional shape that reduces resistance and promotes faster water movement. While this design enhances the channel's efficiency, it inherently reduces the floodplain's storage capacity compared to a natural, less uniform channel.

The key factors contributing to the reduction in storage capacity include:

- Reduced Cross-Sectional Area**:** The trapezoidal shape minimizes areas where water can accumulate, thus reducing the overall volume of water the floodplain can store during flood events.
- Increased Flow Velocity**:** A more efficient channel design increases the velocity of water, decreasing the likelihood of water spreading out and being stored in the adjacent floodplain.

A portion of the storage lost in the transition from natural conditions to a formal trapezoidal channel is likely attributed to dead storage. Dead storage refers to areas within the floodplain that do not actively contribute to the conveyance of flow. This can include low-lying areas or depressions where water may pool but not significantly influence the overall flow dynamics / flow routing.

To ensure that the loss of riparian storage does not adversely impact downstream flows, further analysis using a 2D dynamic model was conducted. This model provides a more comprehensive view of the flow dynamics and storage interactions over time and across the floodplain.

To evaluate the importance of maintaining the flood plain storage as it relates to flow routing / attenuation along the reach, a 2D HEC-RAS model was completed for the reaches between Mississauga Road and Chinguacousy Road. This simulation establishes the “actual” volume occupied during the regional storm and demonstrates the total “routed” peak flow at Chinguacousy Road. This analysis was conducted for the regional storm only. The 2D model provides an additional confirmation and utilizes quasi-steady-state flows as preferred by TRCA.

Table 4-8: Existing Riparian Storage (2D Dynamic Model, With Culverts)

Location	Scenario	Regional Storage	Sum of Peak Flows at Chinguacousy Road (VO6 model with no channel routing elements; adjusted for quasi-steady-stage flow)	Actual Routed Regional Peak Flow at Chinguacousy Road
		(m^3)	(m^3/s)	(m^3/s)
Entire Study Area (Heritage Road to Chinguacousy Road)	Existing	1,478,937	131.66 TP = 11.25 hours	71.91+ 27.34 spill = 99.25 (19.92 hours)
	Proposed	1,466,658	139.84 TP = 11.00 hours	110.50 (20.00 hours)
	Difference	-12.279	8.18 (-0.25 hours)	11.25 (0.08 hours)
	%	0.83%	6.2% (-3%)	11.3% (0.91%)

The key findings from these models are as follows:

- Peak Flow Comparisons**:** The dynamic 1D and 2D models were used to compare peak flows downstream of the proposed channel modifications. The results indicated that despite the reduction in storage capacity, the peak flows at downstream locations such as Chinguacousy Road did not show significant increases even under uncontrolled conditions. The largest difference is attributed to eliminating the spill across Heritage Road through implementation of the Highway 413 corridor. There is no significant difference in peak flow timing in the 2D model or total flow attributed to loss of storage.
- Floodplain Impacts**:** The analysis confirmed that the more efficient flow routing through the trapezoidal channel compensated for the loss of storage. The channel's enhanced conveyance capacity ensured that floodwaters were transported more effectively, reducing the risk of backwater effects and localized flooding.

The proposed changes to the channel design between Mississauga Road and Chinguacousy Road, while reducing riparian storage, do not adversely impact downstream flows. The more efficient trapezoidal channel design improves flow conveyance, and the lost storage primarily comprises dead storage that does not significantly contribute to flow dynamics. The validation using 1D dynamic and 2D models confirms that peak flows downstream remain within acceptable limits, ensuring that the proposed conditions maintain effective floodplain management and minimize flood risks.

5 SANITARY SERVICING

5.1. EXISTING SANITARY SERVICING AND REGIONAL SYSTEM CAPACITY

The subject lands are serviced by Peel Region's lake-based wastewater system, which collects wastewater from the City of Mississauga, the City of Brampton and part of the Town of Caledon (including the Alloa Secondary Plan). The lake-based system consists of two (2) wastewater treatment facilities and a network of pumping stations, forcemains and gravity sewers (both trunk and local). The system is divided into three main trunk systems – McVean, East and West.

The Alloa Secondary Plan is tributary to the Peel Region West Trunk sewershed. Wastewater generated from the Secondary Plan area will be conveyed south via two (2) main branches of the west collection system:

- Fletcher's Creek Trunk: Wastewater generated from the Alloa Phase 1 lands (generally between Chinguacousy Road and Creditview Road) will be directed to the Fletcher's Creek trunk sewer via an existing 750 mm sanitary connection at Brisdale Drive.
- Credit Valley Trunk: Wastewater generated from the Alloa Phase 2 lands (generally between Creditview Road and Heritage Road) will be directed to the Credit Valley trunk sewer, via a future planned 900 mm sewer connection at Mississauga Road and Mayfield Road.

Recent discussions with Peel Region Staff indicate that planned growth in this service area (generally north of Mayfield Road, including Alloa) has triggered new downstream capacity improvements in the broader wastewater system. As a result, Peel Region 2024 DC Wastewater Mapping includes the following new wastewater projects:

- Project 34521 and Project 29450: new 1500 mm sanitary sewer along Bovaird Drive from west of McLaughlin Road to Kennedy Road and south on Kennedy Road from Bovaird Drive to south of Steeles Road East.

These projects will alleviate constraints in the Fletcher's Creek Trunk system by shifting a portion of flow from new growth areas to the East Trunk network. Upgrades are scheduled for construction in the 2026 – 2028 timeframe. It is anticipated that Alloa Phase 1 will proceed concurrently, so there will be no impact to Phase 1 development timing.

5.2. PROPOSED SANITARY SERVICING

Drawing 5.1 shows the proposed Alloa Secondary Plan sanitary servicing strategy, including all existing and future Peel Region service connections. The Secondary Plan is intended to be serviced by a series of local sub-trunk sewers, generally draining from north to south and connecting into existing or planned Regional DC infrastructure.

As noted in **Section 5.1**, discussions with Peel Region to-date have confirmed that local sanitary infrastructure is in place to support Alloa Phase 1. The sanitary outlet for the Phase 1 lands (i.e., the area generally between Chinguacousy Road and Creditview Road) is the existing 750 mm trunk sewer on Brisdale Drive. The Brisdale sewer is sized to accommodate 500 ha of development north of Mayfield Road (including all of Alloa Phase 1). This was approved through the Mount Pleasant

Block 51-2 EIR/FSR and the associated Block 51-2 detailed subdivision designs. Per the current Alloa Secondary Plan land use schedule, estimated Phase 1 development area (including SWM facilities, but excluding NHS) totals approximately 275 ha. This drainage area contribution is almost 50% below the approved drainage area to the Brisdale trunk sewer. A such, it is not anticipated that Alloa Phase 1 wastewater generation will exceed the original capacity allocated through the Mount Pleasant Block studies.

While the Alloa Phase 1 servicing concept follows the approved Block 51-2 and Mayfield West supporting studies (i.e., connection to the Brisdale trunk sewer), there is an existing 450 mm diameter sewer connection at the intersection of Tim Manley Blvd and Chinguacousy Road that could be utilized by Alloa Phase 1 (eastern boundary) as a temporary and/or ultimate servicing outlet. Further discussion with Peel Region staff is required to confirm servicing capacity in this sewer. Similarly, there is a future Peel Region DC sewer planned for Creditview Road which also provides flexibility for future servicing of Phase 1 lands.

Alloa Phase 2 (generally from Creditview Road to Heritage Road) will be serviced by a network of internal sub-trunks and future regional trunk sewers planned for Creditview Road, Mayfield Road and Mississauga Road. The wastewater outlet for the Phase 2 area is the future 900 mm sanitary trunk sewer at Mississauga Road and Mayfield Road. The Region is expected to confirm the extent of the drainage area to the proposed Phase 2 trunk sewers are part of the on-going Master Plan update, at which point sizing can be confirmed. **Drawing 5.1** also includes provision for local connections across Mayfield Road at Veterans Drive and / or Robert Parkinson Drive. These connections would be used as either temporary or permanent outlets (subject to the Region's confirmation of capacity) in the event that prestige employment lands along Mayfield Road proceed ahead of adjacent properties, and in advance of regional infrastructure along Mayfield Road and Mississauga Road.

Planned Regional sanitary infrastructure projects that directly support the Alloa Secondary Plan are summarized in **Table 5-1.**

Table 5-1: Alloa Wastewater Servicing (Planned Regional Projects[1])

Project No.	Project Description	Project Timing [2]	Supporting
56982	Brisdale Sewer Extension (Mayfield Road north to mid-block) Size to be confirmed by Peel Region	2031	Alloa Phase 1
56986	675 mm Creditview Road Trunk Sewer (Hwy 413 to Mayfield Road)	2032	Phase 2
56984	675 mm Mayfield Road Trunk Sewer (Creditview Road to Mississauga Road)	2032	Phase 2
56988	600 mm Mississauga Road Trunk Sewer (Hwy 413 to Mayfield Road)	2032	Phase 2
21055 / 21056	900 mm Mississauga Road Trunk Sewer (from Mayfield Road to Wanless Drive	2033	Phase 2
21057 / 21058	900 mm Mississauga Road Trunk Sewer (Wanless Drive to Sandalwood Parkway)	2031	Phase 2

[1] *Taken from Peel Region Wastewater Map 2024 (Map ID: 3871-WW-DC), 2024 Budget (October, 2023).*

[2] *If required to accommodate development timing, the Alloa Landowner's Group may enter into a front ending agreement with Peel for delivery of necessary regional infrastructure ahead of the capital program planning schedule*

5.3. SANITARY DESIGN CRITERIA AND WASTEWATER GENERATION RATES

Peel Region wastewater design criteria and design standards are taken from the Public Works Linear Wastewater Standards (March, 2023). Pipe size, slope and depth, as shown in **Drawing 5.1** will follow the March 2023 Design Manual.

Preliminary wastewater generation rates for the Secondary Plan area (**Table 5-3**) are determined by development phase and for the full Secondary Plan area based on site statistics as noted in **Section 1.4** and design criteria shown in **Table 5-2**, taken from the March 2023 Design Manual and consistent with the 2020 Master Plan.

Table 5-2: Peel Region Wastewater Generation Design Criteria

Population Type	Average Dry Weather Flow (L/cap/day)	Peaking Factor	Inflow and Infiltration (L/s/ha)
Residential	290	Harmon Formula	0.260
Employment	270	Harmon Formula	0.260

In the next phase of study (block plan) design sheets will be prepared for the proposed internal sub-trunk network.

Table 5-3: Alloa Secondary Plan Preliminary Wastewater Generation Rates

	Average Dry Weather Flow (L/s)	Peaking Factor (Harmon Formula)	Peak Wet Weather Flow (L/s) [1]
Alloa – Phase 1	89	2.53	311
Alloa – Phase 2	71	2.62	289
Alloa – Full Secondary Plan	160	2.28	554

[1] *Note that peak flow rates are not additive due to variations in peaking factors for each area*

The values in **Table 5-3** are preliminary and subject to refinement in future studies as more information becomes available. Ultimately, pipes internal to the Alloa Secondary Plan will be designed based on peak wet weather flow for their specific sewer catchment area, and in accordance with Peel Region's design standards (size, slope, depth, etc.).

6 WATER SERVICING

6.1. EXISTING WATER SERVICING AND REGIONAL SYSTEM CAPACITY

The subject lands are serviced by the Region of Peel's lake-based water system, which distributes water from Lake Ontario to the City of Mississauga, the City of Brampton and part of the Town of Caledon (including the Alloa Secondary Plan). The Region's lake-based system consists of two (2) treatment facilities, transmission systems, and distribution systems. There are three transmission systems (west, central and east), each containing a series of booster pump stations, water reservoirs and elevated tanks. The Alloa Secondary Plan is part of the west transmission system. Transmission systems provide direct supply to the local water distribution systems, which includes watermains extending down to each individual user.

There are a total of seven (7) water pressure zones in the Peel System, each separated by approximately 30 m intervals of elevation. The Alloa Secondary Plan is proposed to develop on the Pressure Zone 7 West (7W) system. Zone 7W has a top water level of 327.7 m, a hydraulic grade line of 335.3 m and services elevations between 243.4 m and 289.6 m. The Alloa Booster Pump Station and Alloa Reservoir, both located within the Secondary Plan area (west of Creditview Road, north of Mayfield Road) provide storage and pumping capacity for the Alloa Secondary Plan area as well as other growth areas within Zone 7W.

The Zone 7W system is intended to be expanded in the near-term to include new transmission mains from the Alloa Booster Pump Station to the new West Caledon Elevated Tank. A Schedule C Municipal Class Environmental Assessment study is currently underway to select the ultimate location for the Elevated Tank and the alignment of the future transmission mains. This study is anticipated to be completed by the end of 2024. Currently, the Alloa Reservoir provides all of the Zone 7W floating storage. The future addition of the West Caledon Elevated Tank will improve the storage capacity for the zone as well as system redundancy and security of supply.

Peel Region staff have confirmed that Phase 1 development is not reliant on the future West Caledon Elevated Tank (or associated distribution / transmission mains). Phase 1 development can proceed with only the trunk watermains within Phase 1, as identified on **Drawing 6.1**. Broader area projects, like the West Caledon Elevated Tank will provide additional capacity and security for the remainder of the Secondary Plan area (Phase 2).

6.2. PROPOSED WATER SERVICING

Drawing 6.1 shows the proposed Alloa Secondary Plan water servicing strategy, including all existing and future Peel Region service connections. The Secondary Plan area is intended to be serviced by a series of local watermains, connected and looped with existing or planned Regional DC infrastructure.

There is an existing 600 mm diameter Zone 7W watermain that runs along Mayfield Road from Mississauga Road to east of Chinguacousy Road. There is also an existing 600 mm diameter Zone 7W watermain that runs north on Chinguacousy Road, terminating at Tim Manley Blvd. This watermain will be extended further north by the Region in the 2026 timeframe. The Alloa Phase 1 lands will use these existing watermains for water distribution and looping. Additional Regional DC watermains on Mayfield Road, Creditview Road, Mississauga Road, Heritage Road and mid-block within the Secondary Plan will be required for development of the remainder of the Secondary Plan, along with the future West Caledon Elevated Tank and associated transmission mains.

Planned Regional water infrastructure projects that directly support the Alloa Secondary Plan are summarized in **Table 6-1**.

Table 6-1: Alloa Water Servicing (Planned Regional Projects[1])

Project No.	Project Description	Project Timing [2]	Supporting
53977	600 mm watermain on Chinguacousy Road from Tim Manley Blvd to Old School Road	2026	Phase 1
57094	400 mm watermain on new Alloa internal east-west road from Chinguacousy Road to Creditview Road	2026	Phase 1 / Phase 2
57096	400 mm watermain on Creditview Road from Mayfield Road north to new Alloa internal east-west road	2026	Phase 1 / Phase 2
57092	400 mm watermain on new Alloa internal east-west road from Creditview Road to Mississauga Road	2026	Phase 2
57090	600 mm watermain on Mississauga Road from Mayfield Road north to new Alloa internal east-west road	2026	Phase 2
20697	750 mm transmission main from Alloa Pump Station to new West Caledon Elevated Tank	2026	Phase 2
30703	New West Caledon Elevated Tank (Zone 7W Reservoir)	2026	Phase 2
53975	750 mm watermain on Old School Road from West Caledon Elevated Tank to Chinguacousy Road	2026	General looping and security of supply. Not required for development.

[1] *Taken from Peel Region Wastewater Map 2024 (Map ID: 3870-W-DC), 2024 Budget (October, 2023).*

[2] *If required to accommodate development timing, the Alloa Landowner's Group may enter into a front ending agreement with Peel for delivery of necessary regional infrastructure ahead of the capital program planning schedule*

6.3. WATER DESIGN CRITERIA AND SYSTEM DEMAND

Peel Region provides design criteria and water supply standards to ensure uniformity in their system. The Region of Peel Public Works Design, Specifications and Procedures Manual (June, 2010) provides comprehensive instruction for the design and construction of municipal services. Watermain size, slope and depth, as shown in **Drawing 6.1**, follow the June 2010 Design Manual.

Peel Region per capita water demand criteria were updated through the 2020 Water and Wastewater Master Plan. As such, the criteria in the June 2010 Design Manual are considered superseded by the 2020 Master Plan values. The Master Plan water demand criteria are shown in **Table 6-2.**

Table 6-2: Peel Region Water Demand Design Criteria

Population Type	Average Dry Water Demand (L/cap/day)	Max Day Peaking Factor	Peak Hour Peaking Factor
Residential	270	1.8	3.0
Employment	250	1.4	3.0

Preliminary water demand rates are tabulated in **Table 6-3**. The values are preliminary and subject to refinement in future studies as more information becomes available.

Table 6-3: Alloa Secondary Plan Preliminary Water Demand (Domestic)

	Average Day Demand (L/s)	Max Day Demand (L/s)	Peak Hour Demand (L/s)
Alloa – Phase 1	83	148	249
Alloa – Phase 2	66	115	198
Alloa – Full Secondary Plan	149	263	447

In addition to the domestic demand outlined above, the water distribution system will provide water capacity for fire protection, in accordance with the requirements of the Underwriters Laboratories of Canada. Fire flow will be further defined as more information becomes available regarding built form. Water distribution systems are commonly designed to provide either Max Day + Fire Flow or Peak Hour Flow (whichever is higher).

The Region requires delivery pressures between 40 psi and 100 psi (not including during fire events).

The water distribution system analysis, including local watermain sizing and layout, for the subject site will be completed/confirmed as engineering proceeds and more information is available regarding built form and neighbourhood concept plans. Interim water servicing and looping is also to be determined, based on the future development phasing, as applicable. The Alloa Secondary Plan watermains will be designed to supply demand under all operating scenarios, while maintaining adequate pressure to the system as required by Peel Region.

7 CLIMATE ADAPTATION

The Resilient Caledon Community Climate Change Action Plan identifies how the Town of Caledon intends to respond to potential climate-related challenges including changes in the frequency of extreme weather (droughts, floods, etc.). In order to design a community that is resilient to climate change, the following items have been (and will continue to be) considered as the studies for this area advance.

Flood hazards: Flood hazards in the adjacent creeks have been established using the regional event (Hurricane Hazel) which is based on an historic event. As such, the extent of existing or proposed flood hazards will not be affected by increased intensity, frequency and duration of storm events due to climate change.

Erosion: As there is the potential for increased frequency of flows in the creeks due to climate change, the impacts of these flows on erosion protection measures should be considered at detailed design. While this will not affect channel block sizes, it could impact the sizing of stone protection or other mitigation measures.

Stormwater Management: All proposed stormwater management facilities within the study area have been designed to control, and in the case of Etobicoke Creek facilities, over-control the regional event. Due to the use of this historical storm in the sizing, the pond blocks are not anticipated to increase as a result of climate change.

Storm Sewers: To ensure stormwater sewers/downstream culverts are able to withstand the impacts of climate change during more frequent and/or intense events, the proposed sizes will be reevaluated at the detailed stage of the design when considering the potential for increased frequency, duration and intensity of storm events. The storm sewers in the community are currently designed to convey the 10-year storm event in accordance with Caledon standards. This requirement is more conservative than other GTA municipalities which only require storm sewers to be designed to convey the 5-year event. The storm sewer design can be updated once the Town has published updated IDF parameters incorporating climate change.

Irrigation: In parks and site plan blocks, the potential for storing stormwater and utilizing it for irrigation should be explored in future studies to decrease reliance on municipal water during drought conditions. Increased irrigation demand due to potential drought should be considered in the final water distribution analysis. This can be mitigated through public education, signage, and the incorporation of efficient fixtures and irrigation methods.

Roadways: Proposed roadways within the development will be designed to avoid excessive flooding during large storms as well as ensuring adequate conveyance of flows. This can be accomplished by verifying the capacity in the roadways compared to the 100-year event, as well designing and implementing adequate catchbasins to capture the flows.

Site water balance: Where feasible based on soil / groundwater constraints, LIDs such as green roofs (in the site plan / high density blocks), infiltration measures, tree pits, etc., in will be utilized in the design to mitigate the effects of climate change (i.e., managing more frequent runoff events).

Environmental features / wetlands: Potential impacts of climate change on feature-based water balance for the wetlands will continue to be evaluated and have considered extreme conditions (wet / dry years). Mitigation could include utilizing stormwater to irrigate the wetlands and preparing monitoring plans for post-development to evaluate the health of the wetlands.

8 DEVELOPMENT PHASING

The Alloa Secondary Plan is intended to develop in two phases as shown in **Figure 8.1**:

- Phase 1: Generally, from Chinguacousy Road to Creditview Road, with a small area west of Creditview Road south of the Alloa Municipal Drain.
- Phase 2: Generally, from Creditview Road to Heritage Road.

The phasing plan provides a logical extension of growth in this area of Caledon (east to west) and is consistent with Town and Regional infrastructure planning (water, sanitary, roads).

Recent discussions with Peel Region staff have indicated that water treatment and transmission infrastructure is in place to service Phase 1, and water system capacity is available. There are trunk sewer upgrades required in the downstream sanitary network (i.e., Bovaird Drive and Kennedy Road) to provide sufficient sanitary capacity for future growth north of Mayfield Road. However, the timing of these upgrades corresponds with the planning approvals and initial development timeframe for Alloa Phase 1. It is anticipated that wastewater system capacity will be available coincident with development of Phase 1.

Phase 2 will rely on new water transmission, storage and distribution infrastructure, including the West Caledon Elevated Tank (scheduled for construction in the 2026 timeframe). New sanitary infrastructure will also be required, specifically on Creditview Road, Mississauga Road and Mayfield Road to support Phase 2 growth. Additional upgrades further south in the Credit Valley Trunk system are on-going or planned, which will provide system-level capacity for development north of Mayfield Road.

If required to accommodate development timing and phasing, the Alloa Landowner's Group may enter into a front-ending agreement with Peel Region to deliver necessary regional infrastructure ahead of the capital program planning schedule. This will be further discussed as planning proceeds.

Phasing internal to each Block will be determined as work proceeds and draft plans come forward. Considerations for interim phasing of stormwater management, water, sanitary and floodplain channelization will be reviewed, as required, with the Planning Authorities at an appropriate time in the process.

9 CONCLUSION

This Scoped Servicing Study has been prepared in support of the Alloa Secondary Plan and in conformance with the Alloa Local Subwatershed Study. This study is meant to provide a framework for future servicing work at the Block Plan and Draft Plan stage.

Key conclusions are as follows:

- The Alloa Secondary Plan lands fall within the Fletcher's Creek, Huttonville Creek, and Etobicoke Creek watersheds. The north portion of the site drains to the Alloa Municipal Drain, which discharges to Etobicoke Creek east of Chingaucousy Road. The south portion of the site drains to existing roadside ditches and culverts across Mayfied Road. This sewer network outlets to the Fletcher's Creek and Huttonville Creek watersheds.
- The stormwater management requirements for the Alloa Secondary Plan Area are based on the criteria as specified in the Etobicoke Creek Hydrology Update (April 2013) and the Subwatershed Study for the Huttonville and Fletcher's Creeks (June 2011). The Scoped Subwatershed Study for the Settlement Area Boundary Expansion in the Region of Peel (January 2022) was also referenced to confirm that SWM criteria proposed in this report align with the SABE study.
- The storm servicing plan identifies eleven (11) proposed SWM pond facilities to achieve the SWM requirements for the proposed neighbourhood/residential areas. Two (2) of the SWM pond facilities are located in the Fletcher's Creek subwatershed. Nine (9) of the SWM pond facilities are located in the Etobicoke Creek subwatershed.
- Employment blocks in the southwest corner of the subject area and mid/high rise blocks in the southeast portion of the site will be controlled by private on-site controls to achieve the required SWM criteria.
- The minor and major drainage systems for the subject lands will be designed to convey storm runoff to the proposed SWM facilities, prior to the outlets at Huttonville Creek, Fletcher's Creek and Etobicoke Creek. The minor storm system will be designed to convey flows up to the 10-year design storm (via storm sewers) without surcharge. The major storm system will allow excess flows up to the 100-year design storm to be conveyed via overland flow within the proposed ROW limits.
- The SWM strategy will address water balance requirements for the site and adjacent wetlands through the use of LID technology, where practical and appropriate.
- Under proposed conditions floodplain limits and associated watercourses across the Secondary Plan area are intended to be regularized, realigned and improved. The NHS traversing the site under post-development conditions will include a corridor designed to contain erosion hazards, meander belt, flood hazard, crossings and other environmental features / considerations.
- The proposed changes to the channel design between Mississauga Road and Chinguacousy Road, while reducing riparian storage, do not adversely impact downstream flows. The more efficient trapezoidal channel design improves flow conveyance, and the loss of storage primarily comprises dead storage that does not significantly contribute to flow dynamics.

- Sanitary effluent from the Phase 1 area is intended to be conveyed via the existing 750 mm trunk sewer connection at Mayfield Road and Brisdale Drive, which is sized to provide service to the Alloa Phase 1 lands. Upgrades to the downstream Fletcher's Creek trunk system (at Bovaird and Kennedy) have been identified by Peel Region to support growth north of Mayfield Road. The timing for these upgrades (i.e., 2026 – 2028) are anticipated to correspond with the development of Alloa Phase 1.
- Sanitary effluent from the Phase 2 area will be serviced via future regional trunk sewers planned for Creditview Road, Mayfield Road and Mississauga Road. The ultimate wastewater outlet for the Phase 2 area is the future 900 mm sanitary trunk sewer at Mississauga Road and Mayfield Road.
- Pressure Zone 7W watermains are in place along Mayfield Road and Chinguacousy Road. Peel Region has confirmed that the existing Alloa Reservoir and Pump Station are sized to provide sufficient water capacity to support initial growth in Alloa Phase 1. Development in Phase 2 will require the completion of the new West Caledon Elevated Tank and associated transmission / distribution mains.

Report prepared by:
Urbantech Consulting

Dragan Zec, P.Eng.
Partner

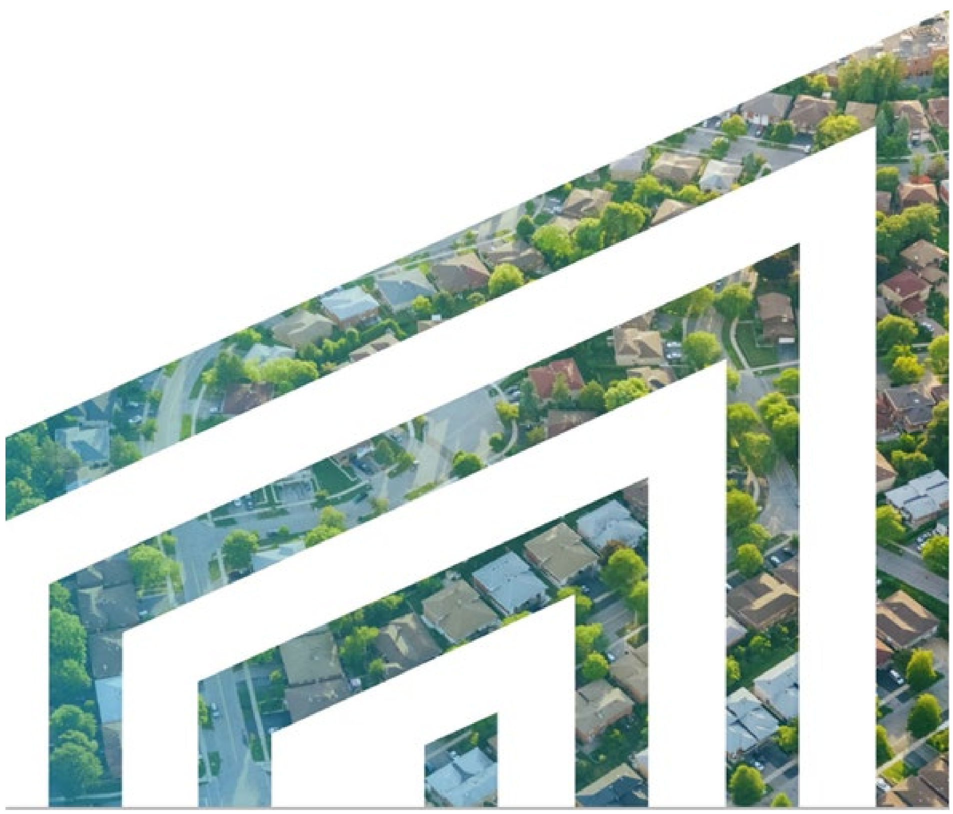
APPENDIX A
DRAWINGS AND FIGURES

Available under separate link

APPENDIX B
SWM TARGETS

APPENDIX B

Etobicoke Creek SWM Targets



Legend

- Watershed Boundary
- Municipal Boundaries
- Key Flow Nodes
- Watercourse
- Collector
- Expressway/Highway
- Freeway

0 750 1,500 3,000 4,500 6,000 Meters

CLIENT
TORONTO AND REGION CONSERVATION AUTHORITY

TITLE
ETOBICOKIE CREEK WATERSHED STUDY

EXISTING CATCHMENTS

MMM GROUP

Checked	Drawn
A.Z	S.Y
Date: March 2013	Proj. No.: 14-11605-001-WR1
Scale: As Shown	Drawing No.: J-1

Legend

Future Watershed Boundary	Watercourse
Future Catchments	Collector
Municipal Boundaries	Expressway/Highway
Key Flow Nodes	Freeway

0 750 1,500 3,000 4,500 6,000 Meters

CLIENT
TORONTO AND REGION CONSERVATION AUTHORITY

TITLE
ETOBICOKIE CREEK WATERSHED STUDY

FUTURE DEVELOPMENT CATCHMENTS

MMM GROUP

Checked: A.Z	Drawn: S.Y
Date: March 2013	Proj. No.: 14-11605-001-WR1
Scale: As Shown	Drawing No.: J-2

ETOBICOKE WATERSHED QUANTITY CONTROL STRATEGY - UNIT FLOW RATES

Basin 1 - Etobicoke Creek Headwater (Upstream) - Control to 60% of Existing Flows

Existing Catchment #	Unit Flow Rates ($m^3/s/ha$)					
	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
1	0.00286	0.00506	0.00675	0.00909	0.01096	0.01291
2	0.00322	0.00578	0.00779	0.01056	0.01275	0.01506
3	0.00393	0.00713	0.00962	0.01304	0.01584	0.01878
6	0.00467	0.00830	0.01118	0.01516	0.01831	0.02164
7	0.00281	0.00507	0.00685	0.00932	0.01127	0.01334
8	0.00385	0.00722	0.00985	0.01350	0.01641	0.01955
9	0.00426	0.00745	0.00995	0.01338	0.01610	0.01895
10	0.00432	0.00768	0.01028	0.01395	0.01684	0.01990
11	0.00318	0.00567	0.00761	0.01024	0.01232	0.01452
12	0.00401	0.00696	0.00922	0.01227	0.01471	0.01728
13	0.00337	0.00604	0.00811	0.01095	0.01323	0.01565
14	0.00391	0.00682	0.00904	0.01205	0.01441	0.01689
17	0.00337	0.00595	0.00798	0.01078	0.01302	0.01538
18	0.00342	0.00599	0.00798	0.01075	0.01297	0.01530
20	0.00325	0.00589	0.00797	0.01087	0.01318	0.01562
21	0.00641	0.01082	0.01413	0.01857	0.02203	0.02561
32	0.00400	0.00709	0.00953	0.01289	0.01556	0.01836
33	0.00528	0.00961	0.01293	0.01749	0.02113	0.02490
34	0.00361	0.00632	0.00842	0.01129	0.01356	0.01593
35	0.00383	0.00696	0.00941	0.01278	0.01546	0.01827
37	0.00785	0.01364	0.01801	0.02398	0.02864	0.03343
40	0.00817	0.01412	0.01855	0.02461	0.02934	0.03429
42	0.00338	0.00597	0.00801	0.01080	0.01301	0.01533
43	0.00633	0.01143	0.01535	0.02074	0.02499	0.02943
49	0.00550	0.00987	0.01322	0.01781	0.02143	0.02523
50	0.00551	0.00996	0.01336	0.01822	0.02219	0.02623
52	0.00434	0.00771	0.01034	0.01401	0.01693	0.01999
53	0.00644	0.01168	0.01570	0.02124	0.02557	0.03010
54	0.00366	0.00649	0.00869	0.01174	0.01417	0.01670
55	0.00273	0.00493	0.00665	0.00903	0.01095	0.01296
62	0.00319	0.00558	0.00746	0.01005	0.01211	0.01428
63	0.00466	0.00824	0.01105	0.01490	0.01793	0.02111
70	0.00310	0.00565	0.00763	0.01036	0.01253	0.01481
71	0.00317	0.00565	0.00757	0.01025	0.01238	0.01463
72	0.00342	0.00618	0.00834	0.01131	0.01374	0.01629
76	0.00476	0.00878	0.01210	0.01672	0.02041	0.02433
80	0.00472	0.00837	0.01118	0.01503	0.01806	0.02125
82	0.00287	0.00511	0.00685	0.00923	0.01112	0.01313
83	0.00318	0.00579	0.00785	0.01069	0.01296	0.01536
84	0.00595	0.01042	0.01386	0.01851	0.02219	0.02603
85	0.00290	0.00516	0.00690	0.00930	0.01121	0.01324
86	0.00309	0.00556	0.00746	0.01013	0.01225	0.01449
87	0.00442	0.00819	0.01115	0.01524	0.01853	0.02197
89	0.00272	0.00483	0.00648	0.00877	0.01059	0.01255
90	0.00426	0.00761	0.01019	0.01384	0.01674	0.01979
97	0.00379	0.00666	0.00883	0.01179	0.01414	0.01661
102	0.00796	0.01336	0.01763	0.02360	0.02815	0.03270
103	0.00387	0.00700	0.00952	0.01304	0.01583	0.01878
104	0.00333	0.00605	0.00820	0.01117	0.01353	0.01601
105	0.00410	0.00764	0.01041	0.01422	0.01725	0.02042
107	0.00292	0.00525	0.00706	0.00960	0.01163	0.01378
108	0.00297	0.00542	0.00732	0.00998	0.01212	0.01435
118	0.00293	0.00526	0.00708	0.00958	0.01157	0.01365
125	0.00358	0.00655	0.00889	0.01217	0.01478	0.01752
132	0.00398	0.00720	0.00969	0.01310	0.01587	0.01880
140	0.00296	0.00527	0.00705	0.00949	0.01142	0.01348
147	0.00319	0.00565	0.00756	0.01018	0.01229	0.01451
153	0.00436	0.00794	0.01074	0.01457	0.01761	0.02079
167	0.00516	0.00912	0.01230	0.01664	0.02007	0.02367
168	0.00308	0.00553	0.00743	0.01002	0.01213	0.01434
170	0.00353	0.00630	0.00849	0.01151	0.01391	0.01642
176	0.00327	0.00581	0.00778	0.01049	0.01266	0.01494

within Alloa Secondary Plan Area

minimum target unit flow rate

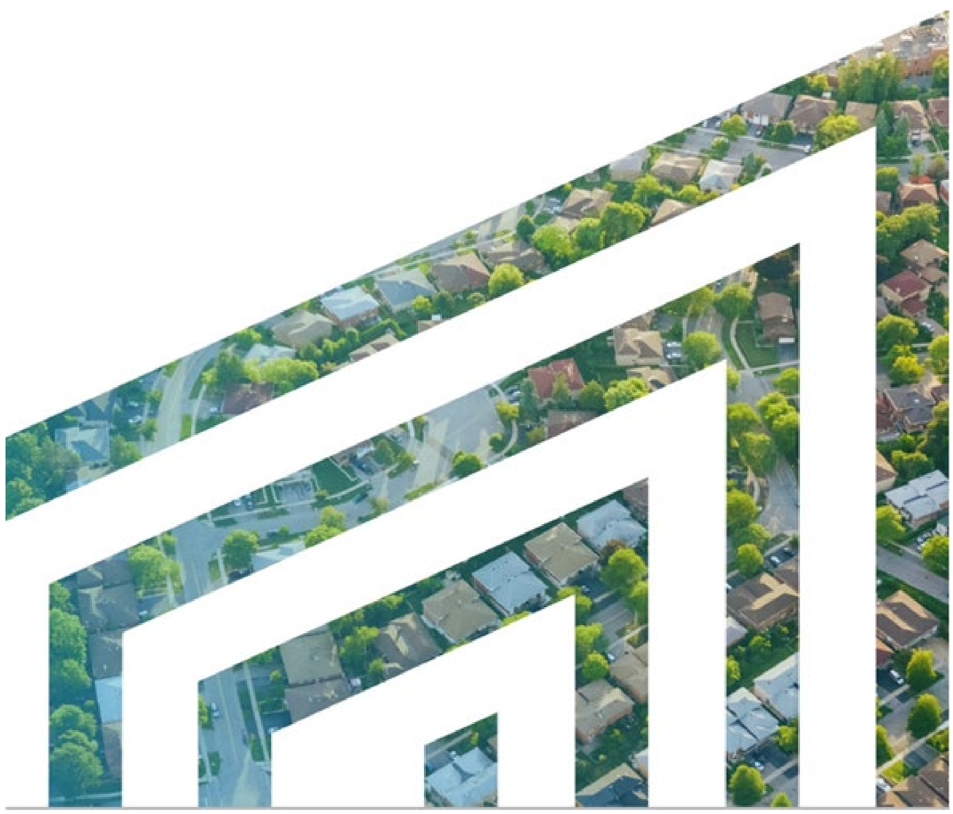
ETOBICOKE WATERSHED QUANTITY CONTROL STRATEGY - UNIT FLOW RATES
REGIONAL CONTROL

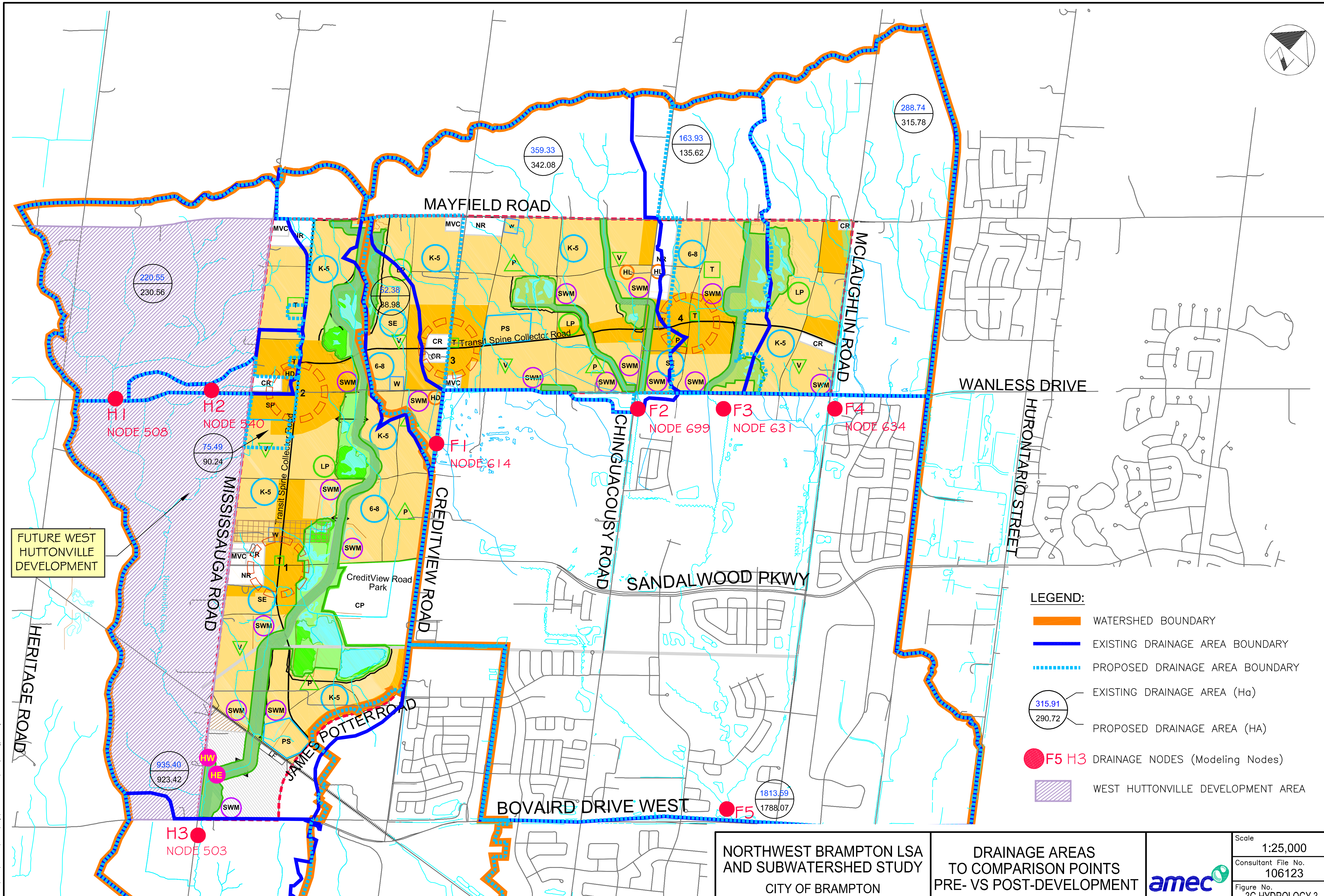
Basin 1 - Etobicoke Creek Headwater (Upstream) - Exclusive Mayfields Area - Control to 60% of Future Flows
Basin 1 - Etobicoke Creek Headwater (Upstream) - Mayfields Area - Control to 100% of Future Flows

Future Catchment #	Unit Flow Rates (m^3/s/ha)
	Regional
1	0.04963
2	0.05656
3	0.06398
6	0.06738
7	0.05335
8	0.06661
9	0.06233
10	0.06465
11	0.05388
12	0.05831
13	0.05788
14	0.05750
18	0.05727
20	0.05905
21	0.06765
32	0.06216
34	0.05646
35	0.06343
40	0.08108
42	0.05565
43	0.07767
49	0.07040
50	0.07417
52	0.06475
53	0.07923
54	0.05880
55	0.05233
62	0.05457
70	0.05731
71	0.05509
72	0.06139
76	0.07829
80	0.06449
82	0.05135
83	0.06047
84	0.07681
85	0.05155
86	0.05504
87	0.07126
89	0.05333
90	0.06224
97	0.05427
102	0.08161
103	0.06452
104	0.05990
105	0.06942
107	0.05577
108	0.05479
118	0.05386
125	0.06194
132	0.06388
140	0.05130
147	0.05498
153	0.06647
167	0.06852
168	0.05447
170	0.05938
176	0.05475
743	0.06956
746	0.07996
747	0.07726
63998	0.06533
744, 63999, 105105, 8484 (Mayfields Area)	0.14209

APPENDIX B

Huttonville and Fletcher's Creeks SWM Targets





NORTHWEST BRAMPTON LSA AND SUBWATERSHED STUDY

CITY OF BRAMPTON

DRAINAGE AREAS TO COMPARISON POINTS PRE- VS POST-DEVELOPMENT

amec

Scale 1:25,000

Consultant File No. 106123

Figure No. 3G HYDROLOGY 3

Dec 14/10 – ana-maria.tr

Table 2.7. Erosion Control Storage Requirements			
Scenario	**Site/Node**	**Storage (m^3/imp. ha)**	**Critical Erosion Flow Rate (m^3/s/ha)**
Conventional	F1	250	0.00052 (Case 1) 0.00025 (Case 2)
	F2	250	0.00052 (Case 1) 0.00025 (Case 2)
	F3	250	0.00052 (Case 1) 0.00025 (Case 2)
	F4	250	0.00052 (Case 1) 0.00025 (Case 2)
	HW	325	0.00052
	HE	200	0.00052
SWM with LID[1.]	F1	150 for Impervious Areas to LID BMPs 250 for Impervious Areas without LID BMPs	0.00052 (Case 1) 0.00025 (Case 2)
	F2	150 for Impervious Areas to LID BMPs 250 for Impervious Areas without LID BMPs	0.00052 (Case 1) 0.00025 (Case 2)
	F3	150 for Impervious Areas to LID BMPs 250 for Impervious Areas without LID BMPs	0.00052 (Case 1) 0.00025 (Case 2)
	F4	150 for Impervious Areas to LID BMPs 250 for Impervious Areas without LID BMPs	0.00052 (Case 1) 0.00025 (Case 2)
	HW	200 for Impervious Areas to LID BMPs 325 for Impervious Areas without LID BMPs	0.00052
	HE	150 for Impervious Areas to LID BMPs 200 for Impervious Areas without LID BMPs	0.00052

1. Storage values represent volumetric requirements for areas without and with LID BMPs.

Water Budget

The LID BMP capture although demonstrated to be able to reduce erosion control volumes, also benefits the overall water budget. As documented within the Phase 2 Impact Assessment, surface runoff would be marginally above existing volumes for East Huttonville Creek at Bovaird at 3% and a similar 2% increase for Fletcher's Creek at the limits of the Mount Pleasant development area.

Water budgets to existing natural features will be assessed as part of the Block Plan EIR Stage to establish an appropriate hydroperiod with respect to wetland conservation, restoration and enhancement efforts. It has been proposed that roof drain collection systems for shallow features and both roof drain and foundation drain systems for deeper features be considered for managing the overall ecological water budget for these features.

2.2.3. Surface Water Quality

The stormwater quality management strategy has been established based on using generic LID infiltration best management practices and conventional stormwater management facilities that would provide Level 1 (Enhanced) quality control. The combination of LID BMPs and conventional stormwater quality management would in effect provide a level of water quality control for Total Suspended Solids above the current MOE Level 1 requirements for stormwater management. Stormwater management facility sizing has been provided within Table 2.8.

Table 2.3 Summary of Stormwater Management Requirements for Flood Control[2]

Stormwater Management Scenario	Drainage Outlet	25-Year		100-Year	
		Unitary Storage Volume (m^3/Impervious ha)	Unitary Discharge (m^3/s/ha)	Unitary Storage Volume (m^3/Impervious ha)	Unitary Discharge (m^3/s/ha)
Conventional	HW	675	0.0068	1200	0.025
	HE	550	0.0068	975	0.025
	F1[1]	800	0.0072	1055	0.025
	F2	500	0.0083	850	0.025
	F3	700	0.0083	900	0.026
	F4	1100	0.0069	1500	0.019
LID	HW	550	0.0068	1100	0.025
	HE	475	0.0068	975	0.025
	F1[1]	750	0.0072	1055	0.025
	F2	400	0.0083	850	0.025
	F3	625	0.0083	850	0.026
	F4	1000	0.0069	1450	0.019

1. F1 Node located at Sugarhill Drive and Crown Victoria Drive just east of Creditview Road.

To mitigate the increase in Regional Storm peak flows, Flood Control Storage would also have to be provided at strategic locations within East Huttonville Creek and Fletcher's Creek. Regional Storm storage as cited in Table 2.3 has been determined based on locating Regional Storm flood control storage in the East Huttonville Creek and F2 stream corridor discounting the attenuative influence of the tableland stormwater management facilities designed for the 100 year control rate. For F1 and F4, since there is not stream corridor Regional Storm , flood control has been accommodated in the off-line facilities inherently including all storage volumes, up to and including the Regional Storm event.

It should be noted that the flow comparison node for F1 is not Creditview Road (for post- to pre-) but rather a confluence point just downstream (east) of Creditview Road (ref. Footnote 4), due to combined drainage to this point. From the F1 confluence upstream to Creditview Road, the system is enclosed and not regulated by CVC, hence the standard for management reverts to City of Brampton criteria for major system design (100 year). From the F1 confluence downstream to Sandalwood Road, the system is open and hence regulated, therefore the Regional Storm criteria applies.

Additional investigations have taken place for F4 as well, to determine whether there may be potential to reduce F4 Regional Storm flood control storage by retrofitting/optimizing the existing stormwater management facilities east of McLaughlin Road, north of Wanless Drive. Based on initial investigations this has been determined to have potential, hence should be examined further as part of the EIR.

[2] The application of LID BMPs is currently not to result in a reduction of the quantity management requirements to be achieved by stormwater management facilities.

Table 2.4 Regional Storm Event Flood Storage

Total Storage (m^3)	Storage Type	Storage (m^3/imp.ha)	Total Storage (m^3)
HE[2.]	On-line SWM	841	125,000
F1[3., 4.]	Off-line SWM	910	37,000
F2[2.]	On-line SWM	446	42,000
F3[1.]	NA	0	0
F4[3.]	Off-line SWM	1178	38,500

1. 100 year governs.
2. Storages do not include 100 year offline facility storage.
3. Storages determined with 100 year off-line facility in-place, but are considered in addition to the required 100 year storage.
4. F1 Node located at Sugarhill Drive and Crown Victoria Drive just east of Creditview Road.

All structures supporting Regional Storm on-line storage will need to be designed and managed appropriately (i.e. designed to meet functional stability, Canadian Highway Bridge Design Codes (CHBD Codes), . In addition, appropriate risk assessment tools should be considered for use such as a dam break analysis to ensure appropriate flood management measures are implemented upstream and downstream of proposed control structures.

Hydraulics

Regional Storm on-line storage would be provided within the Regulatory channel corridors, which have been assessed for flood hydraulics and stream morphology along with required setbacks. Accordingly Table 2.5 provides the required channel corridor widths.

Table 2.5. Minimum Watercourse Channel Block Width Requirements (m)

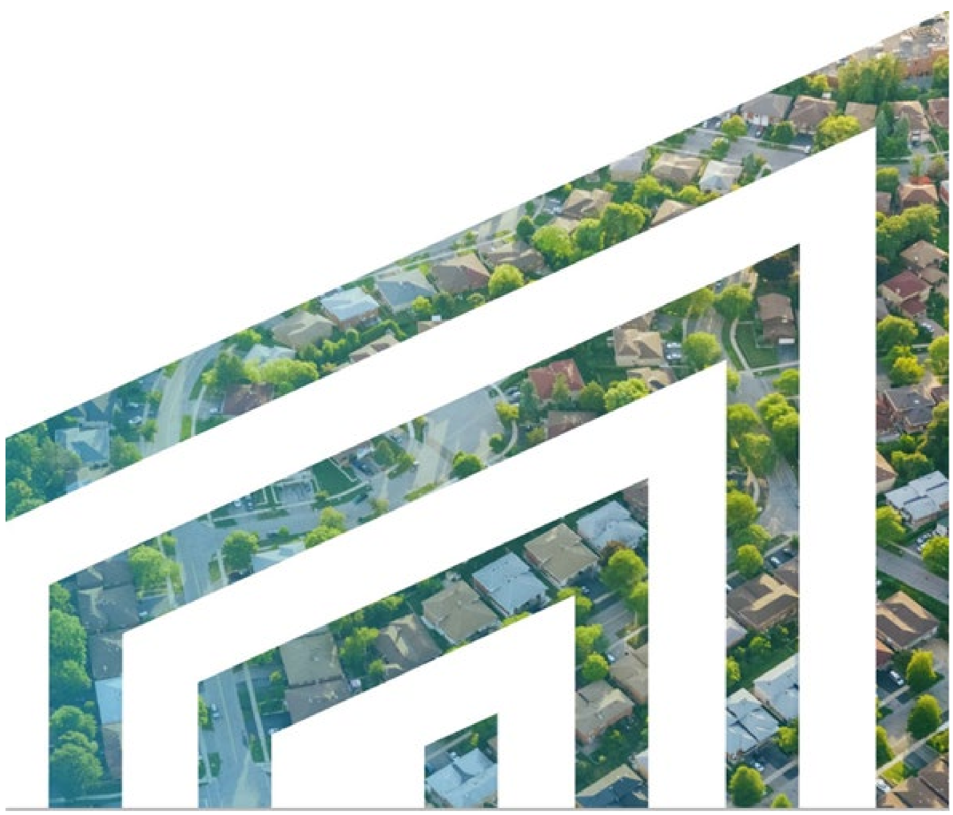
Creek Location		Stream Meander Belt	Flood Control	Buffer/Setback	Total[1.]
East Huttonville	South of CNR (ref. Reach HV 18, Fig. 1.1)	30	60	10	70
	North of CNR to TCPL (ref. Reaches HV 19, Fig. 1.1)	31-50	55 +/-	10	70 +/-
	TCPL to Wanless (ref. Reaches HV20-25), Fig. 1.1)	15-20	40 +/-	10	50 +/-
	North of Wanless to Woods (ref. Reaches HV 26, Fig. 1.1)	15-20	35 +/-	10	45 +/-
	North of Wanless, Woods to Mayfield (ref. Reaches HV 27-29, Fig. 1.1)	15-20	35 +/-	10	45 +/-
Fletcher's	West and Central Eastern Corridors (ref. Reaches F04, Fig. 1.1)	31-40 21-30	50 +/- 45 +/-	10	62.5 +/- 55 +/-
	Central Western Corridor (ref. reaches F 07-F08, Fig. 1.1)	15-20	45 +/-	10	55 +/-
	Eastern Corridor (ref. Reaches F15 – F17, Fig. 1.1)	21-30	45 +/-	10	55 +/-
	Mayfield/ McLaughlin Corridor (ref. Reach F22, Fig. 1.1)	21-30	45+/-	10	55 +/-

Note: "The implementation of this buffer/setback can be variable/flexible as it relates to its application to the corridor, e.g. if its 10 m, it might be split 5 m on either side, or used as 6 metres on one side to facilitate the City trail and 4 m on other side."

1. Actual watercourse corridors can be greater based on SPNHS principles.
2. This buffer/setback may be variable/flexible as applied from top-of-bank (e.g. 5 m per side).

APPENDIX B

Settlement Area Boundary Expansion (SABE) SWM Targets



Subwatershed: Upper Etobicoke Creek Subwatershed	
Subwatershed Characterization:	
Total Subwatershed Drainage Area:	9978 ha
Predominant Soil Group:	Clay Loam
Predominant Grades:	<2%
Downstream FVA:	Yes (Downtown Brampton)
# of Structures within FVA:	110 Commercial; 13 Miscellaneous/Institutional; 68 Residential
Flood Frequency for FVA:	> 50 Year
Redside Dace Habitat:	No
Land Classification Characterization:	
Area of FSA Within Subwatershed:	2027 ha
FSA As Proportion of Subwatershed:	20.3 %
Assumed Imperviousness of FSA:	51%
Receiving Systems:	Mixed (Confined and Unconfined Watercourses, HDFs)
Area of Preliminary SABE Concept Within Subwatershed:	731 ha Community 146 ha Employment
Preliminary SABE Concept As Proportion of Subwatershed:	8.8 %
Assumed Imperviousness of Preliminary SABE Concept:	70% Community 90% Employment
Receiving Systems:	Mixed (Confined and Unconfined Watercourses, HDFs)
Area of SABE Testing Area Within Subwatershed:	72 ha Community 136 ha Employment
SABE Testing Area As Proportion of Subwatershed:	2.1 %
Assumed Imperviousness of SABE Testing Area:	70% Community 90% Employment
Receiving Systems:	Mixed (Confined and Unconfined Watercourses, HDFs)
Range of Stormwater Management Sizing and Design Criteria	
Extended Detention Storage/Erosion Control:	325 m^3/imp. ha
100 Year Flood Control:	400 m^3/imp. ha – 1250 m^3/imp. ha
Regional Storm Control:	0 m^3/imp. ha – 1200 m^3/imp. ha
Water Budget:	1 mm/imp. ha – 6 mm/imp. ha
Water Quality Criteria:	Enhanced Standard of Treatment Thermal Mitigation

Subwatershed: Fletcher's Creek Subwatershed	
Subwatershed Characterization:	
Total Subwatershed Drainage Area:	4169 ha
Predominant Soil Group:	Clay Loam
Predominant Grades:	<2%
Downstream FVA:	No
Redside Dace Habitat:	Yes
Land Classification Characterization:	
Area of FSA Within Subwatershed:	186 ha
FSA As Proportion of Subwatershed:	4.5 %
Assumed Imperviousness of FSA:	51%
Receiving Systems:	Mixed (Unconfined Watercourses, HDFs)
Area of Preliminary SABE Concept Within Subwatershed:	126 ha Community 1 ha Employment
Preliminary SABE Concept As Proportion of Subwatershed:	3.1 %
Assumed Imperviousness of Preliminary SABE Concept:	70% Community 90% Employment
Receiving Systems:	Mixed (Unconfined Watercourses, HDFs)
Range of Stormwater Management Sizing and Design Criteria	
Extended Detention Storage/Erosion Control:	250 m^3/imp. ha
100 Year Flood Control:	600 m^3/imp. ha - 1250 m^3/imp. ha
Regional Storm Control:	0 m^3/imp. ha - 1225 m^3/imp. ha
Water Budget:	1 mm/imp. ha – 6 mm/imp. ha
Water Quality Criteria:	Enhanced Standard of Treatment Discharge temperatures below 24°C Dissolved oxygen concentrations of at least 7 mg/L
TSS levels less than 25 mg/L above background conditions	

Subwatershed: Huttonville Creek Subwatershed	
Subwatershed Characterization:	
Total Subwatershed Drainage Area:	1510 ha
Predominant Soil Group:	Clay Loam
Predominant Grades:	<2%
Downstream FVA:	No
Redside Dace Habitat:	Yes
Land Classification Characterization:	
Area of FSA Within Subwatershed:	43 ha
FSA As Proportion of Subwatershed:	2.8 %
Assumed Imperviousness of FSA:	51%
Receiving Systems:	HDFs
Area of Preliminary SABE Concept Within Subwatershed:	2 ha Community 36 ha Employment
Preliminary SABE Concept As Proportion of Subwatershed:	2.5 %
Assumed Imperviousness of Preliminary SABE Concept:	70% Community 90% Employment
Receiving Systems:	Mixed (Unconfined Watercourses, HDFs)
Range of Stormwater Management Sizing and Design Criteria	
Extended Detention Storage/Erosion Control:	200 m^3/imp. ha - 325 m^3/imp. ha
100 Year Flood Control:	550 m^3/imp. ha - 1150 m^3/imp. ha
Regional Storm Control:	975 m^3/imp. ha - 1200 m^3/imp. ha
Water Budget:	1 mm/imp. ha – 6 mm/imp. ha
Water Quality Criteria:	Enhanced Standard of Treatment Discharge temperatures below 24°C
Dissolved oxygen concentrations of at least 7 mg/L	
TSS levels less than 25 mg/L above background conditions	

APPENDIX C
HYDROLOGY AND HYDRAULICS MODELLING FILES

Modelling files are provided separately for Agency review