



Guelph Innovation District (GID) Lands, Blocks 1 & 2

Stormwater Management Report

Project Location:

328 Victoria Road South and 588 Stone Road East
Guelph, Ontario

Prepared for:

Fusion Homes
500 Hanlon Creek Boulevard
Guelph, Ontario, N1C 0A1

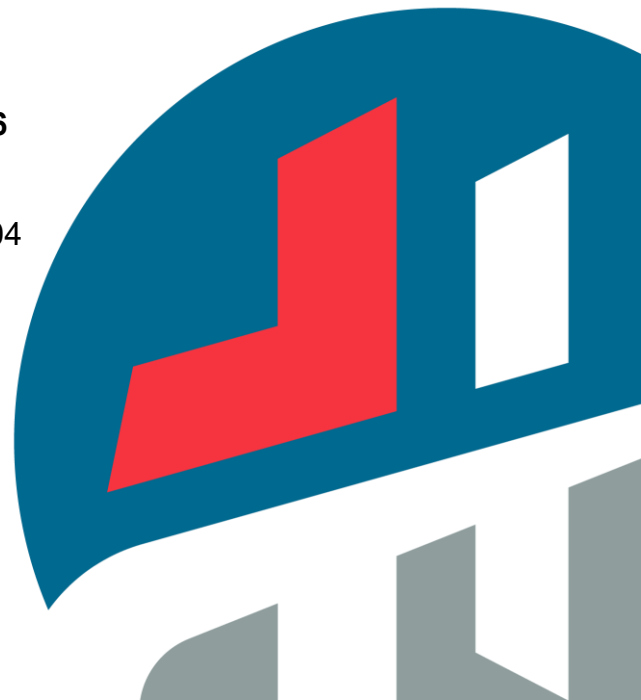
Prepared by:

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

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1.0 INTRODUCTION

1.1 Overview

MTE Consultants Inc. (MTE) has been retained by Fusion Homes (Fusion) to prepare a Preliminary Stormwater Management (SWM) Report in support of a Draft Plan of Subdivision application for the proposed Guelph Innovation District (GID) Lands, herein referred to as the 'subject lands'. The subject lands consist of approximately 116.0ha and is located in the City of Guelph.

The subject lands are currently agricultural/open space and part of the University of Guelph's Agroforestry Research facility. The subject lands are bounded by Stone Road East to the south, Victoria Road South to the west, and the Guelph Junction Railway and the Eramosa River to the north and east. Refer to **Figure 1.1** for a site location plan.

Development plans for the subject lands include the construction of street-oriented residential units, multiple residential and mixed-use blocks, a school site, employment blocks, park lands, stormwater management facilities, open space blocks, and the required roads and municipal services (storm, sanitary, and water). A Draft Plan of Subdivision (dated May 28, 2026) for the proposed development has been prepared by MHBC Planning and forms the basis for this report. Refer to **Appendix A** for more details.

This report presents the stormwater management quality, quantity and water balance measures that are proposed to be provided for the development. This report should also be read in conjunction with the following reports:

- *Guelph Innovation District (GID) Lands, Blocks 1 & 2 – Engineering Master Servicing Plan* (MTE, July 16, 2025);
- *Guelph Innovation District (GID) Lands, Blocks 1 & 2 – Functional Servicing Report* (MTE, June 12, 2026);
- *Guelph Innovation District (GID) Lands, Blocks 1 & 2 – Hydrogeological Assessment* (MTE, June 12, 2026);
- *Guelph Innovation District (GID) Lands, Blocks 1 & 2 – Geotechnical Investigation Report* (MTE, December 12, 2025);

The lands are located within the Eramosa River Watershed as defined in the *Eramosa-Blue Springs Watershed Study - GRCA et al. (1999)*. The Subject Lands are surrounded by the Laurel Creek Conservation Area, Reservoir, and Nature Centre to the south, Creekside Church and rural residential homes to the north, an existing mobile trailer park to the east (Green Acre Park – aka Martin Lands), and Laurel Creek and a woodlot to the west.



Engineers, Scientists, Surveyors

PROJECT

GUELPH INNOVATION DISTRICT LANDS

TITLE

LOCATION PLAN

Drawn	OXR	Scale	1:10000	Figure
Checked	CJC	Project No.	46927-104	
Date	2025-12-15	Rev No.	0	

1.1

1.2 Background Information

1.2.1 Engineering Master Servicing Plan for GID Lands, Blocks 1 & 2

The subject lands are located within the study area as identified in the *Engineering Master Servicing Plan for GID Lands, Blocks 1 & 2* prepared by MTE Consultants in April 2024 (Revised July 2025) (herein referred to as the 'MSP').

The objective of the *MSP* is to guide the development of the subject lands and develop a comprehensive design strategy that is acceptable to the City, the Grand River Conservation Authority (GRCA), and the Ministry of the Environment, Conservation and Parks (MECP), taking into consideration the findings and recommendations of previously completed and related studies.

The *MSP* informs the Block Plan process through:

- Review of relevant background policies and documents to incorporate objectives and recommendations into the site servicing and grading design;
- Identification and assessment of the relevant environmental, servicing, and engineering design considerations and recommendations for design of a preferred development plan; and,
- Development of a framework to be followed by subsequent submissions, including the Draft Plan of Subdivision Application and the Final Engineering Submissions.

The *MSP* highlights the existing site conditions and engineering design criteria/constraints, to which future plans will need to adhere. A preliminary design strategy, including considerations for grading, servicing, stormwater management (SWM), and an environmental noise assessment has been outlined. This design approach will be refined during future detailed design stages of the proposed development.

1.2.2 Eramosa-Blue Springs Watershed Study Report

The subject lands are located within the Eramosa River subwatershed. The GRCA has published the *Eramosa-Blue Springs Watershed Study Report (Aquafor Beech Ltd., 1999)*, which provides existing conditions and mitigation recommendations for the watershed.

The Eramosa River is categorised as a cool water stream with high levels of groundwater interaction, with areas of both groundwater discharge and recharge. Due to the mainly undeveloped nature of the catchment area, water quality throughout the watercourse is better than typical, with lower levels of nutrients and suspended solids and higher levels of dissolved oxygen. Baseflow is consistent and flood events are less frequent due to delayed peak flow times resulting from the mainly undeveloped contributing area.

It is recommended that any development in the catchment area maintain existing groundwater recharge rates as closely to at-source as possible, to maintain the current baseflow characteristics.

1.2.3 Guelph Innovation District Stormwater Management Study

The subject lands are located within the study area identified in the *Guelph Innovation District Stormwater Management Study (Wood., 2020)*. This study was completed to assess the stormwater management requirements of the area and provide associated guidance and policies to mitigate the impacts of proposed GID development. The study established

preliminary locations for stormwater management facilities, as well as infiltration criteria for the subject lands.

1.3 Purpose of Study

The purpose of this study is to develop a comprehensive stormwater management strategy for the development proposal for the subject lands in accordance with the Draft Plan of Subdivision, taking the findings of previous studies and agency comments into consideration that is acceptable to the City of Guelph, the Grand River Conservation Authority (GRCA), and the Ministry of the Environment, Conservation and Parks (MECP- formerly known as the MOE).

1.4 Objectives

The objective of the stormwater management plan recommended by this report is to ensure that the proposed development includes the necessary controls to protect the hydrology and water quality of the receiving water systems. The plan will ensure that the proposed Plan of Subdivision provides the necessary blocks and corridors for stormwater management measures to be implemented. The primary objectives of this study are as follows:

- Document criteria for the management of stormwater runoff from the subject lands.
- Recommend a comprehensive plan for controlling the quality of stormwater runoff from the subject lands (including temperature mitigation as required).
- Recommend a comprehensive plan for controlling the quantity of stormwater runoff from the subject lands.
- Recommend a comprehensive plan for balancing infiltration to groundwater and surface water inputs to existing features.
- Prepare preliminary designs for the recommended stormwater management infrastructure within the subject lands.

2.0 EXISTING CONDITIONS AND BACKGROUND INFORMATION

2.1 Topographical Information

MTE conducted a detailed topographical survey of the subject lands in 2022. Existing topographical conditions for the subject lands, as well as the adjacent surrounding lands, are shown in **MTE Drawing 46927-104-EC1.1**.

There are two large existing mounds onsite, at approximate elevations of 343.0m-345.0m, creating a ridge near the center of the property in a north-south orientation. As such, existing surface runoff drains in all directions; south towards Stone Road East, west towards Victoria Road South, and north and east towards the Eramosa River.

There is significant topographic relief onsite, with upwards of 15.0m of difference within the developable 'tablelands' alone. There is also approximately 10.0m of relief within the adjacent Valleylands down to the river, not slated for development. The average slopes onsite range from approximately 2.0% – 8.0%, with steeper sections to the north ranging from 10.0% – 20.0%.

2.2 Pre-Development Conditions

The subject lands are located in the southeastern end of the Eramosa River watershed, adjacent to the confluence of the Torrance Creek, Clythe Creek, and Hadati Creek with the Eramosa River. The pre-development catchment areas are shown in **Figure 2.1** and summarized as follows:

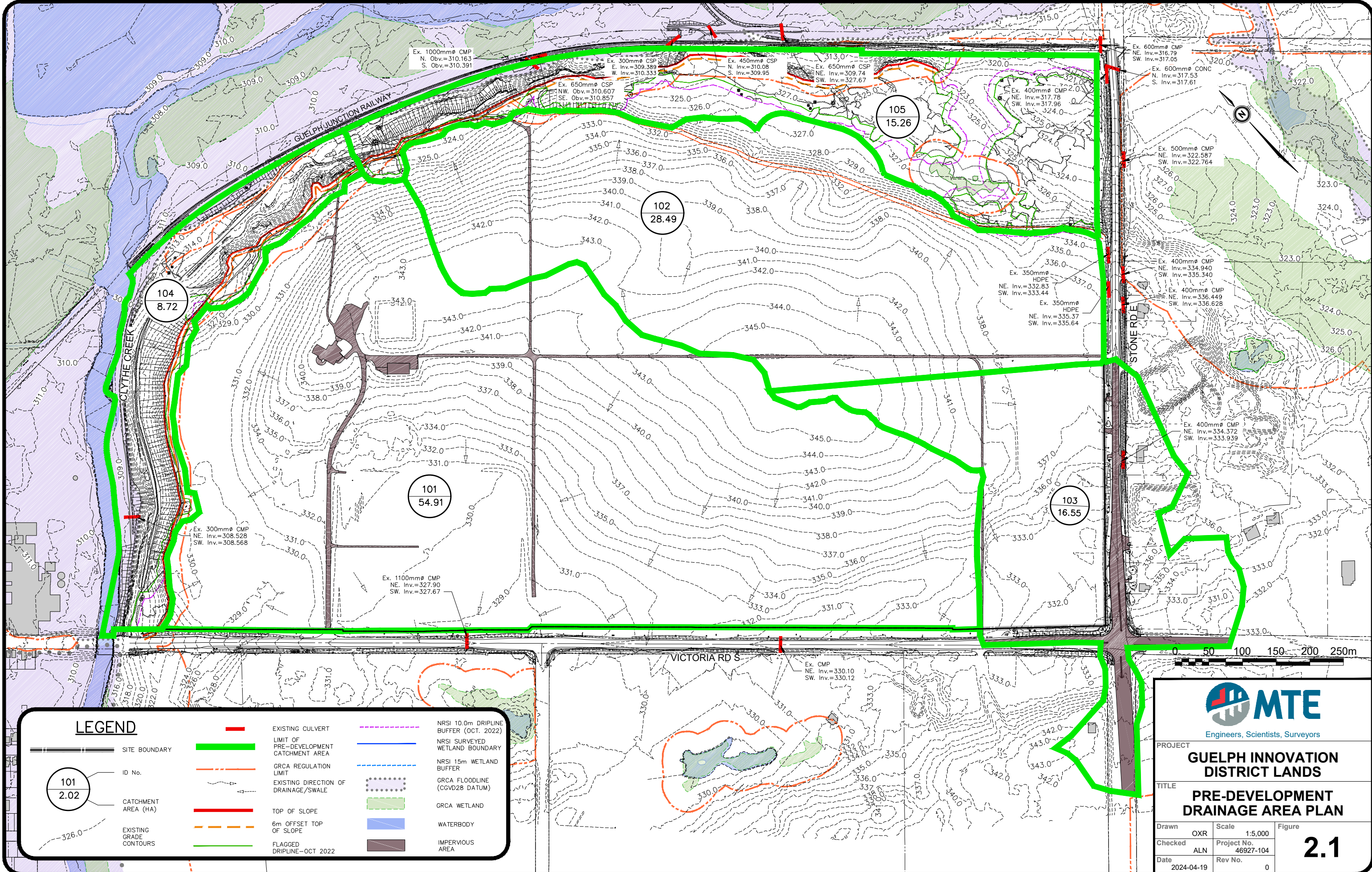
Catchment 101 (Outlet 1) – this catchment is 54.91ha in size with an agricultural/open space land use. For modelling purposes, the average slope is approximately 6.0%, with steeper localized slopes to the north. The majority of overland flow drains west towards Victoria Road South, where roadside ditches and culverts convey flow northward. The ultimate outlet is considered to be the Eramosa River to the north; east of Victoria Road South.

Catchment 102 (Outlet 2) – this catchment is 28.49ha in size with an agricultural/open space land use. For modelling purposes, the average slope is approximately 4.0%, with steeper localized slopes to the north. The majority of overland flow drains east towards the adjacent Natural Areas. The ultimate outlet is considered to be the Eramosa River to the east.

Catchment 103 (Outlet 3) – this catchment is 16.55ha in size, which includes approximately 8.00ha of external lands (Victoria Road South right-of-way, Stone Road East right-of-way, and some developed lands to the south). For modelling purposes, the average slope is approximately 2.0%. Overland flow from this catchment drains to the northeastern corner of the Victoria-Stone intersection, where an existing storm sewer network and overland conveyance directs flow towards an existing infiltration drypond (SWMF No. 104 – refer to 2020 *GID SWM Study*).

Catchment 104 – this catchment is 8.72ha in size, agricultural/open space land use. For modelling purposes, the average slope is approximately 11.0%. The majority of overland flow drains north. The ultimate outlet is considered to be the Eramosa River to the north.

Catchment 105 – this catchment is 15.26ha in size, agricultural/open space land use. For modelling purposes, the average slope is approximately 11.0%. The majority of overland flow drains east. The ultimate outlet is considered to be the Eramosa River to the east.



2.3 Geotechnical and Hydrogeological Information

MTE has conducted geotechnical investigations for the subject lands in 2022 and 2023. The latest 2025 report, *Guelph Innovation District (GID) Lands, Blocks 1 & 2 – Geotechnical Investigation Report*, summarizes the work performed, the findings of the investigations, and makes recommendations in support of future development plans, to be further discussed in this report. The fieldwork for this investigation involved drilling of 22 borehole locations (boreholes MW501-22 to MW520-22, BH654-22, and BH655-22) to depths of 1.4m to 11.1m. Soil conditions found in the boreholes generally show a mixture of silt till, sandy till, gravelly till, sand, and gravel. Auger refusal on bedrock occurred at boreholes MW501-22 to MW507-22, BH654-22, and BH655-22. The bedrock elevations varied from 1.4m to 11.1m below the ground surface, indicating shallow bedrock along the east adjacent to the Natural Areas, and much deeper bedrock depths along the northern extent of the subject lands. Refer to MTE's *Geotechnical Investigation Report* for more details.

Concurrently with the geotechnical investigations discussed above, MTE has also been conducting ongoing hydrogeological investigations and monitoring. The work performed to date includes: the construction of monitoring wells in some of the earlier boreholes drilled for the aforementioned geotechnical investigations (MW501-22, MW507A-22, MW507B-22, MW512A-22, MW512B-22, MW514-22, and MW520-22), the advancement of an additional 51 boreholes (MW601-22 to MW651-22) to depths of 0.9m to 12.2m, the construction of an additional seven monitoring wells (MW601-22 to MW607-22), and the installation of a minipiezometer (MP101-23) within the wetland onsite. The analysis of this additional data has confirmed the original assessments of the existing soil stratigraphy, location of the underlying bedrock, and provided additional information regarding the groundwater elevations encountered throughout. Refer to MTE's 2025 *Guelph Innovation District (GID) Lands, Blocks 1 & 2 – Hydrogeological Assessment* for more details.

Similarly to the existing topography, more specifically the previously discussed high topographic knobs onsite, the groundwater mimics the surface contours and concentric mounds are present near those locations. As identified in MTE's 2026 *Hydrogeological Assessment*, the latest measured groundwater levels near the mounds are above the proposed preliminary finished grades in those locations. As such, appropriate waterproofing measures shall be implemented for structures in these areas.; to be further discussed in Section 5.6.

Through additional review of GRCA mapping, it was confirmed that the subject lands are within the Eramosa-Blue Springs Creek subwatershed. Based on the *Eramosa-Blue Springs Watershed Study Report* (Beak International Inc. and Aquafor Beech Ltd., 1999), the subject lands are in a low stress diverse warm/cool water community. A large portion of the Eramosa-Blue Springs Creek subwatershed is considered an important recharge area to local streams and rivers. Within this subwatershed, infiltration techniques are encouraged to achieve a sitewide water balance. The subject lands are also within a Source Water Wellhead Protection Area B, with a vulnerability score of 8-10. Therefore, special attention is required for the protection of the groundwater resource and its interaction with any proposed development.

Details involving infiltration criteria, proposed water balance measures, and stormwater quality management will be further discussed in subsequent sections.

2.4 Slope Stability Assessment

As part of the geotechnical investigation, a slope stability assessment was completed for the Valleylands slope along the north and east limits of the subject lands. Various failure modes of this slope were investigated. An Erosion Hazard Setback Limit (EHSL) was established based

on the recommendations for the Stable Top of Slope, as well as development setbacks following the GRCA and Ministry of Natural Resources and Forestry (MNRF) guidelines. The Stable Top of Slope and the associated 6.0m setback from the EHSL was established. The following Slope Stability Setback recommendations are proposed for the development:

- No additional fill shall be placed within the EHSL or on the face of the slope;
- No excavation work should be carried out along the face or the bottom of the slope without geotechnical review;
- No new infiltration or stormwater management infrastructure shall be placed within the EHSL areas;
- Surface runoff should be directed away from the slope to prevent gullies from forming and expanding; and,
- Though the conservation areas are currently well-vegetated, periodic planting might be required to maintain vegetation across the slope face.

Based on the above, the proposed development limits were established, as shown in the Draft Plan.

2.5 Environmental Buffers

There are regulated GRCA wetland complexes located north and east of the subject lands, adjacent to the Eramosa River and the Guelph Junction Railway corridor. Through site walks and specific OPA policy review, site-specific environmental buffers were established by NRSI. These buffers establish a Development Limit, beyond which development may not occur. This Development Limit was used to further establish a functional Draft Plan of Subdivision and help delineate pre-development and post-development catchment areas used in the SWM assessment. The buffers established onsite are as follows, of which, a combination of the most restrictive is what defines the Development Limit:

- Surveyed Dripline and associated 10.0m Buffer;
- Surveyed Wetland and associated 15.0m Buffer; and,
- Erosion Hazard Setback Limit and associated 6.0m Buffer.

3.0 STORMWATER MANAGEMENT CRITERIA

New developments are required to provide stormwater management in accordance with provincial and municipal policies. Relevant documents, which have been previously listed, have been referenced in the design of the SWM plan for the subject lands, including:

- *Stormwater Management Planning and Design Manual* (MECP formerly MOE, 2003);
- *Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation – Ontario Regulation 150/06* (GRCA, 2015);
- *Stormwater Management Study, Guelph Innovation District* (Wood, 2020);
- *Stormwater Management Master Plan: Municipal Class EA, Final Report*, (Aquafor Beech Ltd., 2023); and,
- *Development Engineering Manual*, (City, 2023).

Based on the above policies and relevant documents, the following SWM criteria have been established for the subject lands:

- **Water Quality Control** – Provide an Enhanced level of stormwater quality treatment prior to discharging to surface or groundwater systems.
- **Water Quantity Control** – Control peak flow rates to the Eramosa River to existing levels for the 5-year storm event. For the 25-year and 100-year storm events, control peak flow rates to the allowable Unitary Storage and Discharge Rates specified in the 2020 *GID SWM Study*. This will minimize flooding and preserve hydraulic and hydrologic functions. Note that the 5-year storm event rate criterion is self-imposed for the purposes of this study and not a requirement from any governing study. This is simply used to aid in sizing of the storm infrastructure and SWM facilities.
- **Infiltration / Water Balance** – 27mm rainfall capture in infiltrative Low Impact Development measures (LIDs) and maintain or enhance existing recharge rates across the development area.
- **Thermal Mitigation** – Implement thermal preventative and mitigation measures to maintain cool water fish habitat (Eramosa River).

It should be noted that the overall SWM design criteria established in the 2020 *GID SWM Study*, and subsequently in the 2023 *SWM Master Plan*, includes a treatment train approach, with distributed LID Best Management Practices (BMPs) coupled with end-of-pipe SWMFs. To aid in the overall quality and quantity control for the subject lands, the goal of the LID BMPs is to be adequately sized to capture 27mm of rainfall depth over the entire development area, whereas the resulting excess flows are conveyed to the respective SWMFs.

It should further be noted that implementation of a reduced capture rainfall depth, per Section 5.3 of the 2020 *GID SWM Study*, is proposed for the development. Per the study, a reduced rainfall capture of up to 75% (i.e. 20mm) is allowed where the 27mm capture depth is not feasible. Refer to Section 5.7 of this report for more details.

3.1 Water Quality Control

All new SWMFs proposed for the development will need to provide an Enhanced level (80% TSS reduction) of water quality protection prior to discharging to surface or groundwater systems. Furthermore, a chloride mitigation strategy should be considered to protect groundwater from chloride-laden stormwater during winter months. As outlined in Section 5.3 of the 2022 *Stormwater Management Master Plan: Final Stormwater Infiltration Policy Recommendations (2023 Master Plan)*, consideration should be given to a winter bypass with operable controls for infiltration measures that receive runoff from roadways and/or parking areas (i.e. surfaces that receive winter maintenance). Furthermore, site specific Salt Management Plans shall be developed to align with *Source Water Protection Policies*. Lastly, non-infiltrating end-of-pipe SWMFs should be lined.

Erosion and Sediment Control (ESC) Plans shall be designed to incorporate flexible ESC measures, to accommodate required changes resulting from specific rainfall events or site conditions. The ESC measures should aim to protect the downstream features from sediment-laden runoff during construction, until such time that the contributing drainage areas have been vegetated and established. Refer to Section 7.0 for more details.

3.2 Water Quantity Control

As described in the foregoing studies, the overall SWM strategy for the GID Lands is to maintain existing hydraulic and hydrologic conditions. As such, allowable post-development flow rates to the Eramosa River were developed in two ways.

First, the 2020 *GID SWM Study* established Unitary Storage Volumes and Discharge Rates to the Eramosa River for GID and proposed the post-development allowable flow rates for the 25-year and 100-year storm events.

Secondly, since a Unitary Rate is not available in the 2020 study for a 5-year storm event, a pre-development hydrologic model was developed using PCSWMM to confirm the existing flow rates off-site. It is assumed that a post-to-pre-development peak flow rate maintenance would be appropriate for the 5-year storm event. This additional analysis helps appropriately size receiving sewers and SWMFs, ensuring capacity for the 5-year event flows.

The appropriate quantity control is to be provided by the proposed SWMFs; ultimately discharging to the Eramosa River. The post-development total allowable peak flow rates outlined in **Table 3.1** below include a combination of flow from the respective SWMF and any other additional uncontrolled flow, where applicable.

Table 3.1 – Post Development Quantity Control Targets

Storm Event	Unitary Storage Volumes (m ³ /imp. ha) ¹	Unitary Discharge (m ³ /s/ha) ¹	Outlet 1 - North to Eramosa River ⁴		Outlet 2 - East to Eramosa River ⁴		Outlet 3 - (SWMF No. 104) ⁴	
			Storage (m ³)	Discharge (m ³ /s) ³	Storage (m ³)	Discharge (m ³ /s) ³	Storage (m ³)	Discharge (m ³ /s) ³
5-year	-	-	-	1.550	-	0.560	-	1.120
25-year	175	0.069	7,224	4.193	1,768	1.043	3,015	1.663
100-year	325	0.131	13,416	7.961	3,283	1.979	5,599	3.157

- *Note: 1. Taken from Table 5.4.4 of the 2020 *Stormwater Management Study, Guelph Innovation District* by Wood.
2. Areas used to determine the allowable release rates are the post-development catchments. See Section 5.3.
3. Areas used to determine the allowable release rates are the pre-development catchments.
4. Discharge Rates (in post-development) = SWMF flows + uncontrolled flows
5. 'Outlets' are further defined in Section 4.2 to follow.

As identified in the 2020 *GID SWM Study* and subsequent studies, additional erosion controls are not required due to the implementation of upstream LID BMPs (i.e. the 27mm capture).

3.3 Infiltration / Water Balance

Water Balance criteria are set out by the policies and analyses conducted for the 2020 *GID SWM Study* and 2022 *Infiltration Policy (2023 Master Plan)*. The studies outline requirements for infiltration and the protection of groundwater and surface water features. In a general sense, the requirement is to maintain pre-development infiltration in post-development conditions, while protecting groundwater resources.

The following recommendations have been outlined specifically for the subject lands:

- LID BMPs are recommended to reduce stormwater runoff and promote groundwater recharge;
- LID integration in the public right-of-ways, open spaces, and amenity areas are encouraged; and,
- Design a distributed infiltration strategy such that 27mm of capture over pre-development conditions is maintained in post-development conditions.

The 2022 *Infiltration Policy* highlights restrictions based on high-risk activities and/or Wellhead Protection Area (WHPA) vulnerability scores, infiltration opportunities, and recommendations specific for the GID infiltration measures proposed within this study. The most significant policy affecting overall infiltration and SWM is the required 27mm capture in LID BMPs.

The *Policy* gives direction as to where and when typical infiltration measures (e.g. soakaway pits, galleries, bioretention, etc.) are appropriate and provides recommendations to ensure groundwater resources are protected at all times. Following the decision flow chart, tables, and recommendations outlined in the *Policy*, the proposed infiltration strategy for GID shall incorporate appropriate pre-treatment (e.g. oil-grit separators (OGSs) or end-of-pipe facilities), where needed, prior to introducing stormwater runoff back into the groundwater system.

Additionally, as previously stated, the 2023 *Master Plan* allows for a reduced rainfall capture of up to 75% (i.e. 20mm) where the 27mm capture depth is not feasible for sites with restrictions and/or constraints. The use of this exception will be further explored in the subsequent sections of this report when discussing the overall infiltration and water balance strategies.

3.4 Thermal Mitigation

According to the City's latest *SWM Master Plan*, the Eramosa River has been classified as having a cool water regime. Therefore, the following criteria should be applied:

- Pre-development water balance is to be maintained;
- Infiltration and filtration measures should be maximized, where possible; and,
- All end-of-pipe facilities should be designed to implement appropriate thermal mitigation measures.

4.0 PROPOSED DEVELOPMENT AND SWM STRATEGY

4.1 Proposed Area Grading

A Preliminary Grading Plan illustrating road grades is enclosed (**MTE Drawing 46927-104-AG1.1**). The grading design of the subject lands is controlled by many factors, which include:

- Matching to centreline of road elevations of existing surrounding roads;
- Compatibility with the proposed widening and grading of Victoria Road South and Stone Road East;
- Matching to existing and proposed boundary grades around the perimeter of the Development Limit, while respecting existing natural features (established buffers);
- Drainage of major storm event overland flows towards the road right-of-ways, where applicable, and ultimately to the proposed SWMFs;
- Compliance with municipal standards for minimum and maximum road grades;
- Servicing constraints (sanitary and storm), while maintaining adequate cover over municipal services; and,
- Optimizing proposed earthworks to minimize the cut/fill imbalance as much as possible.

Utilizing the proposed road layout, preliminary road grades are within the allowable range stated in the City's DEM. Preliminary residential lot grades typically are 2.0% (minimum) to 6.0% (maximum), with a combination of traditional back-to-front drainage, split drainage, walk-out, and walk-up type lots.

As previously discussed, existing grades exceed the maximum municipal standards, therefore, proposed area grading operations may generate soil to be removed from the subject lands. Routine coordination with a Qualified Professional (QP) in excess soil management will be conducted to effectively manage any surplus and the associated requirements, per O. Reg. 406/19.

The two previously mentioned high points onsite will supply the majority of the redistributed earthworks required to optimize the overall cut/fill balance. As identified in MTE's 2026 *Hydrogeological Assessment*, the latest measured groundwater levels near the mounds are above the proposed preliminary finished grades in those locations. As such, appropriate waterproofing measures shall be implemented for structures in these areas; to be further discussed in Section 5.6.

4.2 Post-Development Conditions

The preferred SWM solution for the subject lands requires the implementation of at-source distributed infiltration measures, end-of-pipe infiltration measures, LIDs, and three proposed SWMFs. These facilities are generally aligned with the drainage patterns and SWMF locations recommended in the 2020 *GID SWM Study*. Effort was made to locate SWMFs to optimize the proposed grading, sanitary sewer servicing, and storm sewer servicing. The SWM plan is designed to meet the criteria presented in Section 3.1 of this report.

Minor storm event runoff from all respective contributing areas will be conveyed by the proposed storm sewer system to the SWMFs. Excess runoff from major storm events will flow overland to the facilities, via the proposed right-of-ways and designed overland flow routes, where applicable.

For modelling and analysis purposes, as mentioned in Section 3.2, flow to the Eramosa River has been divided into three distinct 'Outlets'. Outlet 1 flows north, Outlet 2 flows east, and Outlet 3 is considered the existing infiltration facility (SWMF No. 104), which ultimately discharges to n through the subject lands towards the Victoria Road and College Avenue intersection once the infiltration capacity is exceeded. These Outlets are still maintained under post-development conditions and summarize a combination of flows from the respective SWMFs and the associated uncontrolled areas from their contributing catchments. The post-development drainage catchments are shown in **Figure 4.1** and are summarized as follows:

Outlet 1

- **Catchment 201-1** – Catchment 201-1 consists of the northeastern portion of the developed tablelands and is proposed to drain to the eastern forebay of SWMF 1. The drainage area contains a combination of single-family residential blocks, and multiple residential blocks. The average overland slope is approximately 1.5% and the drainage area is approximately 19.37ha.
- **Catchment 201-2** – Catchment 201-2 consists of the northwestern portion of the developed tablelands and is proposed to drain to the western forebay of SWMF 1. The drainage area contains a combination of single-family residential blocks, multiple residential blocks, mixed-use blocks, and park blocks. The average overland slope is approximately 1.5% and the drainage area is approximately 34.21ha.
- **Catchment 201-3** – Catchment 201-3 consists of development block embankments and proposed road sections that drain uncontrolled towards and along Victoria Road South; ultimately northward to the Eramosa River. The average overland slope is approximately 5.0% and the drainage area is approximately 2.68ha.
- **Catchment 201-4** – Catchment 201-4 consists of SWM and development block embankments that drain uncontrolled northward towards the Eramosa River. The average overland slope is approximately 20.0% and the drainage area is approximately 0.75ha.
- **Catchment 201-5** – Catchment 201-5 consists of the SWM block and rear yards of single-family residential blocks. The average overland slope is approximately 15.0% and the drainage area is approximately 3.76ha.

Outlet 2

- **Catchment 202-1** – Catchment 202-1 consists of the southeastern portion of the developed lands and is proposed to drain to SWMF 2. The drainage area contains a combination of single-family residential blocks, a mixed-use block, a park block, and SWMF 2 itself. The average overland slope is approximately 1.5% and the drainage area is approximately 9.33ha.
- **Catchment 202-2** – Catchment 202-2 consists of a park block and open space block, along the east. The catchment drains uncontrolled eastward towards the Eramosa River. The average overland slope is approximately 7.5% and the drainage area is approximately 2.89ha.
- **Catchment 202-3** – Catchment 202-3 consists of significant natural areas and an open space block in the southeastern corner of the subject lands that drain uncontrolled eastward towards the Eramosa River. The average overland slope is approximately 33.0% and the drainage area is approximately 2.17ha.
- **Catchment 202-4** – Catchment 202-4 consists of the SWM block. The average overland slope is approximately 15.0% and the drainage area is approximately 0.72ha.

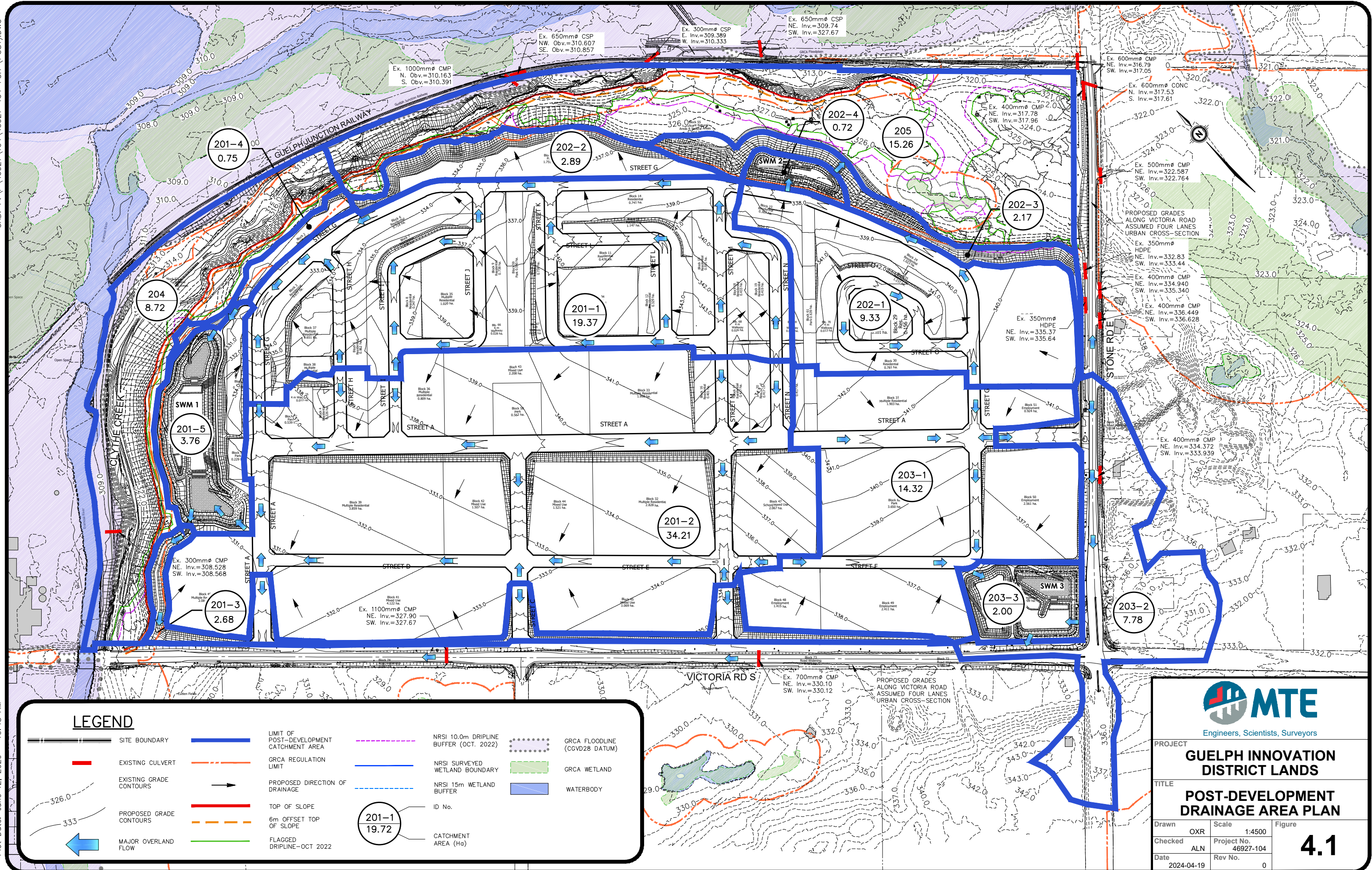
Outlet 3

- **Catchment 203-1** – Catchment 203-1 consists of the southwestern portion of the developed lands. This catchment is proposed to drain to SWMF 3. The drainage area contains a combination of proposed multiple residential block, employment blocks, an institutional block, a park block, and SWMF 3 itself. The average overland slope is approximately 2.5% and the drainage area is approximately 14.32ha.
- **Catchment 203-2** – Catchment 203-2 consists of the external lands surrounding the Victoria-Stone intersection. This catchment is proposed to drain to SWMF 3. The drainage area contains existing single-family residential and aggregate extraction land uses. The average overland slope is approximately 4.0% and the drainage area is approximately 7.78ha.
- **Catchment 203-3** – Catchment 203-3 consists of the SWM block. The average overland slope is approximately 15.0% and the drainage area is approximately 2.00ha.

Undeveloped Areas

- **Catchment 204** – this catchment is 8.72ha in size, agricultural/open space land use. For modelling purposes, the average slope is approximately 11.0%. The majority of overland flow drains north. The ultimate outlet is considered to be the Eramosa River to the north.
- **Catchment 205** – this catchment is 15.26ha in size and is not proposed to be developed from its existing agricultural/open space land use. For modelling purposes, the average slope is approximately 11.0%. The majority of overland flow drains east. The ultimate outlet is considered to be the Eramosa River to the east.

All SWMFs are designed to outlet to the Eramosa River, through a combination of piped and overland flows. SWMF 3 includes the amalgamation of existing SWMF No. 104 and is designed as a wet pond with an infiltration cell. This will help maintain existing groundwater recharge in the area, currently being provided by the existing facility.



5.0 STORMWATER MANAGEMENT DESIGN

5.1 Hydrologic Modeling

As previously mentioned in Section 3.2, a 5-year storm event existing conditions model was developed using the PCSWMM modelling platform. The model was then updated to reflect assumed proposed conditions and SWM strategies within the subject lands to create a proposed hydrologic model. The proposed conditions were also modelled for the 25 and 100-year return period rainfall events (3-hour Chicago distribution derived from the City's IDF parameters). Per the GRCA's request, the Regional (Hurricane Hazel) storm event was also modelled to confirm overland flow route conveyance capacity throughout.

It should be noted that pre-development models were not created for the 25-year and 100-year storm events. As previously mentioned, allowable release rates for these storm events are calculated using the established Unitary Discharge Rates from the 2020 *GID SWM Study*.

The pre- and post-development modelling is included in **Appendix B**. The IDF and hydrologic parameters for each of the pre- and post-development catchment areas are included in **Appendix C**.

5.2 Stormwater Management Facilities

The subject lands are located within the Eramosa-Blue Springs Subwatershed. The southwestern portion of the subject lands, along with existing lands south of Stone Road and west of Victoria Road will utilize a stormwater management facility (SWMF3) located at the northeast corner of Victoria Road and Stone Road. The southeastern portion of the subject lands will utilize a stormwater management facility (SWMF2) located at the eastern end of the development adjacent to the Significant Natural Areas. The remainder of the subject lands will utilize a stormwater management facility (SWMF1) at the northern end of the development adjacent to the Eramosa River.

5.3 Water Quality Control

The proposed SWMFs are designed as wet ponds with permanent pool depths of 1.5m. The facilities will incorporate sediment forebays with a depth of 1.5m, which offer benefits of dilution and settling of sediment. A planting scheme will be prepared that carefully selects plant species and their location in and around the basins to stabilize banks, mitigate temperature increases, deter waterfowl from nesting within the area, and provide aesthetics and safety benefits.

Since the majority of annual rainfall occurs in storms less than or equal to a 25mm event, the majority of water borne sediment is also transported to the stormwater management facilities in these less intense events. Therefore, the sediment forebays are designed targeting the smaller flow events. Furthermore, since larger storm events will have greater peak flows, there is potential for re-suspension of accumulated sediment. To achieve this objective, the forebay has been designed to avoid scour with storm pipes flowing at capacity. Flows greater than the 5 year event will be directed overland, directly into the main cell of each SWMF.

The forebay design is based on classic particle settling and flow dispersion equations as presented in the MECP's 2003 *SWM Manual*. The methodology presented in that document suggests that the design flow for the forebay should be taken as the peak outflow from the facility. The main cell will essentially be empty (or at its permanent pool level) and there will be no mass of water at the outlet of the forebay that would control the flow through the forebay to the main pond's discharge rate.

This being the case, the design of the forebay should be based on the notion that the flow into the forebay equals the flow through the forebay, which equals the flow out of the forebay. In using this approach, the recommended settling velocity of 0.0003m/s (from MECP, 2003) results in extremely large and unachievable forebay lengths. Therefore, the forebay is designed to satisfy the following four conditions:

- Settling length based on a settling velocity of 0.0003m/s (from MECP, 2003) in order to settle finer particles using the main pond peak discharge for the 25mm event;
- Settling length based on a settling velocity of 0.0055m/s in order to settle "Gross Grit" particle sizes using the forebay inflow/outflow for the 25mm event;
- Dispersion length such that, based on flow and depth of water, the velocity through the forebay is less than 0.5m/s; and,
- Velocity based on flow divided by cross-sectional area is less than 0.15m/s to prevent scouring.

The 2003 MOE document suggests that the clean-out frequency for a stormwater management facility be based on the sediment loading within the entire pond, however, it is recommended that the clean-out frequency be based on the loadings within the forebay only. The MOE SWM manual states that an appropriate pond cleanout frequency is 10 years. Through discussions with the City during Block Plan approval, it was determined that due to operation constraints, the City would prefer cleanout frequency of 12-15 years with a maximum depth of 0.50m of sediment accumulation in the forebay. As such the SWM facilities were initially designed to meet all MOE requirements, and the forebays were then oversized to achieve the increased cleanout frequency. The clean-out frequency for the proposed SWM facilities can be found in the respective forebay design calculations in **Appendix C**.

5.3.1 SWM Facility 1

The total drainage area for SWMF 1 (Catchments 201-1, 201-2, and 201-5) is 57.34ha at 67.9% imperviousness. The MECP requires 221m³/ha of total storage for an Enhanced level wet pond, 40m³/ha of which is extended detention, so the required permanent pool and extended detention volumes for SWMF 1 are 10,331m³ and 2,294m³, respectively.

The combined forebays and main pond have permanent pool volumes of 5,391m³ and 8,922m³, respectively, for a total permanent pool volume of 14,312m³. Therefore, SWMF 1 has adequately provided the minimum required permanent pool volume per MECP guidelines.

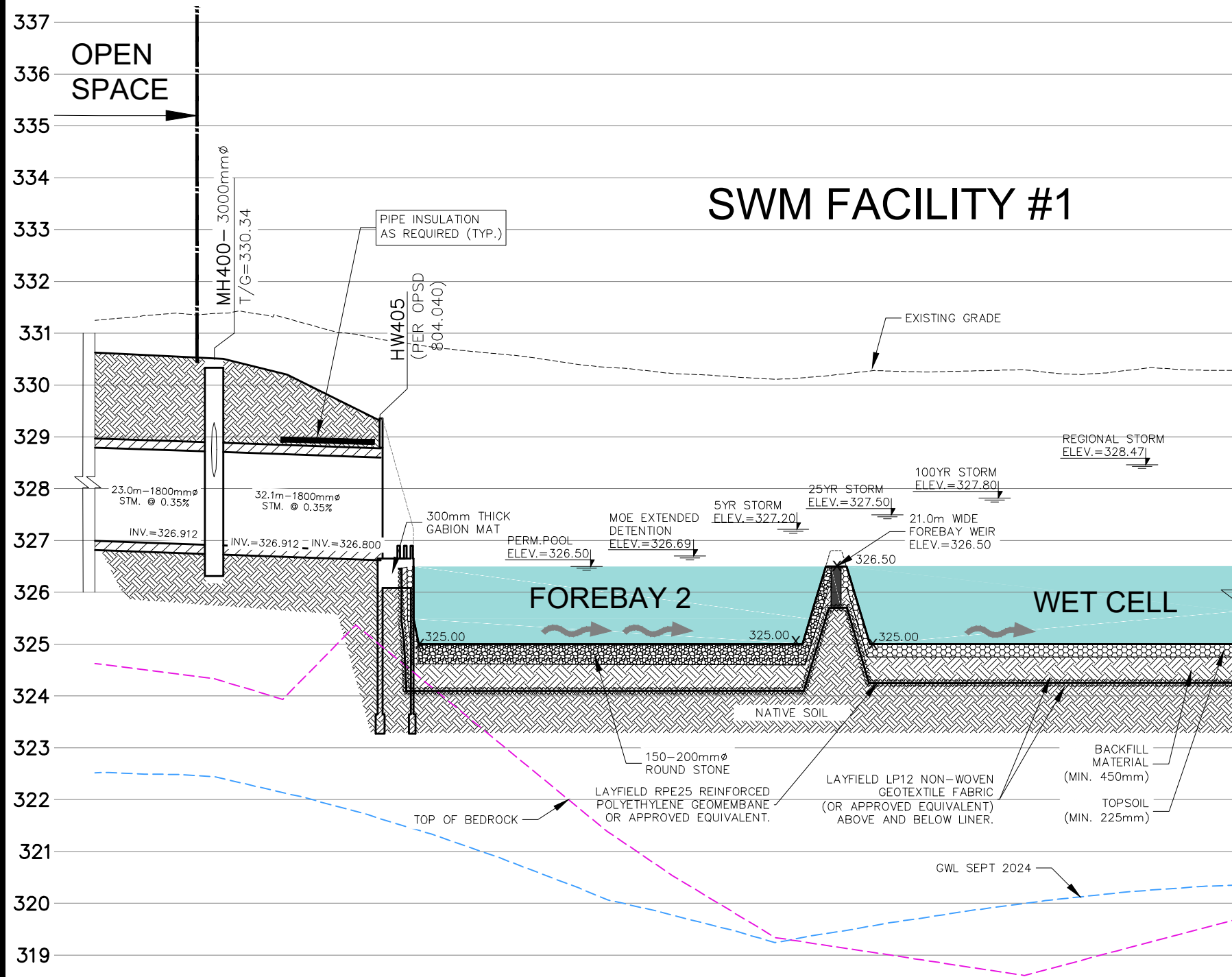
The SWMF 1 design characteristics are summarized in **Table 5.1** below. Refer to **Figure 5.1** to **Figure 5.5** for plan and profile details of the SWMF.

This SWMF will outlet through a dedicated storm sewer within the SWM block along the northern limits of the subject lands. Similarly, a conveyance channel will be graded along the same alignment, with the capacity for the excess flow leaving the pond caused by the Regional storm event. The ultimate Outlet 1 is north to the Eramosa River, along the eastern side of Victoria Road South.

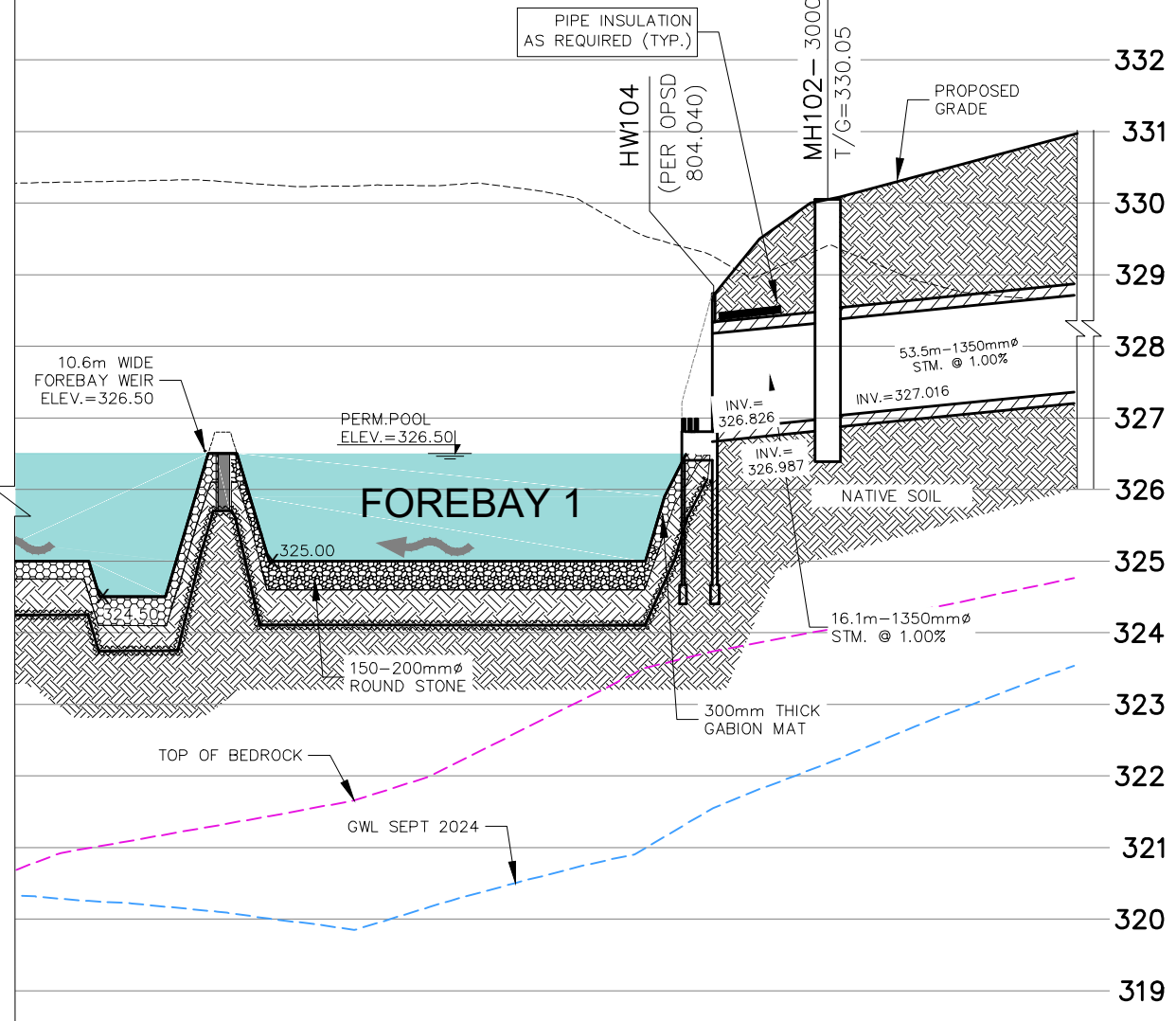
Refer to **Appendix C** for the appropriate SWMF design sheets and calculations.

Table 5.1 – SWM Facility 1 Design Characteristics

General		Facility Characteristics
Stormwater Management Facility Type		Wet pond
Required MECP Water Quality Protection		Enhanced
Total Contributing Area		57.34ha
Imperviousness		67.93%
Bottom Elevation (of main facility)		325.00m
Storage		
Unit Area Storage Volume Requirements as per SWMMP (MOE, 2003)		221m ³ /ha
Required Total Volume		12,625m ³
<i>Permanent Pool</i>		
Required Permanent Pool Volume		10,331m ³
Permanent Pool Volume Provided		14,312m ³
Permanent Pool Elevation		326.50m
<i>Water Quantity Control – 5-year Minor Storm Event</i>		
Resulting Storage Volume		9,896m ³
Ponding Elevation		327.22m
Peak Outflow		0.133m ³ /s
<i>Water Quantity Control – 100-year Major Storm Event</i>		
Resulting Storage Volume		19,011m ³
Ponding Elevation		327.80m
Peak Outflow		0.921m ³ /s
Forebay		
Required Forebay Length (East / West)		36.2m / 65.3m
Actual Forebay Length (East / West)		68.0m / 81.0m
Permanent Pool Elevation		326.50m
Bottom Elevation		325.00m
Outlet Controls		
Outlet 1 & 2 Diameter (Infiltration Gallery Outlet)		2 x 450mm
Outlet 1 & 2 Elevation (Infiltration Gallery Outlet)		326.50m
Orifice 3 Diameter (5yr Outlet Control)		550mm
Orifice 3 Elevation (5yr Outlet Control)		326.95m
Cutout Weir Width		0.40m
Cutout Weir Elevation		327.25m
Emergency Overflow Weir Width / Side Slope		6.4m / 10:1
Emergency Overflow Weir Elevation		328.00m
Emergency Overflow Weir – Maximum Flow Depth		0.44m Above Crest
*As per PCSWMM modelling results maximum ponding depth of 328.44m		



MAXIMUM PONDING LEVELS	
PERMANENT POOL	326.50
MOE EXTENDED DETENTION	326.69
5YR STORM	327.22
25YR STORM	327.50
100YR STORM	327.80
REGIONAL STORM	328.44



SWM FACILITY 1 - CROSS SECTION A-A

SCALE - H 1:1000 V 1:100

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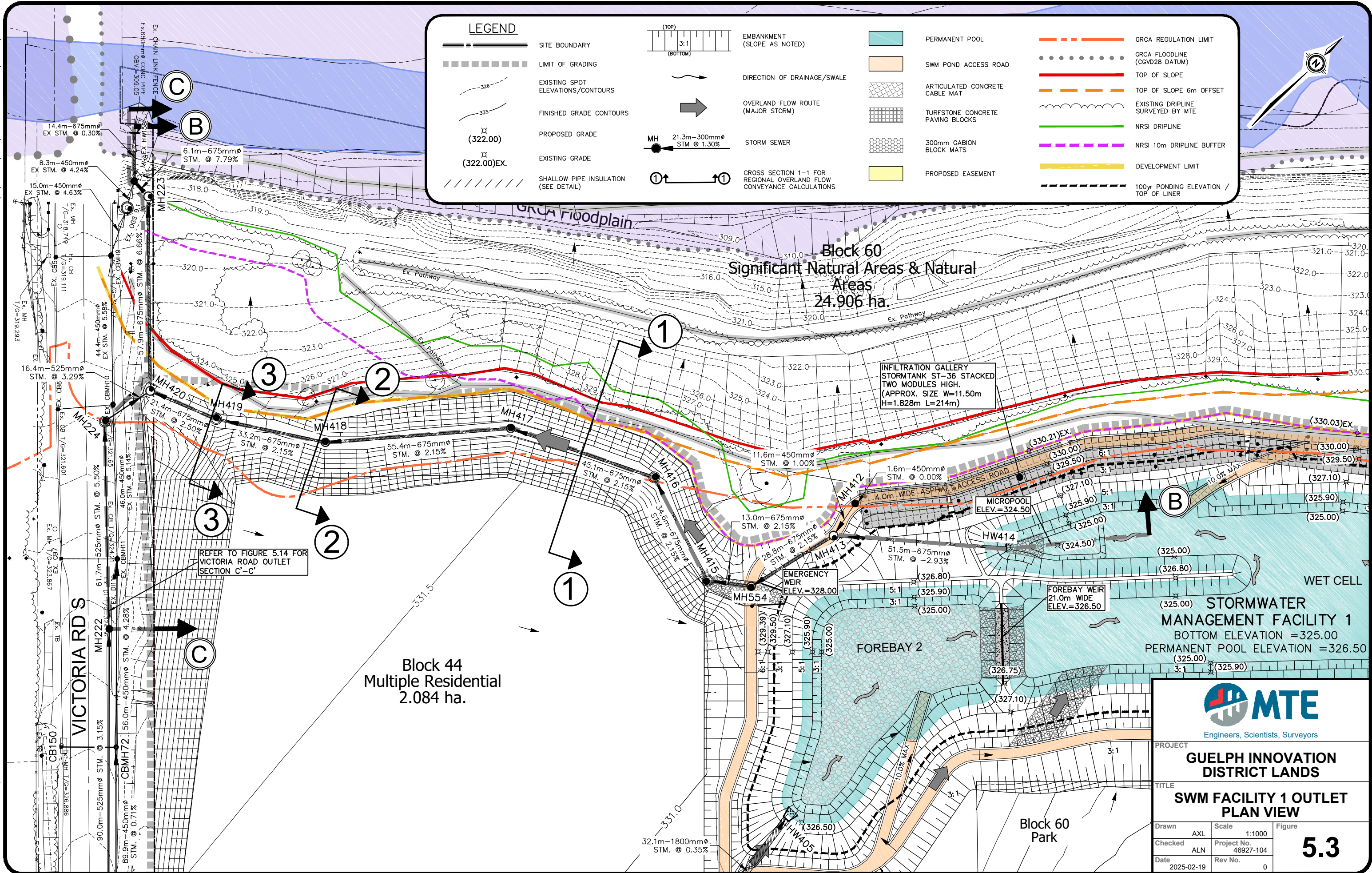
GUELPH INNOVATION DISTRICT LANDS

TITLE

SWM FACILITY 1 SECTION A-A

Drawn	AXL	Scale	H 1:1000 V 1:100	Figure
Checked	ALN	Project No.	46927-104	
Date	2025-02-19	Rev No.	0	

5.2

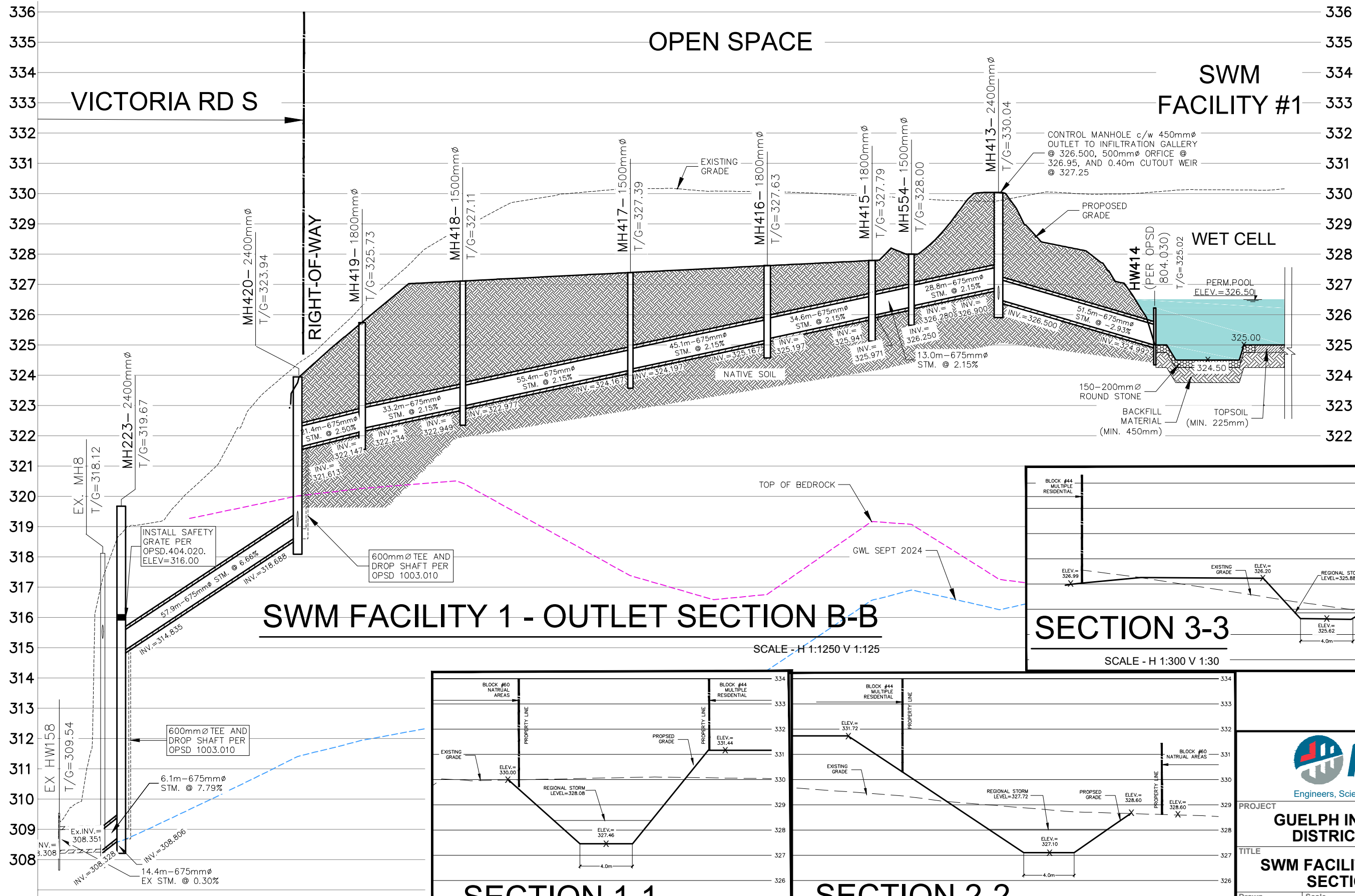


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GUELPH INNOVATION DISTRICT LANDS

TITLE
SWM FACILITY 1 OUTLET PLAN VIEW

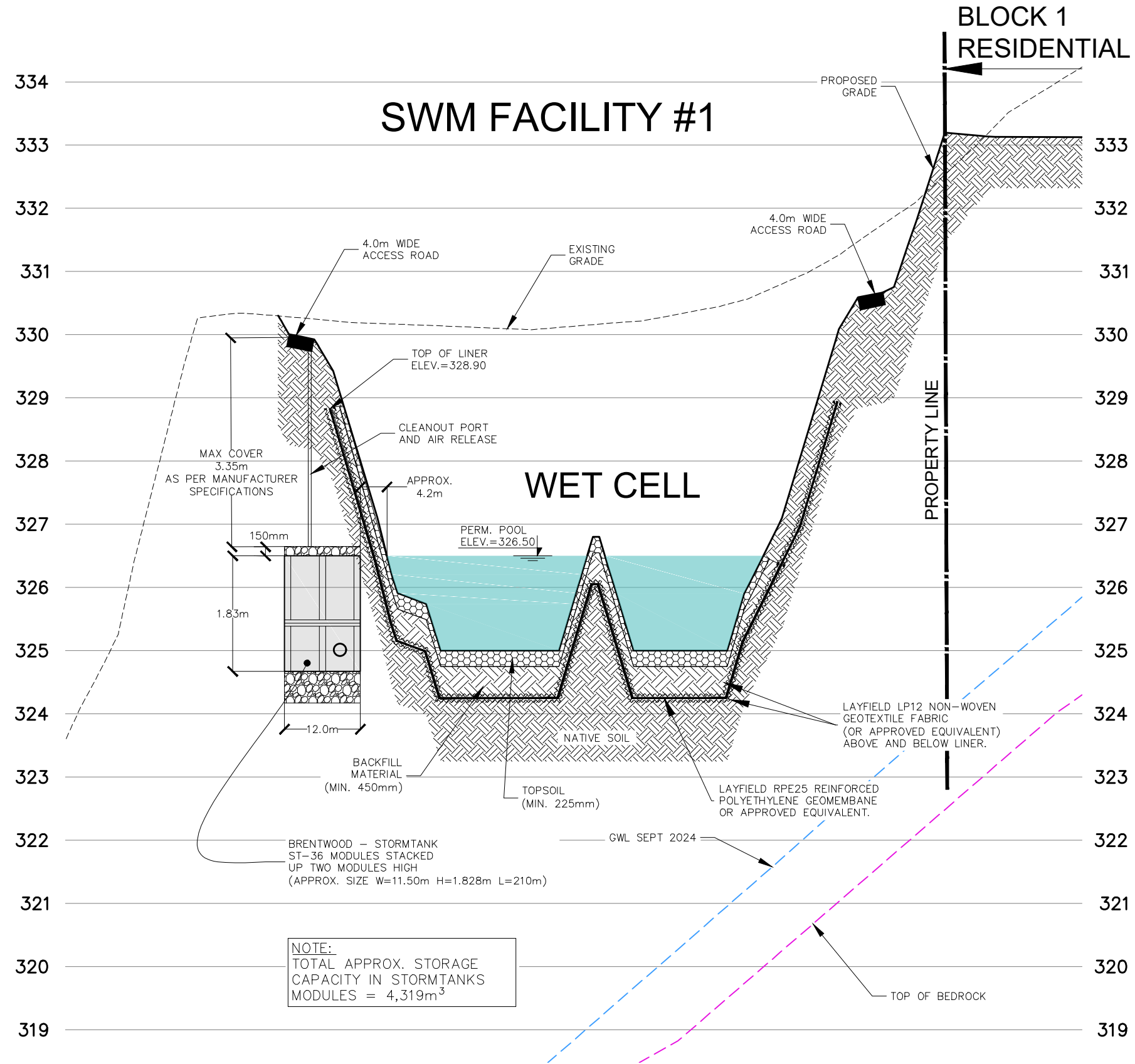
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Checked	ALN	Project No.	46927-104		
Date	2025-02-19	Rev No.	0		



PROJECT
GUELPH INNOVATION DISTRICT LANDS

TITLE
SWM FACILITY 1 OUTLET SECTION B-B

Drawn	AXL	Scale	AS SHOWN	Figure 5.4
Checked	ALN	Project No.	46927-104	
		Rev No.	0	



SWM FACILITY 1 - CROSS SECTION D-D

SCALE - H 1:750 V 1:75

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PROJECT GUELPH INNOVATION DISTRICT LANDS		
SWM FACILITY 1 SECTION INFILTRATION GALLERY DETAIL		
AXL	Scale H 1:750 V 1:75	Figure
Checked ALN	Project No. 46927-104	5.5
2025-02-19	Rev No. 0	

5.3.2 SWM Facility 2

The total drainage area for SWMF 2 (Catchments 202-1 and 202-4) is 10.05ha at 66.9% imperviousness. The MECP requires 218m³/ha of total storage for an Enhanced level wet pond, 40m³/ha of which is extended detention, so the required permanent pool and extended detention volumes for SWMF 2 are 1,787m³ and 402m³, respectively.

The forebay and main pond have permanent pool volumes of 1,199m³ and 1,677m³, respectively, for a total permanent pool volume of 2,877m³. Therefore, SWMF 2 has adequately provided the minimum required permanent pool volume per MECP guidelines.

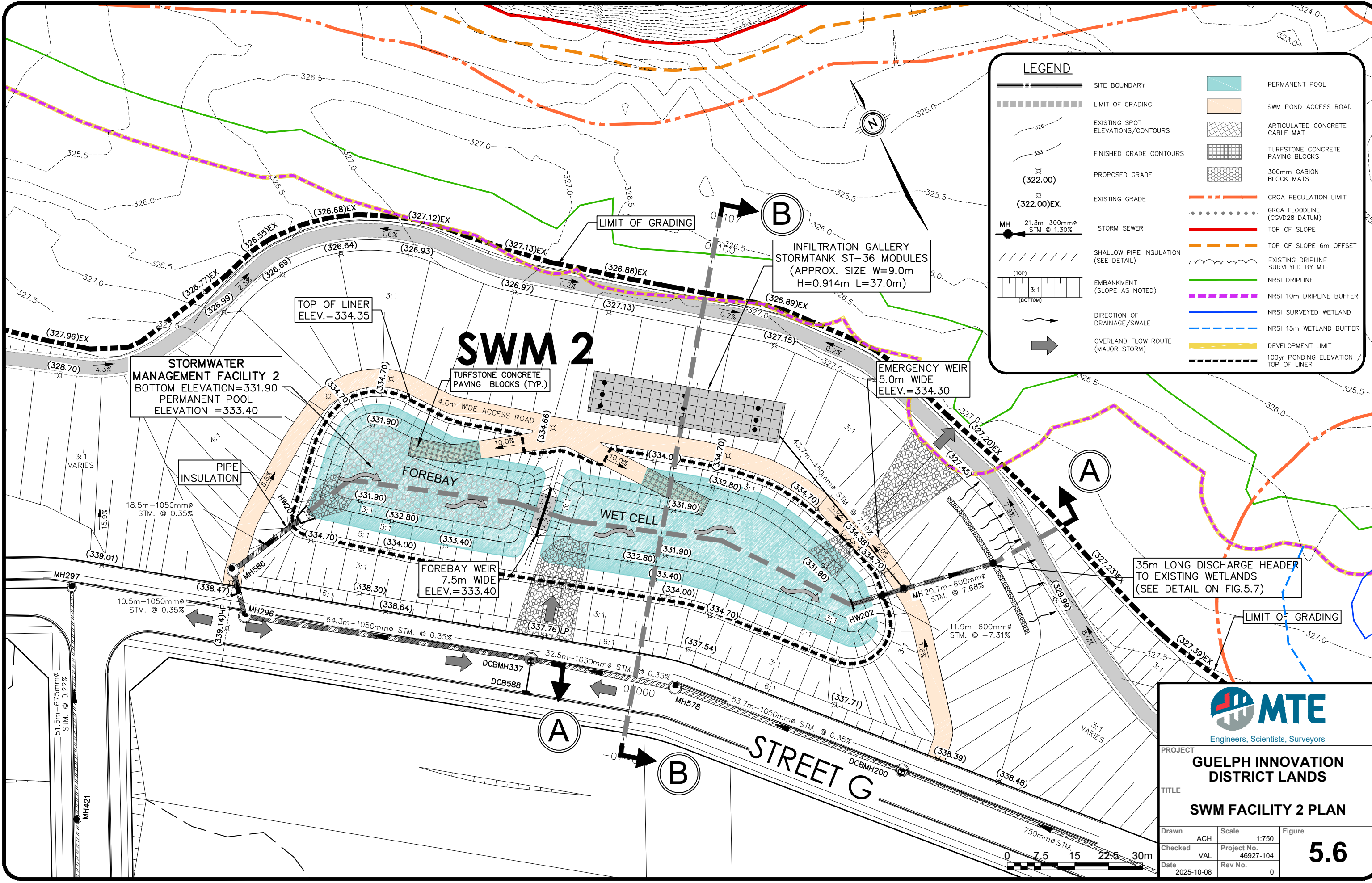
The SWMF 2 design characteristics are summarized in **Table 5.2** below. Refer to **Figure 5.6** to **Figure 5.7** for plan and profile details of the SWMF.

The pond is situated within the existing topography of the Significant Valleyland. The outlet from this SWMF will be directed northward through a spreader berm, mimicking existing drainage patterns. Flow will be conveyed through natural depressions within the downstream Natural Areas, travelling approximately 130m before reaching the existing slope, and then flowing towards the existing 1.8m wide box culvert beneath the adjacent railway and the subsequent 650mm diameter CSP culvert beneath the trail. These culverts will then direct flow to Outlet 2; east to the Eramosa River.

Refer to **Appendix C** for the appropriate SWMF design sheets and calculations.

Table 5.2 – SWM Facility 2 Design Characteristics

General		Facility Characteristics
Stormwater Management Facility Type		Wet pond
Required MECP Water Quality Protection		Enhanced
Total Contributing Area		10.05ha
Imperviousness		66.90%
Bottom Elevation (of main facility)		331.90m
Storage		
Unit Area Storage Volume Requirements as per SWMMP (MOE, 2003)		218m ³ /ha
Required Total Volume		2,189m ³
<i>Permanent Pool</i>		
Required Permanent Pool Volume		1,787m ³
Permanent Pool Volume Provided		2,877m ³
Permanent Pool Elevation		333.40m
<i>Water Quantity Control – 5-year Minor Storm Event</i>		
Resulting Storage Volume		2,028m ³
Ponding Elevation		334.03m
Peak Outflow		0.102m ³ /s
<i>Water Quantity Control – 100-year Major Storm Event</i>		
Resulting Storage Volume		2,777m ³
Ponding Elevation		334.23m
Peak Outflow		0.772m ³ /s
Forebay		
Required Forebay Length		15.5m
Actual Forebay Length		38.4m
Permanent Pool Elevation		333.40m
Bottom Elevation		331.90m
Outlet Controls		
Orifice 1 Diameter		130mm
Orifice 1 Elevation		333.40m
Cutout Weir Width		1.25m
Cutout Weir Elevation		333.91m
Emergency Overflow Weir Width		5.0m
Emergency Overflow Weir Elevation		334.30m
Emergency Overflow Weir – Maximum Flow Depth		0.07m Above Crest
*As per PCSWMM modelling results maximum ponding depth of 334.37m		
Discharge Header Length		35m

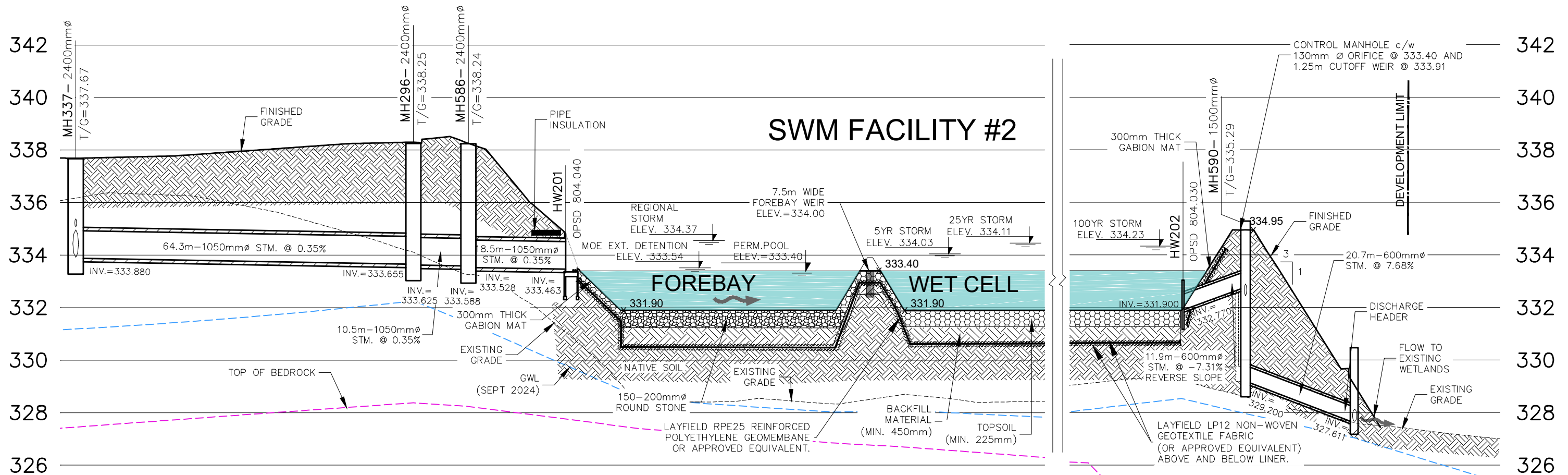


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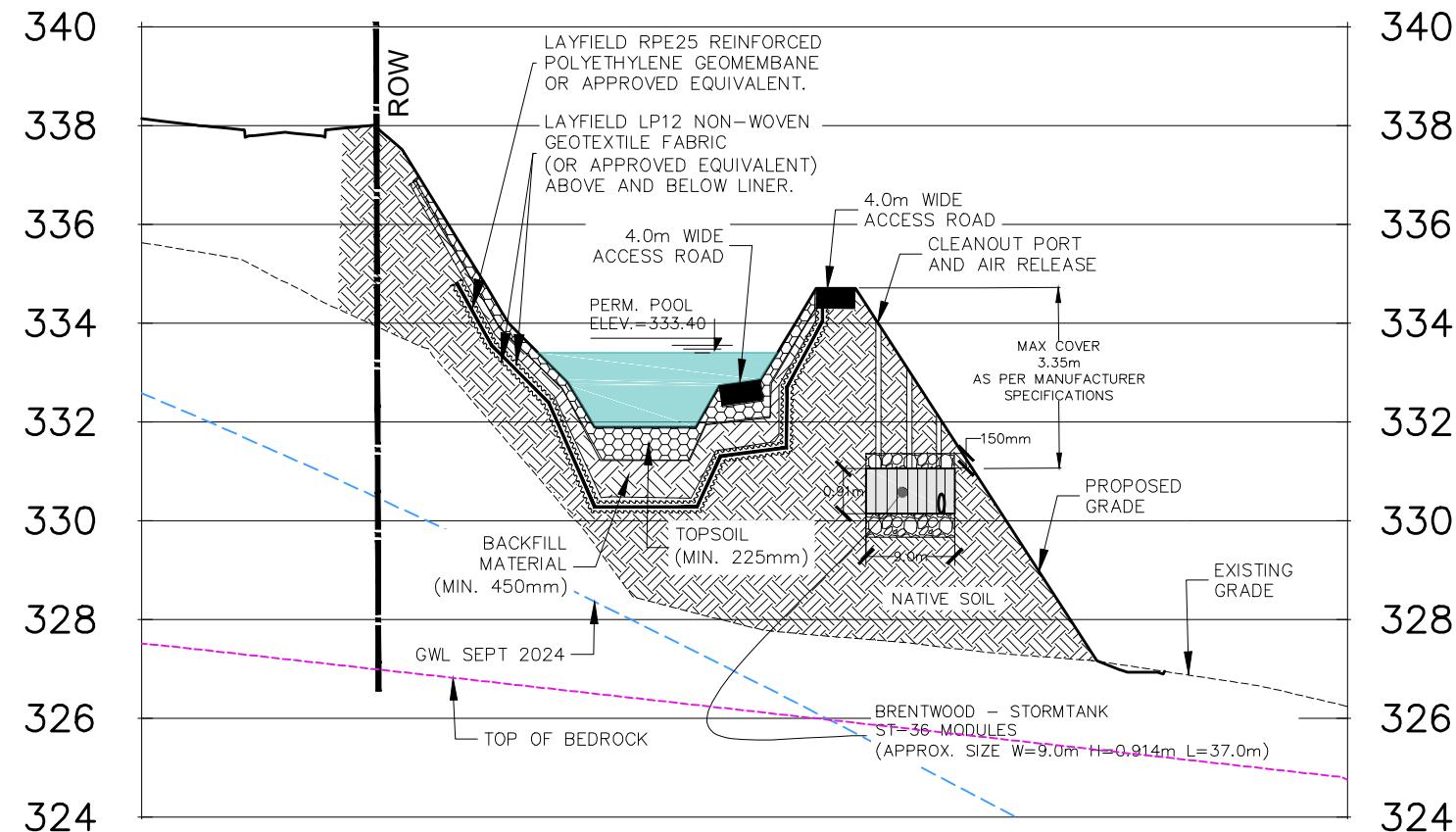
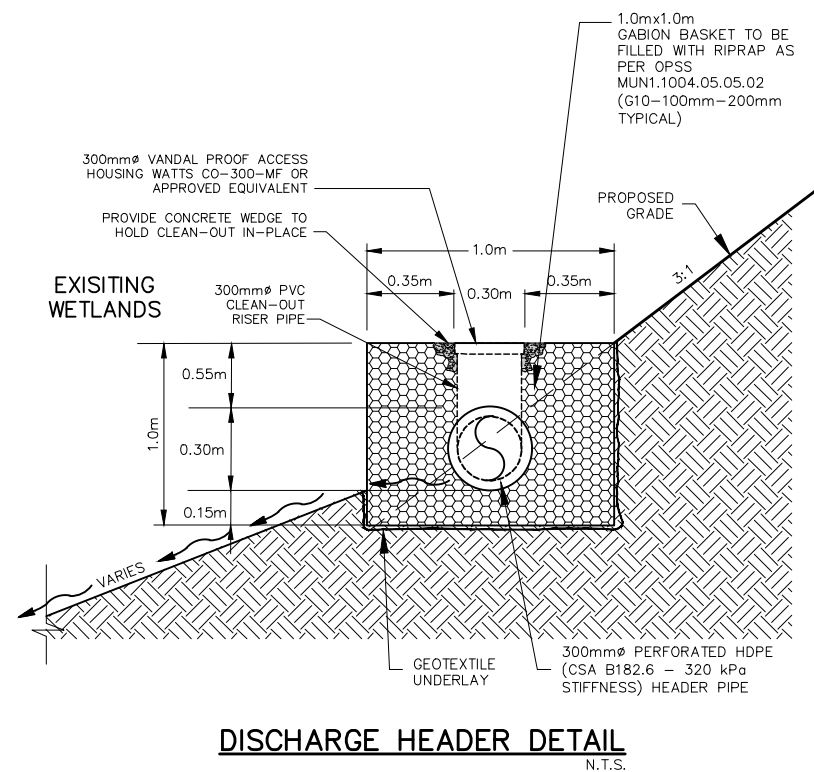
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SWM FACILITY 2 PLAN

Drawn	ACH	Scale	1:750	Figure
Checked	VAL	Project No.	46927-104	5.6
Date	2025-10-08	Rev No.	0	



SWM FACILITY 2 - CROSS SECTION A-A

SCALE - H 1:750 V 1:150



CROSS SECTION B-B

SCALE - H 1:750 V 1:150

MAXIMUM PONDING LEVELS	
PERMANENT POOL	333.40
MOE EXTENDED DETENTION	333.54
5YR STORM	334.03
25YR STORM	334.11
100YR STORM	334.23
REGIONAL STORM	334.37



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PROJECT GUELPH INNOVATION DISTRICT LANDS		
TITLE SWM FACILITY 2 SECTION A-A + B-B		
Drawn ACH	Scale H 1:750 V 1:150	Figure 5.7
Checked VAL	Project No. 46927-104	
Date 2025-10-28	Rev No. 0	

5.3.3 SWM Facility 3

The total drainage area for SWMF 3 (Catchments 203-1, 203-2, and 203-3) is 24.10ha at 71.5% imperviousness. The MECP requires 228m³/ha of total storage for an Enhanced level wet pond, 40m³/ha of which is extended detention, so the required permanent pool and extended detention volumes for SWMF 3 are 4,519m³ and 964m³, respectively.

The forebay and main pond have permanent pool volumes of 2,695m³ and 5,134m³, respectively, for a total permanent pool volume of 7,829m³. Therefore, SWMF 3 has adequately provided the minimum required permanent pool volume per MECP guidelines.

The SWMF 3 design characteristics are summarized in **Table 5.3** below. Refer to **Figure 5.8** to **Figure 5.11** for plan and profile details of the SWMF.

All storm events up to and including the 100-year storm event will be fully infiltrated within the proposed infiltration cell of the facility. Therefore, no surface runoff will be generated or outlet from the facility.

The design of SWMF 3 also includes the 'retrofit' (or amalgamation) of the existing SWMF No. 104 at the Victoria-Stone intersection. The three existing inlets to SWMF No. 104 will be combined to a single pipe and outlet through a newly proposed inlet headwall located within SWMF 3's forebay.

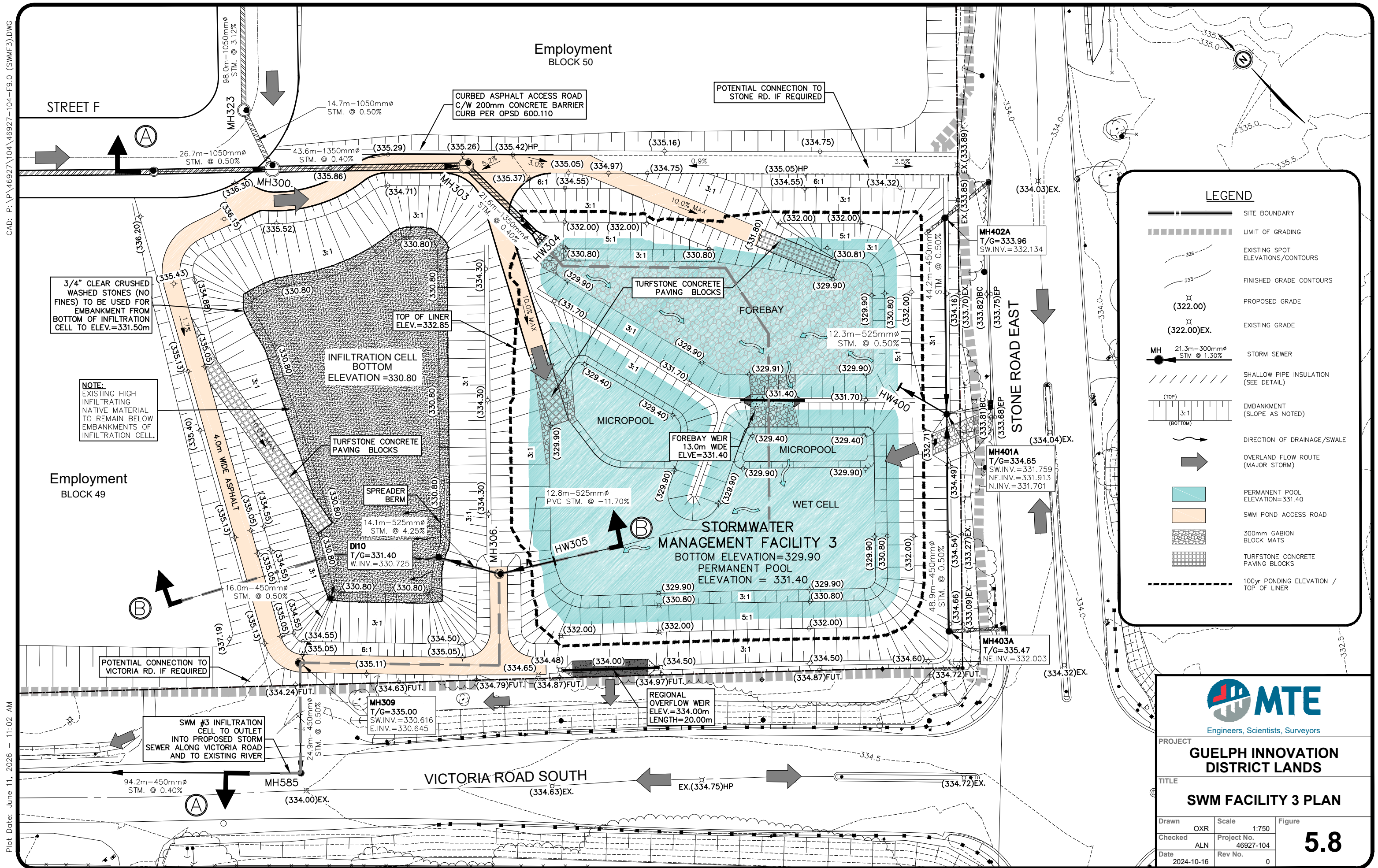
Refer to **Appendix C** for the appropriate SWMF design sheets and calculations.

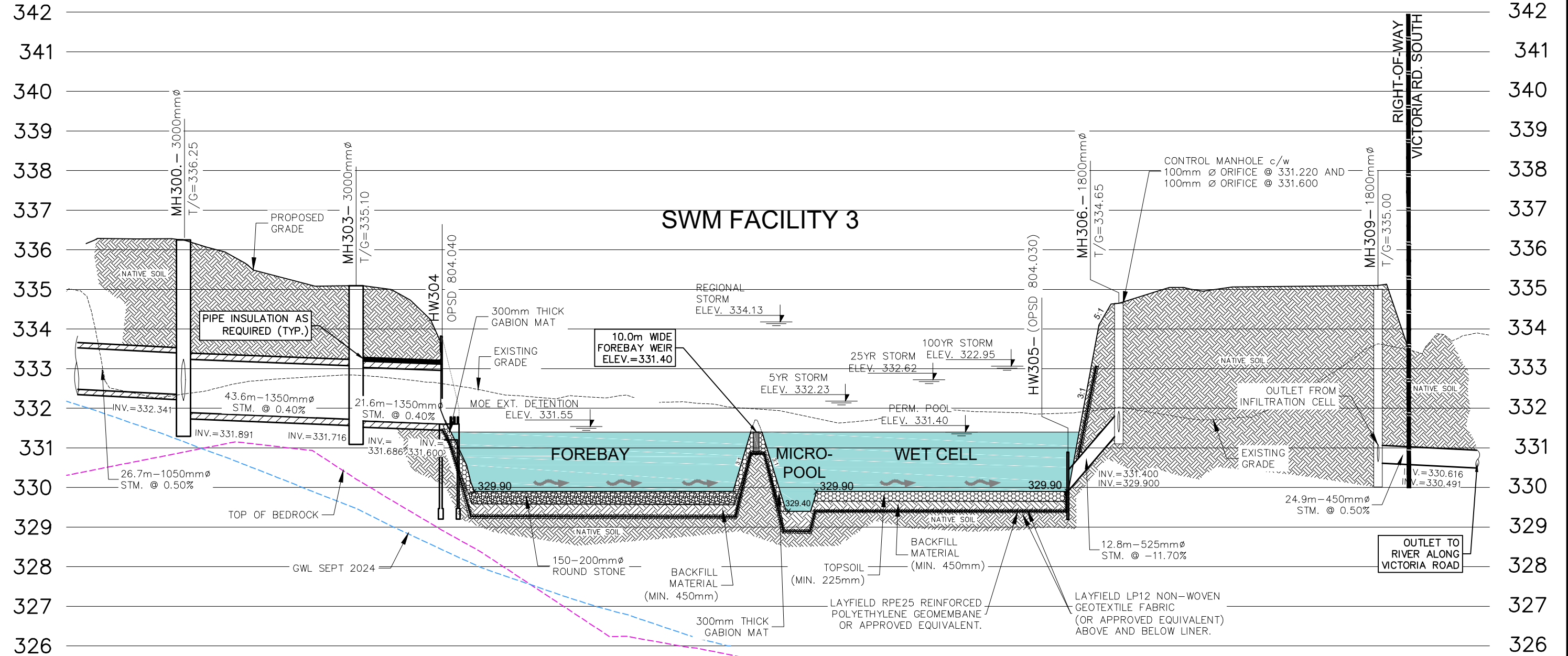
Table 5.3 – SWM Facility 3 Design Characteristics

General	Facility Characteristics
Stormwater Management Facility Type	Wet pond
Required MECP Water Quality Protection	Enhanced
Total Contributing Area	24.10ha
Imperviousness	71.50%
Bottom Elevation (of main facility)	329.90m
Storage	
Unit Area Storage Volume Requirements as per SWMMP (MOE, 2003)	228m ³ /ha
Required Total Volume	5,483m ³
<i>Permanent Pool</i>	
Required Permanent Pool Volume	4,519m ³
Permanent Pool Volume Provided	7,829m ³
Permanent Pool Elevation	331.40m
<i>Water Quantity Control – 5-year Minor Storm Event</i>	
Resulting Storage Volume (Wet Cell)	6,162m ³
Resulting Storage Volume (Infiltration Cell)	83m ³
Ponding Elevation (Wet Cell)	332.23m
Ponding Elevation (Infiltration Cell)	330.83m
Peak Outflow	0.000m ³ /s*
<i>Water Quantity Control – 100-year Major Storm Event</i>	
Resulting Storage Volume (Wet Cell)	12,253m ³
Resulting Storage Volume (Infiltration Cell)	1,397m ³
Ponding Elevation (Wet Cell)	332.96m
Ponding Elevation (Infiltration Cell)	331.28m
Peak Outflow	0.000m ³ /s*
Forebay	
Required Forebay Length	32.4m
Actual Forebay Length	57.7m
Permanent Pool Elevation	331.40m
Bottom Elevation	329.90m
Outlet Controls	
Orifice 1 Diameter	100mm
Orifice 1 Elevation	331.40m
Orifice 2 Diameter	100mm
Orifice 2 Elevation	331.60m
Emergency Overflow Weir Width	20.0m
Emergency Overflow Weir Elevation	334.00m
Emergency Overflow Weir – Maximum Flow Depth	0.13m Above Crest

*As per PCSWMM modelling results maximum ponding depth of 334.13m

*Note: There is no outflow from SWMF 3 as storms up to and including the 100-year event are fully infiltrated within the infiltration cell.



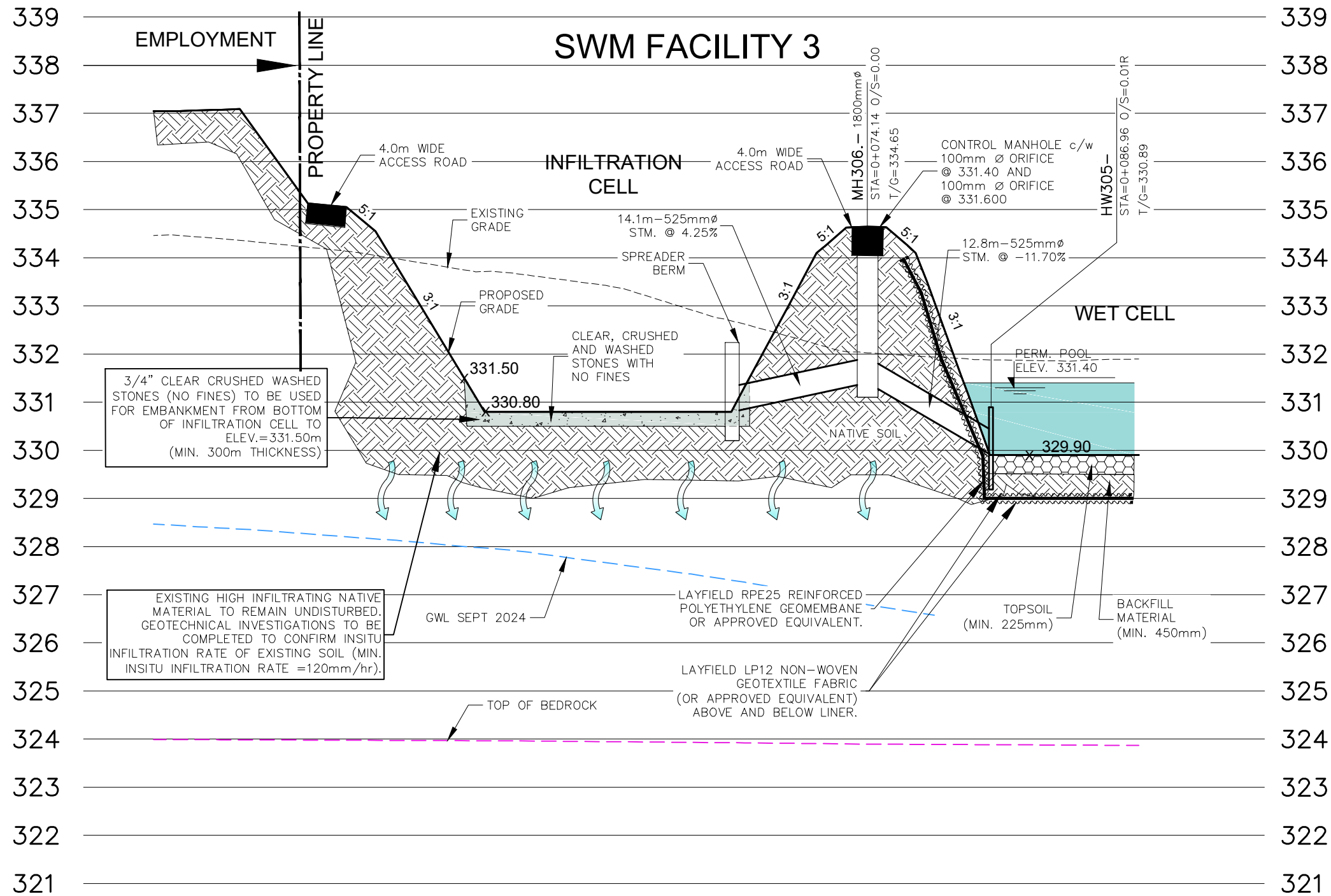




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PROJECT		
GUELPH INNOVATION DISTRICT LANDS		
TITLE		
SWM FACILITY 3 SECTION		
Drawn	OXR	Scale
Checked	ALN	H 1:1000 V 1:100
Date	2024-10-16	Project No. 46927-104
		Rev No. 0

5.9



WETCELL CELL	
PONDING LEVELS	
PERMANENT POOL	331.40
MOE EXTENDED DETENTION	331.55
5YR STORM	332.23
25YR STORM	332.62
100YR STORM	332.95
REGIONAL STORM	334.13

WETCELL CELL	
PONDING LEVELS	
CELL BOTTOM	330.80
5YR STORM	330.83
25YR STORM	331.04
100YR STORM	331.28

SWM FACILITY 3 - CROSS SECTION B-B



Engineers, Scientists, Surveyors

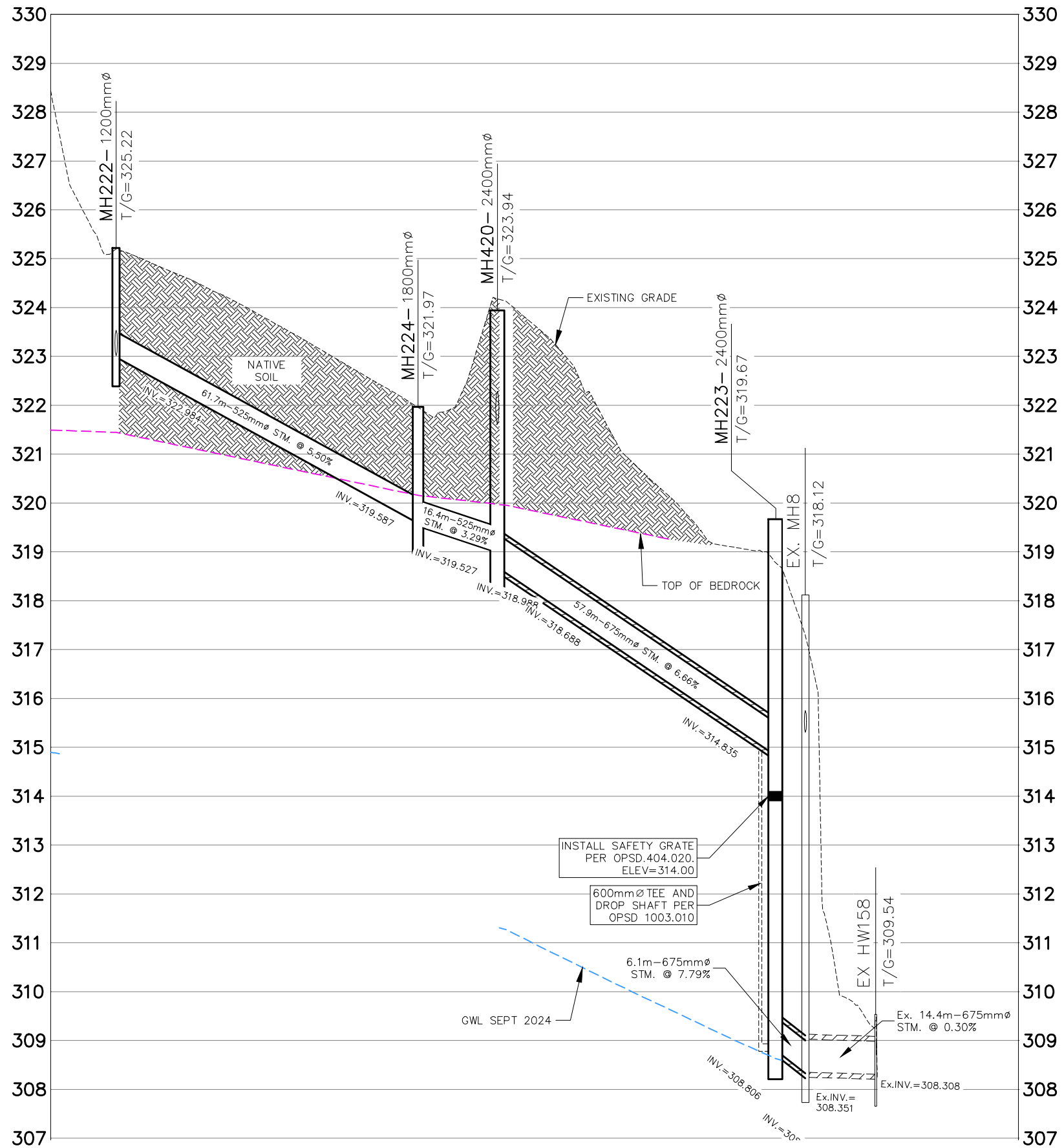
PROJECT

GUELPH INNOVATION DISTRICT LANDS

TITLE

SWM FACILITY 3 SECTION

Drawn	OXR	Scale	H 1:500 V 1:100	Figure
Checked	ALN	Project No.	46927-104	5.10
Date	2024-10-16	Rev No.	0	



VICTORIA ROAD OUTLET SECTION C'-C'

SCALE - H 1:1000 V 1:100

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PROJECT GUELPH INNOVATION DISTRICT LANDS		
TITLE VICTORIA ROAD OUTLET SECTION C'-C'		
Drawn	Scale	Figure
AXL	H 1:1000 V 1:100	5.11
Checked	Project No.	
ALN	46927-104	
Date	Rev No.	
2025-02-19	0	

5.4 Water Quantity Control

Flows for all storm events will be conveyed to the SWMFs by a combination of storm sewers (sized for the 5-year storm event) and overland flow routes (road right-of-ways and designed channels). Similarly, the outlets from all SWMFs include a combination of piped flow and overflow channel design, to appropriately convey all storm event flows to their respective outlet locations. The post-development PCSWMM modelling output is included in **Appendix B**.

5.4.1 SWM Facility 1

SWMF 1 incorporates a typical reverse slope pipe from within the permanent pool, which outlets into a control manhole through a 675mm diameter pipe at an elevation of 326.50m. This control manhole diverts minor storm event flows towards the proposed infiltration gallery within the northern SWMF embankment. Due to the length of the infiltration gallery, an additional 450mm dia. inlet pipe is provided at the east side of the wet cell to allow for a distributed flow into the gallery. Once the gallery becomes full, the overflow is directed back to the control manhole, in which an 550mm diameter orifice plate at an elevation of 326.95 conveys flow to Outlet 1 (Eramosa River) up to the 5 year storm. Additionally and a 0.40m wide cutout weir at an elevation of 327.25m conveys larger storm events.

Due to existing storm sewer size constraints along Victoria Road South, the SWMF outlet is proposed to be a 675mm diameter pipe at a minimum 2.15% slope. This is adequately sized to convey the proposed 100-year storm event 0.924 m³/s outflow by gravity.

An analysis of the existing 675mm diameter, 0.3% slope pipe at the outlet to the Eramosa River was also completed to determine that no negative impacts to the receiving sewer are anticipated. The existing sewer is adequately sized to convey the 5-year storm event 0.133 m³/s outflow from SWMF 1, as per the storm sewer design sheet included in **Appendix G**.

Excess flow from the Regional storm will be conveyed north through a designed overflow channel, constructed along the northwestern property limits towards Victoria Road.

As the ultimate design of Victoria Road South is currently being established through a Municipal Class Environmental Assessment (MCEA), the route for the SWMF1 outflows along Victoria Road towards the Eramosa River (via piped or overland routes) shall continue to be coordinated with the City to ensure that infrastructure is appropriately designed for the outflows from the subject lands.

A summary of the stage-storage-discharge relationship for SWMF 1 is provided in **Table 5.4** below. Refer to **Appendix C** for more details.

Table 5.4 – SWMF 1 Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m ³ /s)	Volume (m ³)	Remarks
326.50	0.000	0	450mm Outlets to Infiltration Gallery / Permanent Pool
327.00	0.066	6,643	550mm Orifice
327.30	0.254	11,107	0.40m Cutout Weir
327.50	0.483	14,202	Contour
328.00	1.028	22,392	6.4m Emergency Overflow Weir
328.50	7.064	31,017	Contour

A summary of the peak flows from the facility and the associated maximum ponding elevations for the post-development conditions is summarized in **Table 5.5**. The results in this table also indicate the combined peak flows at Outlet 1, which include the additional uncontrolled areas previously discussed in Section 4.2. The results demonstrate that post-development peak flows can be attenuated to the SWM criteria outlined in Section 3.2. Active storage volume has been provided for the 100-year storm event to a maximum elevation of 328.44m, or 1.94m above the permanent pool elevation. Refer to the PCSWMM outputs in **Appendix B** for more details

Table 5.5 – Outlet 1 Quantity Control Summary

Storm Event	Ponding Elevation (m)	Required Storage Volume (m ³) ³	Provided Storage Volume (m ³) ¹	SWMF Release Rate (m ³ /s)	Uncontrolled Flow Rate (m ³ /s)	Combined Release Rate (m ³ /s) ²	Allowable Release Rate (m ³ /s) ³
5-year	327.22	-	22,329	0.133	0.750	0.750	1.550
25-year	327.50	7,224		0.676	1.260	1.261	4.193
100-year	327.80	13,416		0.921	1.682	1.746	7.961
Regional	328.44	-		7.502	0.432	7.927	5.810 ⁴

*Note: 1. Provided active storage volume from permanent pool elevation to the emergency overflow weir invert.
2. Combined rates include the SWMF release rate and the additional uncontrolled flow to the respective 'Outlet' location.
3. Taken from Table 3.1
4. There is no quantity control requirement for the Regional storm. The existing release rate is noted under the allowable column for purposes of comparison to the proposed release rates, at the request of the GRCA.

5.4.2 SWM Facility 2

SWMF 2 incorporates a typical reverse slope pipe from within the permanent pool, which outlets into a control manhole through a 130mm diameter orifice plate at an elevation of 333.40m. Additional controls include a 1.25m wide cutout weir at an elevation of 333.91m to convey larger storm events. This control manhole diverts minor storm event flows towards the proposed infiltration gallery within the eastern SWMF embankment. Once the gallery becomes full, the overflow is directed back to the control manhole, in which an outlet pipe conveys runoff towards Outlet 2 (Eramosa River). Outlet flows will be conveyed east to Outlet 2 (Eramosa River) through an 600mm diameter pipe at a 7.68% slope, outletting through a discharge header.

The discharge header allows for the outflow of the pond, up to the 100-year storm, to be horizontally dispersed over the slope. The header will intercept flow from the single pipe outlet and redistribute it horizontally through gabion baskets before outletting to the existing surface. The discharge header will aim to mimic a natural storm flow over the existing surface, and eliminate concerns of the impacts of erosion. A design sheet for the discharge header is included in **Appendix C**.

An analysis of the existing culverts at the ultimate outlet has been completed and included in **Appendix G**. Each culvert was evaluated based on the design criteria for culverts stipulated in MTO B-100 Directive. Under existing and proposed conditions the concrete box culvert is adequately sized to convey the 100-year storm flows. Under existing conditions the existing trail culvert does not meet the stipulated design criteria, and cannot contain the 5-year storm flow. In this case, the proposed SWMF 2 outlet has been constrained such that pre-development conditions maintained or improved.

A summary of the stage-storage-discharge relationship for SWMF 2 is provided in **Table 5.6** below. Refer to **Appendix C** for more details.

Table 5.6 – SWMF 2 Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m ³ /s)	Volume (m ³)	Remarks
333.40	0.000	0	130mm orifice / Permanent Pool
333.60	0.014	585	Contour
333.80	0.021	1,224	Contour
333.90	0.024	1,564	1.25m Cutout Weir
334.20	0.290	2,661	Contour
334.30	0.483	3,048	5.0m Emergency Overflow Weir
334.70	1.300	4,701	Freeboard

A summary of the peak flows from the facility and the associated maximum ponding elevations for the post-development conditions is summarized in **Table 5.7**. The results in this table also indicate the combined peak flows at Outlet 2, which include the additional uncontrolled areas previously discussed in Section 4.2. The results demonstrate that post-development peak flows can be attenuated to the SWM criteria outlined in Section 3.2. Active storage volume has been provided for the 100-year storm event to a maximum elevation of 334.23m, or 0.83m above the permanent pool elevation. Refer to the PCSWMM output in **Appendix B** for more details.

Table 5.7 – Outlet 2 Quantity Control Summary

Storm Event	Ponding Elevation (m)	Required Storage Volume (m ³) ⁴	Provided Storage Volume (m ³) ¹	SWMF Release Rate (m ³ /s) ²	Uncontrolled Flow Rate (m ³ /s)	Combined Release Rate (m ³ /s) ³	Allowable Release Rate (m ³ /s) ⁴
5-year	334.03	-	3,445	0.102	0.285	0.285	0.560
25-year	334.11	1,768		0.390	0.739	0.989	1.043
100-year	334.23	3,283		0.772	1.209	1.776	1.979
Regional	334.37	-		1.321	0.605	1.926	3.060 ⁵

*Note: 1. Provided active storage volume from permanent pool elevation to the emergency overflow weir invert.
2. SWMF release rates are governed by the existing culvert flow analysis requirements. Refer to **Appendix G** for more details.
3. Combined rates include the SWMF release rate and the additional uncontrolled flow to the respective 'Outlet' location.
4. Taken from Table 3.1.
5. There is no quantity control requirement for the Regional storm. The existing release rate is noted under the allowable column for purposes of comparison to the proposed release rates, at the request of the GRCA.

5.4.3 SWM Facility 3

Flow from SWMF 3 is controlled with a bottom draw 100mm diameter orifice and is conveyed from the wet cell through the control manhole located within the infiltration cell berm. All storms up to and including the 100-year event are conveyed to the infiltration cell, where they are ultimately fully infiltrated back into the ground. The infiltration cell is equipped with a ditch-inlet structure and outlet pipe, which is only utilized as an emergency outlet to maintain a maximum 0.6m ponding level within the cell.

Excess flow from larger storm events will be conveyed to the same outlet location along the Victoria Road South.

As the ultimate design of Victoria Road South is currently being established through a Municipal Class Environmental Assessment (MCEA), the route for the SWMF3 outflows along Victoria Road towards the Eramosa River (via piped or overland routes) shall continue to be coordinated with the City to ensure that infrastructure is appropriately designed for the outflows from the subject lands.

A summary of the stage-storage-discharge relationship for SWMF 3 is provided in **Table 5.8** below. Refer to **Appendix C** for more details.

Table 5.8 – SWMF 3 Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m ³ /s) Wet Cell / Infiltration Cell	Volume (m ³) Wet Cell / Infiltration Cell	Remarks
329.90	- / -	- / -	Bottom of Wet Cell
330.80	- / 0.000	- / 0	Contour / Bottom of Infiltration Cell
331.40	0.000 / 0.0284	0 / 1,771	Permanent Pool / 100mm orifice / DI Overflow
331.60	0.009 / 0.171	1,355 / 2,419	Contour / 100mm orifice
332.00	0.029 / -	4,339 / -	Contour
332.40	0.040 / -	7,545 / -	Contour
332.80	0.049 / -	10,933 / -	Contour
333.10	0.055 / -	13,598 / -	Contour
334.00	0.069 / -	22,251 / -	Overflow Weir
334.30	5.100 / -	25,324 / -	Freeboard

A summary of the peak flows from the facility and the associated maximum ponding elevations for the post-development conditions is summarized in **Table 5.9**. The results in this table also indicate the combined peak flows at Outlet 3, which include the additional uncontrolled areas previously discussed in Section 4.2. The results demonstrate that post-development peak flows can be attenuated to the SWM criteria outlined in Section 5.1.2. Active storage volume has been provided for the 100-year storm event to a maximum elevation of 332.95m, or 1.55m above the permanent pool elevation within the wet cell. Maximum ponding within the infiltration cell is maintained under the 0.6m up to and including the 100-year storm event. Refer to the PCSWMM output in **Appendix B** for more details.

Table 5.9 – Outlet 3 Quantity Control Summary

Storm Event	Ponding Elevation (m) Wet Cell / Infiltration Cell	Required Storage Volume (m ³) ³	Provided Storage Volume (m ³) ¹	SWMF Release Rate (m ³ /s)	Combined Release Rate (m ³ /s) ²	Allowable Release Rate (m ³ /s) ³
5-year	332.23 / 330.83	-	22,251	0.000	0.000	1.120
25-year	332.62 / 331.04	3,015		0.000	0.000	1.663
100-year	332.95 / 331.28	5,599		0.000	0.000	3.157
Regional	334.13 / 331.49	-		3.229	3.229	1.860 ⁴

*Note: 1. Provided active storage volume from permanent pool elevation to the emergency overflow weir invert.
2. Combined rates include the SWMF release rate and the additional uncontrolled flow to the respective 'Outlet' location.
3. Taken from Table 3.1
4. There is no quantity control requirement for the Regional storm. The existing release rate is noted under the allowable column for purposes of comparison to the proposed release rates, at the request of the GRCA.

5.5 Overland Flow Conveyance

As discussed in Section 4.2, excess runoff from major storm events will flow overland to the SWM facilities, via the proposed right-of-ways and designed overland flow routes, where applicable.

As per Section 5.7 of the *Development Engineering Manual* the major system overland flow routes to the SWM facilities shall be designed to safely convey the 100-year storm and Regional Storm overland flow. The 100-year storm will govern the design of the overland flow routes in this case, as it produces larger peak flows, shown in the hydrologic modelling in **Appendix B**.

The *Development Engineering Manual* defines the major flow as flow in excess of the minor system capacity during period of surcharge or higher intensity events. The 100-year storm flows have been determined from the PCSWMM modelling results, and the capacity of the storm sewers have been subtracted to determine the overland flow rate at critical cross-sections. The cross sections were then modelled in FlowMaster to determine the level of flooding and confirm that the overland flow routes adequately convey the major flow during the 100-year storm. Where required, additional measures such as modified height barrier curb at the SWM inlets have been proposed to adequately convey the overland flows.

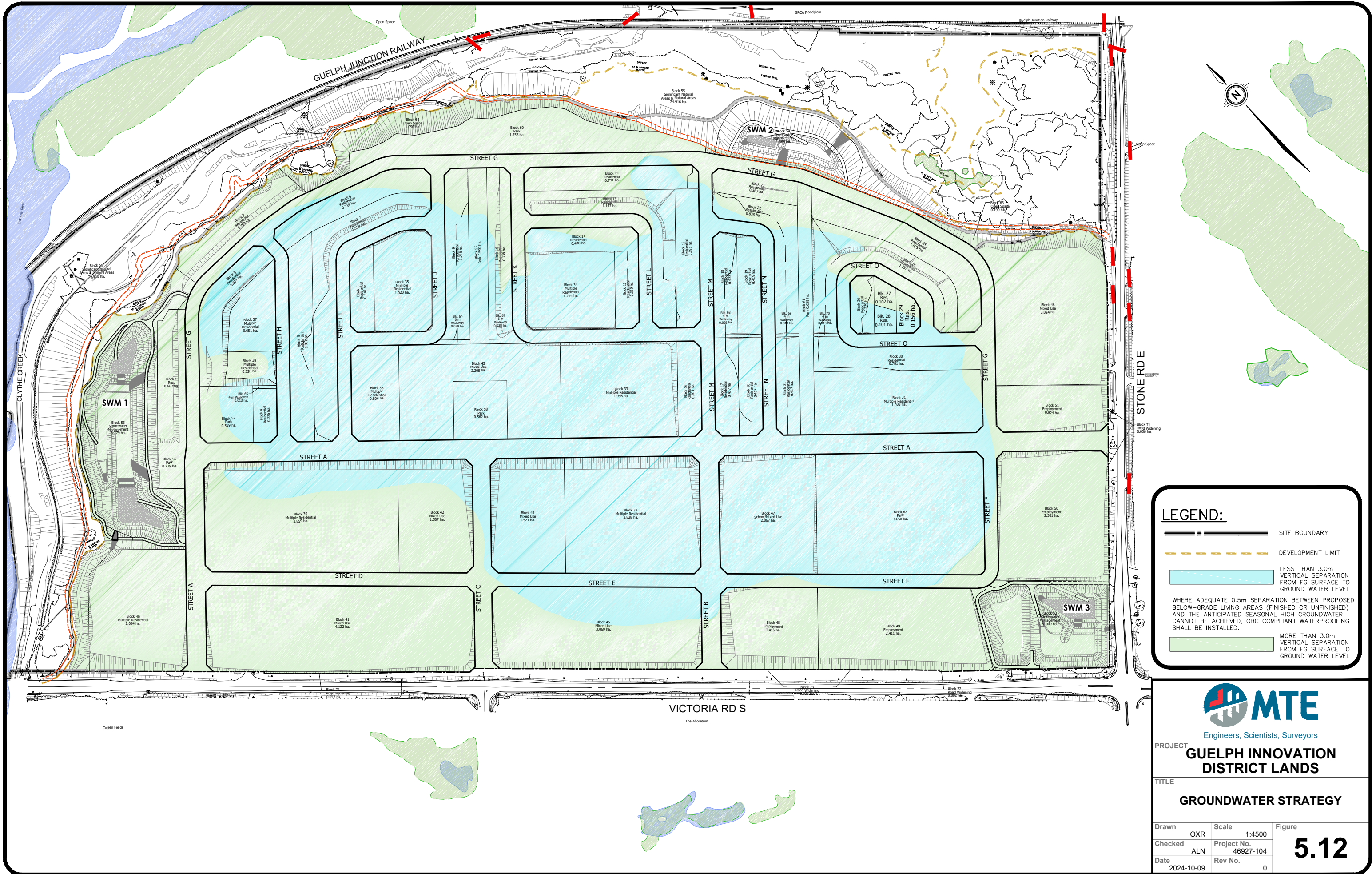
As shown in the analysis in **Appendix D**, due to the large peak flows at Sections 1-1, 3-3, 4-4, and 5-5 there is flooding calculated outside of the right-of-way limits or excessively high curb required at the SWM inlets in order to convey the overland flows. The simplified analysis completed does not account for the increased flow capacity in the storm sewer under pressurized surcharged conditions, and therefore over estimated the flooding levels in the right-of-way. To address this an HGL analysis was completed for the SWMF1 catchment area in PCSWMM, in order to determine more accurate flooding levels. The results of this analysis determine that no flooding will occur outside of the right-of-way limits in these areas. Refer to **Appendix D** for calculations and more details.

5.6 Groundwater and Waterproofing Measures

As discussed in Section 4.1, high groundwater levels near the southwestern and northeastern quadrants of the subject lands have been measured above the proposed preliminary finished grades in those locations. As such, appropriate waterproofing measures shall be implemented for structures in these areas. Where adequate 0.5m separation between proposed below-grade living areas (finished or unfinished) and the anticipated seasonal high groundwater cannot be achieved, OBC compliant waterproofing shall be installed.

To establish the extent of the anticipated waterproofing requirements, a surface comparison was done between the proposed finished grade surface (less 3.0m) and the measured spring groundwater high. The 3.0m depth ensures that groundwater levels are maintained at a minimum separation of 0.5m below basement floors, per the City's DEM. The extent of the zone of influence is highlighted in **Figure 5.12**, and denotes where waterproofing measures are anticipated to be implemented.

Alternative solutions to address the high groundwater in these areas of the subject lands will continue to be explored, and are further detailed within the *Functional Servicing Report*. MTE will work with the City to determine the most appropriate solution.



LEGEND:

- — — — — SITE BOUNDARY
- - - - - DEVELOPMENT LIMIT
- LESS THAN 3.0m VERTICAL SEPARATION FROM FG SURFACE TO GROUND WATER LEVEL
- WHERE ADEQUATE 0.5m SEPARATION BETWEEN PROPOSED BELOW-GRADE LIVING AREAS (FINISHED OR UNFINISHED) AND THE ANTICIPATED SEASONAL HIGH GROUNDWATER CANNOT BE ACHIEVED, OBC COMPLIANT WATERPROOFING SHALL BE INSTALLED.
- MORE THAN 3.0m VERTICAL SEPARATION FROM FG SURFACE TO GROUND WATER LEVEL

MTE
Engineers, Scientists, Surveyors

PROJECT
GUELPH INNOVATION DISTRICT LANDS

TITLE
GROUNDWATER STRATEGY

Drawn OXR	Scale 1:4500	Figure 5.12
Checked ALN	Project No. 46927-104	
Date 2024-10-09	Rev No. 0	

5.7 Water Balance Analysis

During typical urban developments, the conversion of previous vegetated areas to impervious surfaces leads to a decrease in evapotranspiration and infiltration volumes and an increase in runoff volumes. As stated in previous studies and in the City's *SWM Master Plan*, inputs to key natural features, e.g. groundwater resources and the Eramosa River, are to be maintained in post-development conditions. Therefore, a number of SWM practices are proposed within the development lands to achieve infiltration and water balance targets.

5.7.1 Infiltration

As identified in the *Master Plan Infiltration Policy*, one such target is the requirement for the 27mm capture in infiltrative LID BMPs in post-development conditions.

As previously stated, there are a number of site constraints which are not conducive to distributed infiltration techniques. High groundwater throughout, shallow underlying bedrock, relatively tight existing soil conditions, Valleyland slopes, grading requirements, and additional policy constraints based on WHPA vulnerability scores heavily dictate the overall infiltration strategy herein.

Due to the high groundwater, implementation of infiltrative measures will be restricted to the areas outside of the high groundwater zone. Runoff from within the high groundwater zone will be conveyed by the proposed storm sewer and outlet to end-of-pipe infiltration facilities, where possible (e.g. infiltration galleries, SWM infiltration cell). Lot and block level infiltration galleries shall be constructed in all areas outside of the high groundwater zone.

Infiltration within Wellhead Protection Areas

The proposed infiltration infrastructure has been indicated in **Figure 5.13** and displays an overlay of the WHPA mapping. The *Master Plan Infiltration Policy* generally imposes restrictions on infiltration practices within WHPAs with vulnerability scoring of 8 or greater. Particularly the policy implements restrictions on infiltration of runoff from paved surfaces receiving winter maintenance. Given the site's location in a WHPA with vulnerability scoring between 8 and 10, meeting the infiltration criteria would be difficult due to these restrictions. Section 4.1 of the *Master Plan Infiltration Policy* does however provide exemptions at the City's discretion, should a site-specific hydrogeological study be completed.

When evaluating future infiltration of storm water on-site, we have considered Volume II of the Grand River Source Protection Plan. The Grand River Protection Plan identifies risks to municipal water quality and water supplies, and outlines policies and programs in order to reduce risk.

Specific source water protection policies relating to existing or future Stormwater Management with the City of Guelph are found in policy CG-MC-15.

CG-MC-15 states:

"For the existing or future discharge from a stormwater management facility within vulnerable areas where this activity is or would be a significant drinking water threat, the Ministry of the Environment, Conservation and Parks shall ensure that the Environmental Compliance Approval that governs the stormwater management facility includes appropriate terms and conditions to ensure that the activity ceases to be and/or never becomes a significant drinking water threat in the following vulnerable areas:

- *In Wellhead Protection Areas A and B where the vulnerability is equal to 10.*

• *In Wellhead Protection Areas in an Issue Contributing Area (ICA)."*

Currently MTE is proposing three Stormwater Management Facilities on-site, SWMF1, SWMF2, and SWMF3. SWMF1 and SWMF2 are located largely in areas identified as WHPA-B with a vulnerability score of 10, while SWMF3 is located within WHPA-B with a vulnerability score of 8.

In order to determine if chloride is a significant threat MTE reviewed the Drinking Water Threats Table produced by the MECP (2018/2021). SWMF1 and SWMF2 is considered to have the following characteristics:

- SWMF1 Total Capture Area is 57.34ha, SWMF2 Total Capture Area is 10.05ha
- The predominant land use is low and medium density residential, mixed-use, employment lands, and park;
- Storm water management facility is a wet cell with a forebay designed to water to an infiltration cell (discharge storm water to groundwater);
- Located within a WHPA-B, vulnerability of 10.

Based on the above characteristics the risk associated with the circumstances is considered moderate. However, based on a review of on-site groundwater levels beneath SWMF1 and SWMF2 it is noted to flow off-site towards the Eramosa River. As such, infiltrating water will not impact groundwater source water supplies significantly as it will ultimately discharge to the adjacent surface water feature, which is not located within an Intake Protection Zone (IPZ) or within a GUDI vulnerability area. As such, MTE is of the opinion that infiltration of storm water does not represent a significant drinking water threat.

In order to determine if chloride is a significant threat MTE reviewed the Drinking Water Threats Table produced by the MECP (2018/2021). SWMF3 is considered to have the following characteristics:

- Total Capture Area is 24.10ha;
- The predominant land use is medium density residential, employment lands and park;
- Storm water management facility is a wet cell with a forebay designed to water to an infiltration cell (discharge storm water to groundwater);
- Located within a WHPA-B, vulnerability of 8.

Based on the above characteristics the risk associated with the circumstances is considered low. As such, MTE is of the opinion that infiltration of storm water at SWMF3 does not represent a significant drinking water threat.

In conclusion, chloride is not considered a significant drinking water threat in the areas of the proposed SWMFs. MTE's opinion is that the proposed infiltration galleries on-site do not pose a significant drinking water threat. Additionally, a salt management plan will be developed during the detailed design phase.

Reduced Infiltration Target

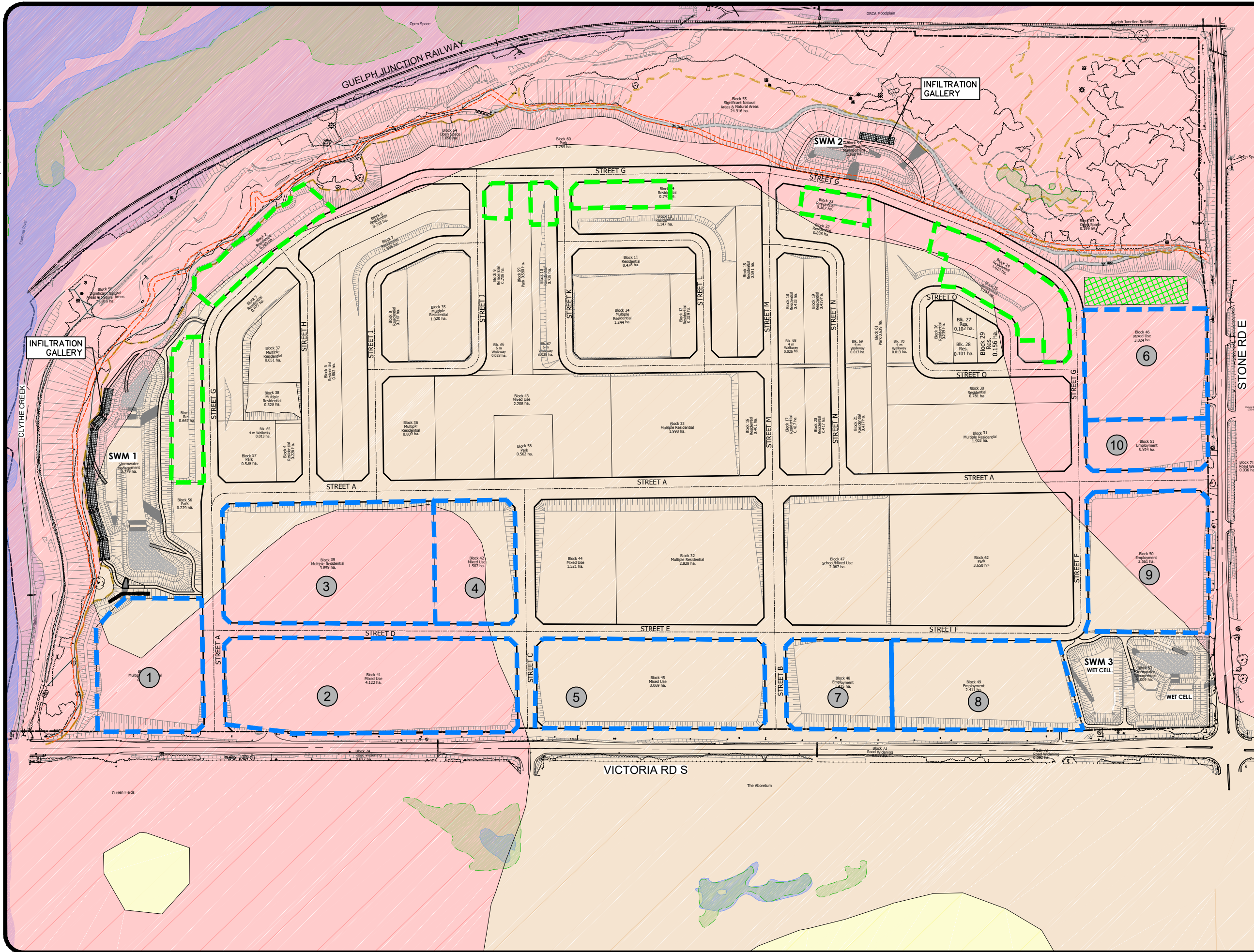
Achieving the required 27mm capture across the entire development is impractical due to the limited available footprint for infiltration measures after all constraints are taken into consideration. As such, per the *Master Plan*, a reduced rainfall capture of up to 75% of 27mm should be targeted if the full 27mm capture is not feasible. This policy has been utilized for this study, and a reduction to 25.48mm rainfall capture across the subject lands has been implemented.

The resulting infiltration volume for the entire development is 18,997.00m³. A total of 2,028.40 m³ will be passively infiltrated in the pervious areas, and 5,806.80 m³ processed through evapotranspiration. Active infiltration will be achieved via a combination of end-of-pipe infiltration galleries located in SWMF 1 and SWMF 2, an infiltration cell in SWMF 3, and various block/lot level infiltration galleries throughout the development, as indicated in **Figure 5.14** and summarized in **Table 5.10**. The design of the galleries will be further refined in future design stages as more information becomes available. Refer to **Appendix E** for preliminary sizing calculations of these infiltration galleries and overall infiltration volume calculations.

Table 5.10 – Summary of Water Balance Volumes

Method	Volume (m ³)
Evapotranspiration	5,806.80
Passive Infiltration	2,028.40
Lot/Block Level Infiltration Galleries	6,482.40
End-of-pipe Infiltration Galleries/Cell	11,486.10
Runoff to Wetlands	260.80
Runoff to Outlets	873.78
Total Volume of 27mm Storm	26,994.60

Further analyses will be required at future final design stages, once more specific lot and building details become available, so that final infiltration volumes and proposed implementation measures can be confirmed.



LEGEND:

SITE BOUNDARY

LIMIT OF POST-DEVELOPMENT CATCHMENT AREA

INFILTRATION GALLERY NUMBER

ROOF RUNOFF TO WETLAND

END OF PIPE INFILTRATION GALLERY

DRAINAGE BOUNDARIES TO LOT LEVEL INFIL. GALLERIES

DRAINAGE BOUNDARIES FOR BLOCK LEVEL INFIL. GALLERIES

BLOCK LEVEL INFIL. GALLERIES

WHPA VULNERABILITY (GRCA):

10

8

6

MTE
Engineers, Scientists, Surveyors

PROJECT

GUELPH INNOVATION DISTRICT LANDS

TITLE

INFILTRATION/SWM SYSTEM AND WHPA VULNERABILITY

Drawn

OXR

Scale

1:4500

Figure

5.13

Checked

ALN

Project No.

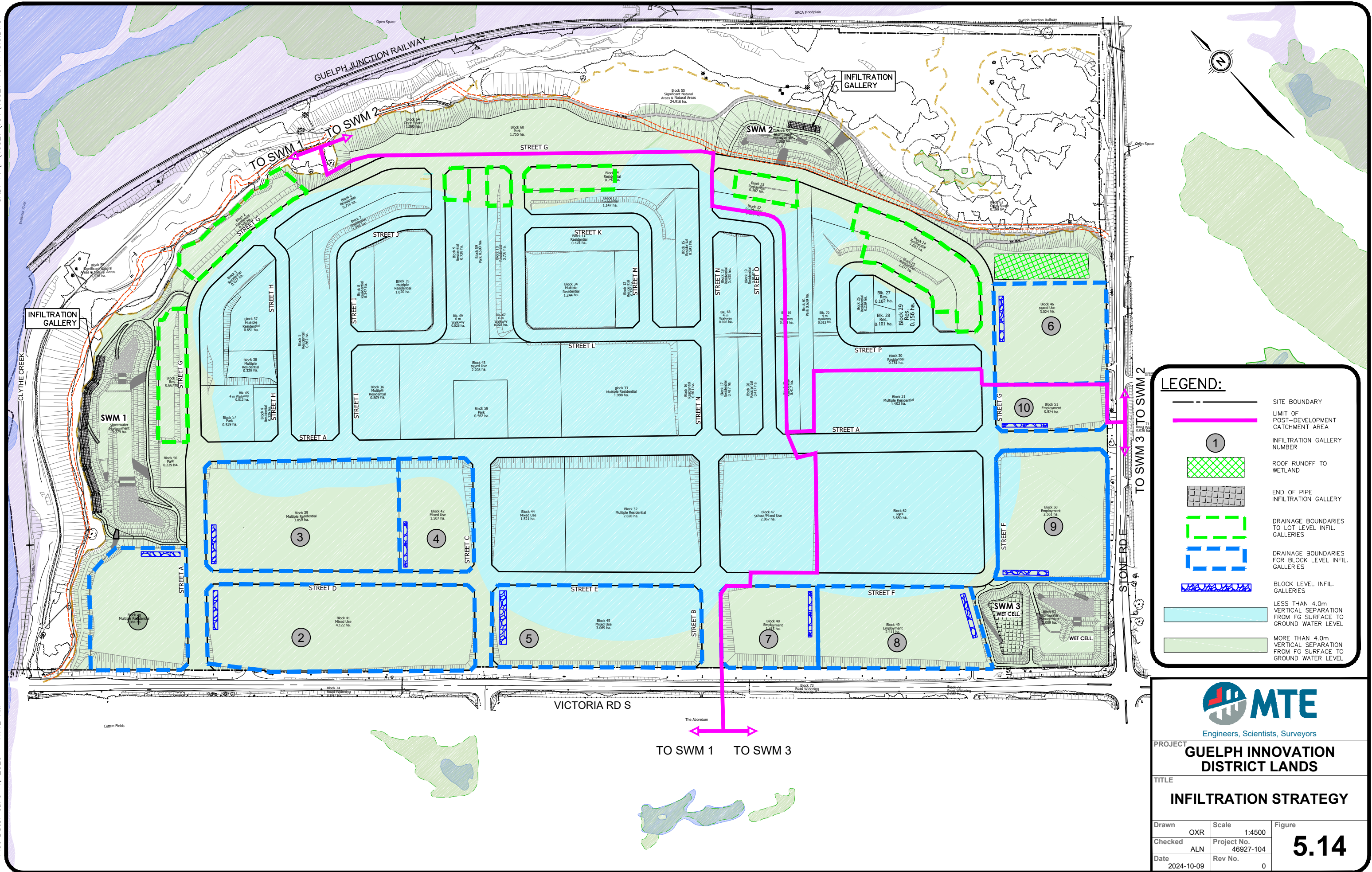
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2024-10-09

Rev No.

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5.7.2 Wetlands

As outlined on Map 4 of NRSI's 2024 *Guelph Innovation District Lands, Block 1&2, Guelph, Environmental Impact Study*, there are six wetland complexes in the adjacent Natural Areas to the east. The wetlands have been identified with numbers 1 through 6, as shown in **Figure E-1 and E-2 of Appendix E**. Impacts to the water balance of these wetlands shall be mitigated.

Wetlands 1, 2, 4, and 5 are outside of the development and separated by the railway. Due to the location of the railway culverts, these wetlands do not receive surface drainage directly from areas proposed to be developed. As such, the balance to these features is deemed to be maintained.

The Wetland 3 drainage area receives surface runoff to a channel fed by Culvert 2 and a surface catchment area that is largely within the development. Ultimately, there is no concern for the impact of flows to the wetland, as the channel functions in a flow through condition with the wetland. An annual analysis of the pre-development and post-development surface runoff was conducted based on the surface drainage area, soil type, existing ground cover conditions, and existing terrain. The analysis accounts for a portion of outflow from SWMF 2 to be directed towards the wetland to reduce losses to the annual runoff to the wetland. The remainder of flows from the SWMF 2 will be infiltrated within the proposed infiltration gallery in the SWMF block. The outlet of SWMF 2 will be designed through detailed design in order to control flows to a level that maintains the surface runoff water balance to the wetland. At this design stage it is assumed the approximately 27% of the outflow from SWMF 2 is directed to the wetland, and the remaining 73% is infiltrated. Refer to **Appendix E** for more detailed calculations.

The groundwater catchment for Wetland 3 falls largely within the limits of the 202 catchment for SWMF 2, with the rest of the catchment area outside of the development limits remaining unchanged from existing conditions. As demonstrated in the previous section, the infiltration target within the 202 catchment is largely being met, to the allowable reduced rainfall capture. Considering that the larger encompassing 202 catchment is meeting the required infiltration targets, the infiltration balance to Wetland 3 is considered to be maintained.

Wetland 6 is within the site limits and will be influenced by the development of the subject lands. An annual analysis of the pre-development and post-development surface runoff was conducted based on the surface drainage area, soil type, existing ground cover conditions, and existing terrain. The analysis accounts for a portion of outflow from the adjacent Mixed Use Block 46 to be directed towards the wetland to reduce losses to the annual runoff to the wetland. The estimated roof area required to be redirected to achieve an annual water balance is 2,270 m². Refer to **Appendix E** for more detailed calculations.

The groundwater catchment for Wetland 6 falls largely within the limits of the 202 catchment for SWMF 2, with the rest of the catchment area outside of the development limits remaining unchanged from existing conditions. As demonstrated in the previous section, the infiltration target within the 202 catchment is largely being met, to the allowable reduced rainfall capture. Considering that the larger encompassing 202 catchment is meeting the required infiltration targets, the infiltration balance to Wetland 6 is considered to be maintained.

5.8 Thermal Mitigation

Thermal preventative and mitigation measures are important components of water quality treatment. During future detailed design stages of the subject lands, the development plans and studies will include details of the proposed thermal mitigation measures to be put in place to ensure the existing cool water regime present in the Eramosa River is not negatively impacted.

As identified in the *SWM Master Plan*, examples of such measures include, but are not limited to:

- Bottom draw outlets from SWMFs;
- Enhanced SWMF landscaping to increase permanent pool shading;
- Improved SWMF design (which includes location and orientation to minimize sun exposure, shading of paved surfaces within the catchment, increasing length-to-width ratios, and selective planting species); and,
- Consideration for infiltration and dry pond facilities.

The main methodology of the thermal mitigation plan is to infiltrate warmed stormwater below ground level where cold groundwater and/or relatively colder ambient temperatures will cool the stormwater, lowering the average stormwater temperatures prior to discharge to natural features.

The following measures have been proposed for the subject lands, and in combination will achieve the specified criteria.

Linear / Lot Level Infiltration

The majority of the stormwater runoff that is generated at the lot-level via roofs and yards, will be effectively disconnected from surface water features during all rain events up to a 20mm depth through the proposed at-source infiltration measures (amended topsoil and infiltration galleries).

End-of-Pipe Infiltration

Portions of subcatchments 201 and 202 will be designed to be completely infiltrated up to a 20mm depth by means of infiltration galleries located within the pond blocks.

Controlled development areas of subcatchment 203 will be designed to be completely infiltrated during all non-winter rain events by means of an infiltration cell located beside the wet pond.

SWM Facility Design Features

Features within the SWMFs to assist in reducing the temperature of surface runoff from the site are:

- Bottom draw outlet for cooling benefits resulting from thermal stratification within the facility.
- SWM facility perimeter plantings to be incorporated in the landscaping design for the facility.

5.9 Landscape Design

Landscape designs for the proposed stormwater management facilities will be completed during the final design stage of the development. The landscape design is to address aesthetics, erosion protection, long term bank stability, and to limit pedestrian access into the permanent pool components. The facilities will be designed in accordance with the *Urban Design Guidelines – Guelph Innovation District, Blocks 1 & 2 (MHBC, April 2024)*, and the *Parks, Trail and Open Space Manual for Stormwater Management Ponds (City of Guelph, 2025)*

5.10 Chloride Impact Assessment

A site wide chloride impact assessment for roads will be completed as part of the final SWM report and plan. Block level chloride impact assessments will be completed during site plan approval. The purpose of this assessment shall be to assess impacts to the groundwater system, and if necessary, mitigate the impacts by proposing enhanced development and construction techniques. The assessment requires the calculation of the salt loading from de-icing operation to the groundwater so as to ensure that groundwater chloride concentrations will remain within the Reasonable Use Guidelines established by the Ministry of the Environment, Conservation and Parks (MECP – formerly known as the MOE).

The City shall minimize chloride infiltration into groundwater through best management practices when applying salt to streets during winter months in accordance with the City's salt management plan. Furthermore, site specific Salt Management Plans shall be developed to align with *Source Water Protection Policies*.

5.11 Block Level Stormwater Management

The proposed Draft Plan of Subdivision for the subject lands contains a number of Blocks that will be developed through a Site Plan Approval process and or a Draft Plan of Condominium. As part of that process, a detailed Stormwater Management Plan will be prepared showing how the stormwater control measures will adhere to the SWM criteria and be implemented within the Block. To facilitate this process and ensure adherence with the SWM criteria, the future SWMFs will be designed to provide quality control, quantity control, and water balance in accordance with the City of Guelph's *Stormwater Management Master Plan*.

Block specific stormwater management criteria is summarized in a table provided in **Appendix F**.

6.0 MONITORING PROGRAM

In accordance with the recommendations of the *Stormwater Management Master Plan* and the *Eramosa-Blue Springs Watershed Study*, a monitoring program is to be designed and implemented by the developer. The plan will serve to ensure that the mitigation measures proposed within the development are implemented and performing at an acceptable level.

A detailed monitoring program will be outlined as more design details are confirmed, including SWM outlets and LID measures. The program include input from the City and GRCA. A general framework for the monitoring program is established below;

6.1 Pre-Construction Monitoring Program

This stage of the monitoring is intended to establish the detailed site background conditions and baseline data. The pre-construction monitoring includes the following parameters:

- **Groundwater** – monitoring includes water level (continuous via datalogger) and annual general chemistry.
- **Surface water** – monitoring includes water quality (total suspended solids and temperature) at the upstream and downstream of SWM Facility catchment limits. For TSS, samples will be taken annually. Temperature will be monitored on a continuous basis, at 1-hour intervals.

6.2 During-Construction Monitoring Program

The purpose of this stage of the monitoring is to continue with the pre-construction monitoring program in order to monitor the effectiveness of erosion and sediment control measures, and to confirm that mitigative measures are functioning properly. Additional monitoring (over and above the pre-construction program) will include:

- **Stormwater Management Facility** – TSS samples will be taken annually at the inlet and outlet of the SWMFs. The program shall also include continuous water level monitoring, at 1-hour intervals, at the respective facility outlets and standard inspection of vegetation, structures, and general operation of hydraulic controls (observations of drawdown) within the SWMFs. These visual inspections are to occur seasonally and typically after a significant rainfall event.
- **Erosion and Sediment Control** – per ESC plans to be prepared during detailed design.

This stage will begin at the commencement of area grading of the subdivision and will continue until 90% buildout of the subdivision.

6.3 Post-Construction Monitoring Program

This period of the monitoring will begin following 90% buildout of the subdivision (buildings are constructed, lots are sodded/landscaped, SWMF plantings are established, and open spaces are stabilized) and following clean-out of the SWMF. The purpose of this stage of the monitoring is to ensure that the SWMFs continue to operate as designed. The post-construction monitoring period will extend for a 2-year period. Monitoring during this stage will include all components from the pre-construction and during-construction monitoring program. It is recommended that, following completion of the developer's portion of the post-development monitoring program and assumption of the SWMFs by the City, the City continues with a post-development inspection and maintenance program to ensure the long-term effectiveness of the SWMFs.

7.0 EROSION AND SEDIMENT CONTROL MEASURES

Precautions will be taken during construction to limit erosion and sedimentation. Erosion and Sediment Control Plans will be prepared and provided during the detailed design stage. The plans will illustrate the erosion and sediment control measures to be implemented during construction, which will limit impacts associated with development.

Typically, the recommended construction sequence for erosion and sediment control measures are as follows:

- Placement of all sediment control fencing where required;
- Topsoil stripping within the permanent SWMF and temporary sedimentation basin footprints, and strategic placement of topsoil stockpiles. Placement of sediment control fencing around all stockpile areas;
- Construction of temporary sediment control ponds outside of the permanent SWMF, which will serve as sedimentation basins for the site during construction;
- Construction of the permanent SWMFs, and any associated infiltration measures, prior to area grading;
- Construction of temporary swales to direct runoff to sedimentation basins, with rock check dams as required to control velocities; and
- Re-vegetation of completed areas as soon as possible after construction, including those areas not slated for construction within 60 days.

The permanent SWMFs will be constructed prior to their respective catchment's area grading. Temporary sediment basins will be constructed outside of the SWMFs to address runoff during area grading operations. Storage consistent with the GRCA's requirement of 125m³/ha of live and dead storage, respectively (total 250m³/ha), will be provided. This storage will be provided to ensure that suspended material will have ample time to settle out. In addition, the sediment basins will be sized with sufficient capacity to allow flows to pass without breaching. Once the active construction and grading activities have been completed, the sedimentation basins can be cleaned out.

Where rock check dams are proposed to promote sedimentation and reduce velocities, clean aggregate is to be placed perpendicular to the direction of flow in the swale, with a small volume of excavation on the upstream side to provide storage for accumulated sediment.

Sediment control fencing shall consist of filter fabric attached to page wire fencing and sealed at ground level. It will be installed at the perimeter of the work areas and intermittently on sloped areas where required. Sediment control fencing will be placed around all topsoil stockpiles.

Access to topsoil or fill storage areas will be located on the upstream side of storage piles. This practice will ensure continuity of the sediment control fencing in the downslope direction; which is most vulnerable to erosion and sediment deposition. Further, topsoil and hydroseed will be placed on all exposed areas following the completion of grading activities.

It is recommended that during construction, monitoring and inspection of the erosion and sediment controls be conducted to ensure the satisfactory performance of these measures. Reporting of the inspection and monitoring results should be distributed to the City and GRCA. If it is found that the erosion and sediment control measures are not working adequately, they shall be augmented to the satisfaction of the City and the GRCA, based on field decisions.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing analyses, it is concluded that:

1. The stormwater management strategy outlined herein will provide the GID development with appropriate levels of quality, quantity, erosion, water balance and thermal mitigation.
2. 'Enhanced' water quality control will be provided through the proposed end-of-pipe SWMFs. Furthermore, the capture and infiltration of approximately 20mm of rainfall sitewide will help recharge groundwater and reduce peak flow and erosion considerations downstream.
3. Quantity control targets for post-development peak flows can be achieved in the proposed stormwater management facilities for the 25 year through the 100-year storm events.
4. Implementing erosion and sediment controls during construction will minimize any negative impacts of construction activities on the adjacent properties and the receiving watercourse.
5. Water Balance targets can be satisfactorily met through the use of the prescribed lot-level, and end-of-pipe infiltration measures as described within this report.
6. Surface water balance to significant surface water features can be satisfactorily met through the flows at the outlets of the SWMFs and the intentional catchment area delineation for roof areas and rear yards.

The findings of this report, and the above conclusions, lead to the following recommendations:

1. That the quality/quantity control stormwater management facilities be constructed to provide control of stormwater as described in Section 5 of this report.
2. That the Water Balance, as calculated in this report, be reviewed and re-confirmed during final design.
3. That during the site grading operations, soils be selectively excavated and placed, under the supervision of a geotechnical engineer, in order to maximize the post-development areas suitable for infiltration.
4. That erosion and sediment controls during construction as described in Section 7 of this report be implemented.
5. That the conceptual design and modeling of the future stormwater management facilities contained within the subdivision be reviewed and re-confirmed at the time of final design.
6. Salt Management Plans be prepared for all blocks subject to site plan approval and/or a plan of condominium approval.

All of which is respectfully submitted,

MTE Consultants Inc.



Matthew Willcox, P. Eng

Design Engineer

519-743-6500

mwillcox@mte85.com

MPW:jng



Valentina Lazic, P.Eng.

Design Engineer

519-743-6500

vlazic@mte85.com

https://mte85.sharepoint.com/sites/46927-104/Shared Documents/02 - Reports/MTE Reports/Preliminary SWM/46927-104_rpt_2026-06-12_Preliminary SWM.docx

Appendix A

Draft Plan of Subdivision

DRAFT PLAN OF SUBDIVISION

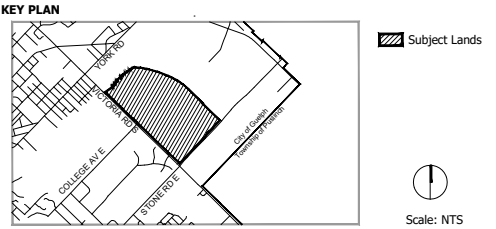
LEGAL DESCRIPTION
PART OF BROKEN FRONT LOTS 10, 11 & 12
CONCESSION 1, DIVISION 'G'
GEOGRAPHIC TOWNSHIP OF GUELPH
IN THE CITY OF GUELPH, COUNTY OF WELLINGTON

OWNER'S CERTIFICATE
I HEREBY AUTHORIZE MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED TO SUBMIT THIS PLAN FOR APPROVAL.

Date: Client Name
Company Name

SURVEYOR'S CERTIFICATE
I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

Date: J. Andrew Smith, Surveyor, O.L.S.
Callion Dietz Incorporated



ADDITIONAL INFORMATION
Required Under Section 51 (17) of the Planning Act, R.S.O., 1990, c.P.13 as Amended

(a) As Shown	(e) As Shown	(h) Municipal Water Supply
(b) As Shown	(f) As Shown	(i) Loam / Sandy Loam
(c) As Shown	(g) As Shown	(j) As Shown
(d) Residential, Multiple Residential, Mixed Use, School, Employment, Open Space, Park, Stormwater Management	(k) All Services As Required	(l) As Shown

DESCRIPTION	LOTS/BLOCKS	UNITS	AREA
Residential	1-30	457	17.725 ha
Multiple Residential	31-40	861	16.724 ha
Mixed Use	41-46	3,722	15.451 ha
School/Mixed Use	47		2.067 ha
Employment	48-51		7.311 ha
Stormwater Management	52-54		7.156 ha
Significant Natural Area & Natural Areas	55		24.916 ha
Park	56-62		7.964 ha
Open Space	63,64		1.289 ha
Walkway	65-70		0.121 ha
Road Widening	71-74		0.108 ha
Roads			15.764 ha

Total	74	5,040	116.596 ha
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- NOTES
- All dimensions are in metres unless otherwise shown.
 - Survey information provided by Callion Dietz Land Surveying Ontario, Nov. 2016.
 - Topographic information provided by MTE.
 - Wetland, dripline, and buffers provided by NRSI INC, Oct. 2022.
 - Contains information made available under Grand River Conservation Authority's Open Data Licence v1.0.
 - Contains information licensed under the Open Government Licence - City of Guelph.
 - Daylight triangle 9m x 9m.
 - Conceptual 3 meter trail location.

Revision No.	Date	Issued / Revision	By
1.	Nov. 11, 2025	Preliminary Draft Plan;	SP

Stamp	Date May 28, 2026
File No.	1405G
Plan Scale	1:2,500 (Arch D)
Drawn By	S.P./J.B
Checked By	D.A.

Project	GUELPH INNOVATION DISTRICT BLOCK 1 & 2 Fusion Homes Guelph, Ontario.
---------	--

File Name	DRAFT PLAN OF SUBDIVISION
Dwg No.	1 of 1

Scale Bar

K:\1405G - GSD Block 1 and 2\2025\1405G_Draft Plan of Subdivision_28May2026.dwg

Appendix B

Hydrologic Modelling

EXISTING CONDITIONS

Guelph Innovation District
PCSWMM Modelling Results
Guelph, Ontario

Project Nur 46927-104

Date: June 11, 2026

Design By: TRN

File: Q:\46927\104\SWM\PCSWMM\Appendices Tables\Post-Development Results.xlsx

Pre-Development Result Summary

Drainage Area	Peak Flows	
	5 year (m^3/s)	Regional (m^3/s)
101	1.55	5.81
102	0.56	3.06
103	1.12	1.86
104	0.45	1.03
105	0.61	1.79

PROPOSED CONDITIONS

Guelph Innovation District
PCSWMM Modelling Results
Guelph, Ontario

Project Number: 46927-104
Date: June 11, 2026
Design By: TRN
File: Q:\46927\104\SWMM\PCSWMM\Appendices Tables\Post-Development Results.xlsx

Post-Development Result Summary

Catchments

Drainage Area	Peak Flows			
	5 year	25 Year	100 Year	Regional
	(m ³ /s)	(m ³ /s)	(m ³ /s)	(m ³ /s)
201-1	5.87	8.60	10.79	2.65
201-2	8.90	13.31	16.87	4.71
201-3	0.45	0.79	1.10	0.33
201-4	0.30	0.47	0.58	0.10
201-5	1.60	2.39	2.95	0.51
202-1	3.10	4.51	5.64	1.28
202-2	0.30	0.70	1.08	0.35
202-3	0.48	1.00	1.38	0.26
202-4	0.34	0.48	0.58	0.10
203-1	3.99	5.84	7.34	1.93
203-2	2.96	4.29	5.32	1.10
203-3	0.86	1.27	1.57	0.27
204	0.45	1.25	2.06	1.03
205	0.61	1.71	2.86	1.79

Storages

SWMF/INF	Max Ponding			
	5 year	25 Year	100 Year	Regional
	(m ³ /s)	(m ³ /s)	(m ³ /s)	(m ³ /s)
INF3	330.83	331.04	331.28	331.49
SWMF1	327.22	327.5	327.8	328.44
SWMF2	333.98	334.11	334.23	334.37
SWMF3	332.23	332.62	332.95	334.13

Peak Outflows

Outlet	SWMF	Peak Flows			
		5 year	25 Year	100 Year	Regional
		(m ³ /s)	(m ³ /s)	(m ³ /s)	(m ³ /s)
1	SWMF	0.133	0.676	0.921	7.502
	Uncontrolled	0.750	1.260	1.682	0.432
	Developable Area	0.750	1.261	1.746	7.927
	Total	1.205	2.513	3.809	8.961
2	SWMF	0.102	0.390	0.772	1.321
	Uncontrolled	0.285	0.739	1.209	0.605
	Developable Area	0.285	0.989	1.776	1.926
	Total	0.773	2.403	4.191	3.718
3	SWMF	0	0	0	3.229
	Uncontrolled	0	0	0	0
	Developable Area	0	0	0	3.229
	Total	0	0	0	3.129

Appendix C

SWMF Design Calculations

Guelph Innovation District
PCSWMM Modelling Results
Guelph, Ontario

Project Number: 46927-104
Date: June 1, 2026
Design By: TRN
File: Q:\46927\104\SWM\PCSWMM\Appendices Tables\Post-Development Results.xlsx

Pre-Development Model Parameters

Catchments

Name	Outlet	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Subarea Routing	Percent Routed (%)	Suction Head* (mm)	Conductivity* (mm/hr)	Initial Deficit* (frac.)
101	OF1	54.91	1098	500	6	3	0.01	0.1	1	5	0	OUTLET	100	144	10.4	0.2
102	OF2	28.49	814	350	4	1	0.01	0.1	1	5	0	OUTLET	100	144	10.4	0.2
103	Pond1	16.55	662	250	2	10	0.01	0.1	1	5	0	OUTLET	100	144	10.4	0.2
104	OF1	8.72	581	150	11	0	0.01	0.1	1	5	0	OUTLET	100	144	10.4	0.2
105	OF2	15.26	763	200	11	0	0.01	0.1	1	5	0	OUTLET	100	144	10.4	0.2

*Green Ampt Parameters adopted from GID SWM Study (Wood, 2020)

Guelph Innovation District PCSWMM Modelling Results

Guelph, Ontario

Project Number: 46927-104
Date: June 1, 2026
Design By: TRN
File: Q:\46927\104\SWM\PCSWMM\Appendices Tables\Post-Development Results.xlsx

Model Parameters

Catchments

Name	Outlet	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Subarea Routing	Percent Routed (%)	Suction Head* (mm)	Conductivity* (mm/hr)	Initial Deficit* (frac.)
201-1	SWMF1	19.37	850	228	1.5	66	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
201-2	SWMF1	34.21	900	380	1.5	70	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
201-3	OF1	2.68	268	100	5	22	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
201-4	OF1	0.75	250	30	20	41	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
201-5	SWMF1	3.76	752	50	15	59	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
202-1	SWMF2	9.33	550	170	1.5	67	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
202-2	OF2	2.89	385	75	7.5	4.25	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
202-3	OF2	2.17	434	50	33	5	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
202-4	SWMF2	0.72	240	30	15	65	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
203-1	SWMF3	14.32	477	300	2.5	59	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
203-2	OF3	7.78	311	250	4	78	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
203-3	SWMF3	2	308	65	15	64	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
204	OF1	8.72	581	150	11	0	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	
205	OF2	15.26	763	200	11	0	0.01	0.1	1	5	0 OUTLET	100	144	10.4	0.2	

*Green Ampt Parameters adopted from GID SWM Study (Wood, 2020)

Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Storage Curve	Coefficient	Exponent	Constant (m ²)	Curve Name	Conductivity (mm/hr)
INF1	324.67	330	5.33	FUNCTIONAL	0	0	2415	*	92.6
INF2	332.486	334.7	2.214	FUNCTIONAL	0	0	333	*	49.4
INF3	330.8	334.5	3.7	TABULAR	1000	0	0	INF3	37.3
SWMF1	326.5	330	3.5	TABULAR	1000	0	0	SWMF1	0
SWMF2	333.4	334.7	1.3	TABULAR	1000	0	0	SWMF2	0
SWMF3	331.4	334.5	3.1	TABULAR	1000	0	0	SWMF3	0

GID
PERCENT IMPERVIOUS AND RUNOFF COEFFICIENT
Guelph, Ontario

Project Number: 46927-104
Date: June 2, 2026
Design By: MPW
File: Q:\46927\104\SWM\IC Coefficients\IC Coefficient Calculation - June 2026.xlsx

	Runoff Coefficient	Percent Impervious
PARKS	0.25	7%
R.O.W.	0.70	70%
RESIDENTIAL	0.65	65%
MULTI-RES	0.75	80%
MIXED USE	0.75	80%
SCHOOL	0.75	80%
SWM	0.65	*
EMPLOYMENT	0.9	100%

1. Runoff coefficients and percent impervious from City of Guelph EDM
2. Roads percent impervious assumed based on calculations below these notes.
3. Residential assumed to be >12m frontage
4. Mixed-use assumed to be same percent impervious as multi-residential
5. Percent impervious for SWM is individually calculated for each pond

R.O.W. Assumptions

	Impervious Width (m)	Pervious Width (m)
18.0m Width		
Asphalt	7	0
Curb	1	0
Sidewalk	3.6	0
Boulevard	0	6.4
	11.6	6.4
	64.4%	35.6%

	Impervious Width (m)	Pervious Width (m)
24.0m Width		
Asphalt	10	0
Curb	1	0
Sidewalk	3	0
Boulevard	0	10
	14	10
	58.3%	41.7%

	Impervious Width (m)	Pervious Width (m)
26.0m Width		
Asphalt	10	0
Curb	1	0
Sidewalk	3	0
Boulevard	0	12
	14	12
	53.8%	46.2%

R.O.W. fronted by low density residential on both sides is 100% impervious at the location of the driveways.

Assuming 457 units from the draft plan with an average driveway width of 6m, the total length of road with a 100% impervious cross section would be 1,371m.

There is a total of 7,303m of road centerline within the subject lands.18.8% of which should be considered 100% impervious.

	Centreline Length (m)	
18.0m Width	6425	88.0%
24.0m Width	294	4.0%
26.0m Width	584	8.0%
	7303	

	Centreline Length (m)	% Impervious	C
18.0m Width	5054	64.4%	0.66
18.0m Width (100% Impervious)	1371	100%	0.90
24.0m Width	294	58.3%	0.61
26.0m Width	584	53.8%	0.58

Weighted Average 70%
% Impervious

Weighted Average 0.70
C

SWMF1 - EAST FOREBAY

		AREA	C	AC	Weighted C
101	R.O.W.	1.01	0.70	0.70	0.66
	RESIDENTIAL	2.40	0.65	1.56	
		3.41		2.26	

		AREA	C	AC	Weighted C
102	R.O.W.	0.43	0.70	0.30	0.66
	RESIDENTIAL	1.10	0.65	0.72	
		1.53		1.01	

		AREA	C	AC	Weighted C
103	R.O.W.	0.60	0.70	0.42	0.66
	RESIDENTIAL	1.32	0.65	0.86	
	MULTI-RES	0.00	0.75	0.00	
		1.92		1.28	

		AREA	C	AC	Weighted C
104	R.O.W.	0.74	0.70	0.52	0.72
	RESIDENTIAL	0.35	0.65	0.23	
	MULTI-RES	1.24	0.75	0.93	
		2.33		1.68	

		AREA	C	AC	Weighted C
105	R.O.W.	0.23	0.70	0.16	0.50
	RESIDENTIAL	0.72	0.65	0.47	
	PARKS	0.59	0.25	0.15	
		1.54		0.78	

		AREA	C	AC	Weighted C
106	R.O.W.	1.14	0.70	0.79	0.69
	RESIDENTIAL	1.36	0.65	0.88	
	MULTI-RES	1.02	0.75	0.77	
		3.52		2.44	

		AREA	C	AC	Weighted C
107	R.O.W.	0.49	0.70	0.34	0.66
	RESIDENTIAL	1.15	0.65	0.75	
	MULTI-RES	0.00	0.75	0.00	
	MULTI-RES	0.00	0.75	0.00	
		1.64		1.09	

		AREA	C	AC	Weighted C
108	R.O.W.	0.32	0.70	0.22	0.70
	MULTI-RES	0.64	0.75	0.48	
	RESIDENTIAL	0.69	0.65	0.45	
		1.65		1.15	

		AREA	C	AC	Weighted C
109*	RESIDENTIAL	0.43	0.65	0.28	0.64
	SWM	1.35	0.65	0.88	
	PARKS	0.03	0.25	0.01	
		1.81		1.16	

		AREA	C	AC	Weighted C
109	R.O.W.	0.52	0.70	0.36	0.68
	MULTI-RES	0.27	0.75	0.20	
	RESIDENTIAL	1.01	0.65	0.66	
		1.80		1.22	

Total Catchment 20.20
Total C 0.68
%IMP 69.00

SWMF1 - WEST FOREBAY

		AREA	C	AC	Weighted C
401	R.O.W.	0.65	0.70	0.45	0.67
	RESIDENTIAL	1.07	0.65	0.70	
		1.72		1.15	

		AREA	C	AC	Weighted C
402	R.O.W.	0.79	0.70	0.55	0.73
	RESIDENTIAL	0.20	0.65	0.13	
	MULTI-RES	2.00	0.75	1.50	
	MIXED USE	0.92	0.75	0.69	
		3.91		2.87	

		AREA	C	AC	Weighted C
403	R.O.W.	0.44	0.70	0.31	0.65
	MULTI-RES	0.81	0.75	0.61	
	MIXED USE	1.29	0.75	0.97	
	PARKS	0.56	0.25	0.14	
		3.1		2.02	

		AREA	C	AC	Weighted C
404	R.O.W.	0.59	0.70	0.41	0.67
	RESIDENTIAL	0.77	0.65	0.50	
	MULTI-RES	0.00	0.75	0.00	
		1.36		0.91	

		AREA	C	AC	Weighted C
405	R.O.W.	0.7	0.70	0.49	0.53
	RESIDENTIAL	0.251	0.65	0.16	
	PARKS	0.539	0.25	0.13	
		1.49		0.79	

		AREA	C	AC	Weighted C
406	SCHOOL	2.07	0.75	1.55	0.75
	EMPLOYMENT	0.00	0.9	0.00	
	R.O.W.	0.19	0.70	0.13	
		2.26		1.68	

		AREA	C	AC	Weighted C
407	R.O.W.	0.96	0.70	0.67	0.74
	MULTI-RES	2.83	0.75	2.12	
	MIXED USE	4.38	0.75	3.29	
		8.17		6.08	

		AREA	C	AC	Weighted C
408	R.O.W.	0.972	0.70	0.68	0.75
	MULTI-RES	3.859	0.75	2.89	
	MIXED USE	5.629	0.75	4.22	
		10.46		7.79	

		AREA	C	AC	Weighted C
409	R.O.W.	0.16	0.70	0.11	0.75
	MULTI-RES	1.79	0.75	1.34	
		1.95		1.45	

		AREA	C	AC	Weighted C
410*	RESIDENTIAL	0.43	0.65	0.28	0.64
	SWM	1.35	0.65	0.88	
	PARKS	0.03	0.25	0.01	
		1.81		1.16	

Total Catchment 36.22
Total C 0.70
%IMP 70.00

SWMF2

		AREA	C	AC	Weighted C
201	R.O.W.	0.83	0.70	0.58	0.66
	RESIDENTIAL	1.78	0.65	1.16	
		2.61		1.74	

		AREA	C	AC	Weighted C
202	R.O.W.	0.24	0.70	0.17	0.75
	MIXED USE	2.76	0.75	2.07	
		3.00		2.24	

		AREA	C	AC	Weighted C
203	R.O.W.	0.45	0.70	0.31	0.66
	RESIDENTIAL	1.49	0.65	0.97	
		1.94		1.28	

		AREA	C	AC	Weighted C
204*	SWM	0.69	0.65	0.45	0.65

		AREA	C	AC	Weighted C
205	R.O.W.	0.21	0.70	0.15	0.52
	RESIDENTIAL	1.03	0.65	0.67	
	PARKS	0.64	0.25	0.16	
		1.88		0.98	

Total Catchment 10.12
Total C 0.66
%IMP 66.00

SWMF3

		AREA	C	AC	Weighted C
301	R.O.W.	0.99	0.70	0.69	0.74
	RESIDENTIAL	0.17	0.65	0.11	
	MULTI-RES	1.90	0.75	1.43	
	EMPLOYMENT	0.81	0.9	0.73	
	PARKS	0.18	0.25	0.05	
		4.05		3.00	

		AREA	C	AC	Weighted C
302	R.O.W.	0.31	0.70	0.22	0.88
	EMPLOYMENT	2.43	0.90	2.19	
		2.74		2.40	

		AREA	C	AC	Weighted C
303	R.O.W.	0.44	0.70	0.31	0.56
	EMPLOYMENT	3.17	0.9	2.85	
	PARKS	3.65	0.25	0.91	
		7.26		4.07	

		AREA	C	AC	Weighted C
304*	SWM	2.00	0.65	1.30	0.73
	EXTERNAL	8.05	0.75	6.04	
		10.050		7.34	

Total Catchment 24.10
Total C 0.70
%IMP 72.00

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STORMWATER MANAGEMENT
 Guelph, Ontario

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Water Quality Sizing Criteria MOE Volumes

SWMF-1

Reference: Section 3.3 Water Quality, MOE Stormwater Management Planning and Design Manual, March 2003

Step 1: Choose Level of Water Quality Control

Enhanced 80% long-term S.S. removal

Step 2: Choose Type of Facility

Wet Pond

Step 3: Define Catchment area and Imperviousness

Catchment Area (ha)

57.34

Imperviousness (%)

67.93

Table 2.3 Interpolated Storage Volume Requirement (m³/ha)

220.16

Total Storage Volume Required (m³)

12624.21

Extended Detention Volume Required (m³)

2293.60

Total Permanent Pool Required (m³)

10330.61

Table 3.2 Water Quality Storage Requirements based on Receiving Waters (from MOE Stormwater)					
Protection Level	SWMP Type	Storage Volume (m ³ /ha) for Impervious Level			
		35	55	70	85
Enhanced 80% long-term S.S. removal	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250
Normal 70% long-term S.S. Removal	Wetlands	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
Basic 60% long-term S.S. Removal	Wetlands	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240

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STAGE-STORAGE RELATIONSHIP: Facility Volumes

SWMF-1

Stage	Active Depth	East Forebay			West Forebay			Main Pond			Total Pond Volume	Active Storage Volume	Volume Summary	Ponding Elevation	Comments	Stage
		Area	Volume	Cumulative Volume	Area	Volume	Cumulative Volume	Area	Volume	Cumulative Volume						
m	m	m ²	m ³	m ³	m ²	m ³	m ³	m ²	m ³	m ³	m ³	m ³	m ³	m		m
325.00		920	0	0	1767	0	0	4640	0	0	0					325.00
325.10		964	94	94	1828	180	180	4808	472	472	746					325.10
325.20		1008	99	193	1890	186	366	4978	489	962	1520					325.20
325.30		1053	103	296	1953	192	558	5148	506	1468	2322					325.30
325.40		1098	108	403	2016	198	756	5319	523	1991	3151					325.40
325.50		1144	112	516	2079	205	961	5491	541	2532	4008					325.50
325.60		1191	117	632	2144	211	1172	5664	558	3090	4894					325.60
325.70		1238	121	754	2208	218	1390	5838	575	3665	5808					325.70
325.80		1287	126	880	2274	224	1614	6013	593	4257	6751					325.80
325.90		1336	131	1011	2340	231	1845	6190	610	4867	7723					325.90
326.00		1409	137	1148	2444	239	2084	6374	628	5496	8728					326.00
326.10		1484	145	1293	2550	250	2333	6560	647	6142	9769					326.10
326.20		1559	152	1445	2658	260	2594	6748	665	6808	10847					326.20
326.30		1635	160	1605	2768	271	2865	6938	684	7492	11962					326.30
326.40		1712	167	1772	2880	282	3148	7131	703	8195	13115					326.40
326.50		1799	176	1948	3028	295	3443	7393	726	8922	14312				Permanent Pool	326.50
326.50	0.00						5391	12220	0	8922	14312	0				326.50
326.60	0.10							12587	1240	10162	15553	1240				326.60
326.70	0.20							12965	1278	11440	16830	2518	2294	326.69	MECP Extended Detention	326.70
326.80	0.30							13581	1327	12767	18158	3845				326.80
326.90	0.40							13993	1379	14146	19536	5224				326.90
327.00	0.50							14388	1419	15565	20955	6643				327.00
327.10	0.60							14794	1459	17024	22414	8102				327.10
327.20	0.70							15027	1491	18515	23906	9593				327.20
327.30	0.80							15252	1514	20029	25419	11107	9896	327.22	5yr	327.30
327.40	0.90							15475	1536	21565	26956	12643				327.40
327.50	1.00							15697	1559	23124	28514	14202	14202	327.50	25yr	327.50
327.60	1.10							15919	1581	24705	30095	15783				327.60
327.70	1.20							16141	1603	26308	31698	17386				327.70
327.80	1.30							16363	1625	27933	33323	19011				327.80
327.90	1.40							16585	1647	29580	34971	20658	19011	327.80	100yr	327.90
328.00	1.50							16817	1670	31250	36641	22329			Emergency Overflow Weir	328.00
328.10	1.60							17030	1692	32943	38333	24021				328.10
328.20	1.70							17255	1714	34657	40048	25735				328.20
328.30	1.80							17480	1737	36394	41784	27472				328.30
328.40	1.90							17707	1759	38153	43544	29231				328.40
328.50	2.00							18000	1785	39938	45329	31017	29945	328.44	Regional	328.50
328.60	2.10							18245	1812	41751	47141	32829				328.60
328.70	2.20							18487	1837	43587	48978	34665				328.70
328.80	2.30							18729	1861	45448	50839	36526				328.80
328.90	2.40							18967	1885	47333	52723	38411				328.90
329.00	2.50							19204	1909	49241	54632	40320				329.00

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Orifice Calculations			
$Q_o = C_d \cdot A_o \cdot (2 \cdot g \cdot H_o)^{0.5}$			
	Orifice 1	Orifice 2	Orifice 3
C_d	0.80	0.80	0.63
Invert (m)	326.50	326.50	326.95
Width (m)			
Diameter/Height (m)	0.450	0.450	0.550
Type (H/V)	H	H	V
Control	INF	INF	5yr

C_d	Description
0.63	Orifice Plate
0.80	Orifice Tube

Weir Calculations		
$Q_w = 2/3 \cdot C_d \cdot (2g)^{1/2} \cdot L \cdot H_w^{3/2} + 8/15 \cdot C_d \cdot (2g)^{1/2} \cdot \tan \theta \cdot H_w^{5/2}$		
	Notch Weir	Emergency Weir
C_d	0.50	0.50
Invert (m)	327.25	328.00
Length (m)	0.400	6.400
Side Slope (H:V)	0	10
Side Slope (rad)	0.000	1.471
Control	>5yr	Regional

STAGE-DISCHARGE RELATIONSHIP: Facility Hydraulics

SWMF-1

Stage	Active Volume	Orifice 1			Orifice 2			Orifice 3			Weir 1 Flow	Weir 2 Flow	Total Flow
		Area	H_o	Flow	Area	H_o	Flow	Area	H_o	Flow			
m	m^3	m^2	m	m^3/s	m^2	m	m^3/s	m^2	m	m^3/s	m^3/s		m^3/s
326.50	0	0.16	0.00	0.0000	0.16	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0000
326.60	1240	*Outflow from the 450mm dia. outlet pipes is capped at the outflow rate of the infiltration gallery, 0.061 m ³ /s as calculated on the infiltration gallery design sheet.					0.0610	0.00	0.00	0.0000	0.0000	0.0000	0.0610
326.70	2518						0.0610	0.00	0.00	0.0000	0.0000	0.0000	0.0610
326.80	3845						0.0610	0.00	0.00	0.0000	0.0000	0.0000	0.0610
326.90	5224						0.0610	0.00	0.00	0.0000	0.0000	0.0000	0.0610
327.00	6643						0.0610	0.01	0.03	0.0047	0.0000	0.0000	0.0657
327.10	8102						0.0610	0.05	0.08	0.0401	0.0000	0.0000	0.1011
327.20	9593						0.0610	0.11	0.13	0.1037	0.0000	0.0000	0.1647
327.30	11107						0.0610	0.16	0.18	0.1862	0.0066	0.0000	0.2538
327.40	12643						0.0610	0.21	0.23	0.2754	0.0343	0.0000	0.3707
327.50	14202						0.0610	0.24	0.28	0.3477	0.0738	0.0000	0.4825
327.60	15783						0.0610	0.24	0.38	0.4060	0.1223	0.0000	0.5893
327.70	17386						0.0610	0.24	0.48	0.4569	0.1783	0.0000	0.6962
327.80	19011						0.0610	0.24	0.58	0.5027	0.2409	0.0000	0.8046
327.90	20658						0.0610	0.24	0.68	0.5447	0.3095	0.0000	0.9152
328.00	22329						0.0610	0.24	0.78	0.5837	0.3836	0.0000	1.0283
328.10	24021						0.0610	0.24	0.88	0.6202	0.4628	0.3362	1.4802
328.20	25735						0.0610	0.24	0.98	0.6546	0.5469	1.0565	2.3190
328.30	27472						0.0610	0.24	1.08	0.6874	0.6354	2.1350	3.5188
328.40	29231						0.0610	0.24	1.18	0.7187	0.7283	3.5858	5.0938
328.50	31017						0.0610	0.24	1.28	0.7486	0.8254	5.4290	7.0640
328.60	32829						0.0610	0.24	1.38	0.7774	0.9264	7.6855	9.4503
328.70	34665						0.0610	0.24	1.48	0.8052	1.0312	10.3766	12.2740
328.80	36526						0.0610	0.24	1.58	0.8320	1.1397	13.5230	15.5557
328.90	38411						0.0610	0.24	1.68	0.8581	1.2517	17.1447	19.3155
329.00	40320						0.0610	0.24	1.78	0.8833	1.3672	21.2613	23.5729

GID STORMWATER MANAGEMENT

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Design By: MPW
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FOREBAY DESIGN CALCULATIONS: Forebay-East

SWMF-1 (East)

Reference: Section 4.6.2 Wet Ponds, MOE Stormwater Management Planning and Design Manual, March 2003

Forebay Design Flows

Flow into forebay during 1.5yr Storm Event 2.851 m³/s *From MTE STM Sewer Design Spreadsheet using Rational Flow
Estimated pipe flow capacity for inlet pipe into forebay designed for the 1.5yr Storm Event 3.396 m³/s *Pipe designed for 90% Capacity
Flow into forebay during the 25 mm - 4 hour design storm event 2.080 m³/s *From PCSWMM modelling
Peak flow from main pond outlet for the 25mm design storm 0.012 m³/s *From PCSWMM modelling

Forebay Characteristics

b = 20.0 m bottom width
y = 1.5 m depth
z = 3.8 :1 side slope
w = 25.7 m average width
R = 1.21 m hydraulic radius
A = 38.6 m² cross-sectional area

1. Length Calculation Based on Settling Velocity

Reference: MOE SWM P&D Manual, Equation 4.5: Forebay Settling Length

L = forebay flow length (m)
r = length-to-width ratio
Q_p = peak flow rate through forebay (m³/s)
v_s = settling velocity (m/s)

a) Required Settling Length (assuming Q_p = forebay through-flow & v_s = 0.0055 m/s)

Q_p = 2.080 m³/s peak flow rate through forebay
v_s = 0.0055 m/s settling velocity
r = 0.57 length-to-width ratio
L = 14.7 m required settling length
L = 14.7 m trial length

Check Calculation with Design Forebay

Q_p = 2.080 m³/s
v_s = 0.0055 m/s
r = 2.65
Dist. = 31.6 m
L_{design} = 68.0 m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

Table 1: Average settling velocities		
Mass Removed	Particle Size Range	Average Settling Velocity
%	µm	m/s
Enhanced: 80 - 100	x ≤ 20	0.00000254
Normal: 70 - 80	20 < x ≤ 40	0.00001300
Basic: 60 - 70	40 < x ≤ 60	0.00002540
Medium Sand: 40 - 60	60 < x ≤ 130	0.00012700
Gross Grit: 20 - 40	130 < x ≤ 400	0.00059267
	400 < x ≤ 4000	0.00550333

b) Required Settling Length (assuming Q_p = pond discharge & v_s = 0.0003 m/s)

Q_p = 0.012 m³/s peak flow rate through forebay
v_s = 0.0003 m/s settling velocity
r = 0.06 length-to-width ratio
L = 1.5 m required settling length
L = 1.5 m trial length

Check Calculation with Design Forebay

Q_p = 0.012 m³/s
v_s = 0.0003 m/s
r = 2.65
Dist. = 10.1 m
L_{design} = 68.0 m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

2. Length Calculation Based on Flow Dispersion Length

Reference: MOE SWM P&D Manual, Equation 4.6: Dispersion Length

Q = 3.40 m³/s inlet flow rate
d = 1.5 m depth of permanent pool in forebay
V_f = 0.50 m/s desired velocity in forebay (typical value ≤ 0.50 m/s)
L = 36.2 m required length of dispersion

3. Required Forebay Length

L_{min} = 36.2 m Minimum required design length
L_{design} = 68.0 m Proposed design length
r = 2.65 design length-to-width ratio (typical minimum of 2.0)

4. Scour Velocity

Reference: MOE SWM P&D Manual, Sect. 4 Pg 56

v_s = 0.15 m/s scour velocity (typical value = 0.15 m/s)
v = 0.088 m/s actual velocity OK The actual velocity through the forebay is less than the scour velocity.

5. Weir Flow From Forebay

Reference: MOE SWM P&D Manual, Equation 4.4: Weir Flow

L = 10.6 m length of crest of weir
α = 1.65 coefficient
H = 0.3 m head
Q = 2.87 m³/s discharge OK The weir flow from the forebay exceeds the flow entering the forebay

6. Estimated Cleanout Frequencies

A) MOE Clean-Out Frequency Estimate (For Reference Only)

(Reference: 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57 & App. H Pg. 12)

Total Forebay Design Volume = 1948 m³
Selected TSS Removal Efficiency = 80%
Estimated Catchment Impervious level = 66.00 %
Estimated annual sediment loading = 2.6 m³/ha
Catchment Contributing area = 19.37 ha
Calculated Annual sediment volume = 40 m³/yr
MOE Clean-out Frequency Estimate = 49.1 years

Table 2: Annual sediment loading	
Impervious Level	Annual Loading
%	m ³ /ha
35	0.6
55	1.9
70	2.8
85	3.8

B) City of Guelph Development Manual and Operational Objective

(Reference: 2023 CoG Development Engineering Manual, Figure 4)

Total Forebay Volume at 0.5m above bottom = 516 m³
Estimated Forebay TSS Removal Efficiency = 80%
Estimated Catchment Impervious level = 66.00 %
Estimated annual sediment loading = 2.6 m³/ha
Catchment Contributing area = 19.37 ha
Calculated Annual sediment volume = 40 m³/yr
Cleanout frequency for 0.5m accumulation = 13.0 years

GID STORMWATER MANAGEMENT Guelph, Ontario

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FOREBAY DESIGN CALCULATIONS: Forebay-West

SWMF-1 (West)

Reference: Section 4.6.2 Wet Ponds, MOE Stormwater Management Planning and Design Manual, March 2003

Forebay Design Flows

Flow into forebay during 1.5yr Storm Event **5.453 m³/s** *From MTE STM Sewer Design Spreadsheet using Rational Flow
Estimated pipe flow capacity for inlet pipe into forebay designed for the 1.5yr Storm Event **6.120 m³/s** *Pipe designed for 90% Capacity
Flow into forebay during the 25 mm - 4 hour design storm event **3.010 m³/s** *From PCSWMM modelling
Peak flow from main pond outlet for the 25mm design storm **0.020 m³/s** *From PCSWMM modelling

Forebay Characteristics

b = **23.5 m** bottom width
y = **1.5 m** depth
z = **3.8 :1** side slope
w = **29.2 m** average width
R = **1.24 m** hydraulic radius
A = **43.8 m²** cross-sectional area

1. Length Calculation Based on Settling Velocity

Reference: MOE SWM P&D Manual, Equation 4.5: Forebay Settling Length

L = forebay flow length (m)
r = length-to-width ratio
Q_p = peak flow rate through forebay (m³/s)
v_s = settling velocity (m/s)

a) Required Settling Length (assuming Q_p = forebay through-flow & v_s = 0.0055 m/s)

Q_p = **3.010 m³/s** peak flow rate through forebay
v_s = **0.0055 m/s** settling velocity
r = **0.64** length-to-width ratio
L = **18.8 m** required settling length
L = **18.8 m** trial length

Check Calculation with Design Forebay

Q_p = **3.010 m³/s**
v_s = **0.0055 m/s**
r = **2.77**
Dist. = **39.0 m**
L_{design} = **81.0 m**

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

Table 1: Average settling velocities		
Mass Removed	Particle Size Range	Average Settling Velocity
%	µm	m/s
Enhanced: 80 - 100	x ≤ 20	0.00000254
Normal: 70 - 80	20 < x ≤ 40	0.00001300
Basic: 60 - 70	40 < x ≤ 60	0.00002540
Medium Sand: 40 - 60	60 < x ≤ 130	0.00012700
Gross Grit: 20 - 40	130 < x ≤ 400	0.00059267
	400 < x ≤ 4000	0.00550333

b) Required Settling Length (assuming Q_p = pond discharge & v_s = 0.0003 m/s)

Q_p = **0.020 m³/s** peak flow rate through forebay
v_s = **0.0003 m/s** settling velocity
r = **0.08** length-to-width ratio
L = **2.4 m** required settling length
L = **2.4 m** trial length

Check Calculation with Design Forebay

Q_p = **0.020 m³/s**
v_s = **0.0003 m/s**
r = **2.77**
Dist. = **13.7 m**
L_{design} = **81.0 m**

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

2. Length Calculation Based on Flow Dispersion Length

Reference: MOE SWM P&D Manual, Equation 4.6: Dispersion Length

Q = **6.12 m³/s** inlet flow rate
d = **1.5 m** depth of permanent pool in forebay
V_d = **0.50 m/s** desired velocity in forebay (typical value ≤ 0.50 m/s)
L = **65.3 m** required length of dispersion

3. Required Forebay Length

L_{min} = **65.3 m** Minimum required design length
L_{design} = **81.0 m** Proposed design length
r = **2.77** design length-to-width ratio (typical minimum of 2.0)

4. Scour Velocity

Reference: MOE SWM P&D Manual, Sect. 4 Pg 56

v_s = **0.15 m/s** scour velocity (typical value = 0.15 m/s)
v = **0.140 m/s** actual velocity **OK** The actual velocity through the forebay is less than the scour velocity.

5. Weir Flow From Forebay

Reference: MOE SWM P&D Manual, Equation 4.4: Weir Flow

L = **21 m** length of crest of weir
α = **1.65** coefficient
H = **0.3 m** head
Q = **5.69 m³/s** discharge **OK** The weir flow from the forebay exceeds the flow entering the forebay

6. Estimated Cleanout Frequencies

A) MOE Clean-Out Frequency Estimate (For Reference Only) (Reference: 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57 & App. H Pg. 12)

Total Forebay Design Volume = **3443 m³**
Selected TSS Removal Efficiency = **80%**
Estimated Catchment Impervious level = **70.00 %**
Estimated annual sediment loading = **2.8 m³/ha**
Catchment Contributing area = **34.21 ha**
Calculated Annual sediment volume = **77 m³/yr**
MOE Clean-out Frequency Estimate = **44.9 years**

Table 2: Annual sediment loading	
Impervious Level	Annual Loading
%	m ³ /ha
35	0.6
55	1.9
70	2.8
85	3.8

B) City of Guelph Development Manual and Operational Objective (Reference: 2023 CoG Development Engineering Manual, Figure 4)

Total Forebay Volume at 0.5m above bottom = **961 m³**
Estimated Forebay TSS Removal Efficiency = **80%**
Estimated Catchment Impervious level = **70.00 %**
Estimated annual sediment loading = **2.8 m³/ha**
Catchment Contributing area = **34.21 ha**
Calculated Annual sediment volume = **77 m³/yr**
Cleanout frequency for 0.5m accumulation = **12.5 years**

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Water Quality Sizing Criteria MOE Volumes

SWMF-2

Step 1: Choose Level of Water Quality Control

Enhanced 80% long-term S.S. removal

Step 2: Choose Type of Facility

Wet Pond

Step 3: Define Catchment area and Imperviousness

Catchment Area (ha)

10.05

Imperviousness (%)

66.90

Table 2.3 Interpolated Storage Volume Requirement (m³/ha)

217.77

Total Storage Volume Required (m³)

2188.56

Extended Detention Volume Required (m³)

402.00

Total Permanent Pool Required (m³)

1786.56

Reference: Section 3.3 Water Quality, MOE Stormwater Management Planning and Design Manual, March 2003

Table 3.2 Water Quality Storage Requirements based on Receiving Waters

Protection Level	SWMP Type	Storage Volume (m ³ /ha) for Impervious Level			
		35	55	70	85
Enhanced 80% long-term S.S. removal	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250
Normal 70% long-term S.S. Removal	Wetlands	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
Basic 60% long-term S.S. Removal	Wetlands	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240



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Project Number: 46927-104
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STAGE-STORAGE RELATIONSHIP: Facility Volumes

SWMF-2

Stage	Active Depth	Forebay			Main Pond			Total Pond Volume	Active Storage Volume	Volume Summary	Ponding Elevation	Comments	Stage
		Area	Volume	Cumulative Volume	Area	Volume	Cumulative Volume						
<i>m</i>	<i>m</i>	<i>m²</i>	<i>m³</i>	<i>m³</i>	<i>m²</i>	<i>m³</i>	<i>m³</i>	<i>m³</i>	<i>m³</i>	<i>m³</i>	<i>m</i>		<i>m</i>
331.90		505	0	0	713	0	0	0					
332.00		539	52	52	761	74	74	126					332.00
332.10		573	56	108	809	78	152	260					332.10
332.20		609	59	167	859	83	236	402					332.20
332.30		645	63	230	909	88	324	554					332.30
332.40		683	66	296	960	93	417	713					332.40
332.50		721	70	366	1012	99	516	882					332.50
332.60		760	74	440	1065	104	620	1060					332.60
332.70		801	78	518	1118	109	729	1247					332.70
332.80		843	82	601	1174	115	844	1444					332.80
332.90		893	87	687	1243	121	965	1652					332.90
333.00		947	92	779	1314	128	1092	1872					333.00
333.10		996	97	876	1387	135	1228	2104					333.10
333.20		1049	102	979	1461	142	1370	2349					333.20
333.30		1103	108	1086	1536	150	1520	2606					333.30
333.40		1159	113	1199	1614	158	1677	2877		2877		Permanent Pool	333.40
333.40	0.00				2772	0	0	2877	0				333.40
333.50	0.10				2934	285	285	3162	285				333.50
333.60	0.20				3063	300	585	3462	585	402	333.54	MECP Extended Detention	333.60
333.70	0.30				3196	313	898	3775	898				333.70
333.80	0.40				3331	326	1224	4101	1224				333.80
333.90	0.50				3467	340	1564	4441	1564				333.90
334.00	0.60				3613	354	1918	4795	1918				334.00
334.10	0.70				3715	366	2285	5161	2285		334.03	5yr	334.10
334.20	0.80				3817	377	2661	5538	2661	2322	334.11	25yr	334.20
334.30	0.90				3919	387	3048	5925	3048	2777	334.23	100yr	334.30
334.40	1.00				4022	397	3445	6322	3445	3326	334.37	Regional	334.40
334.50	1.10				4130	408	3853	6729	3853				334.50
334.60	1.20				4243	419	4271	7148	4271				334.60
334.70	1.30				4359	430	4701	7578	4701				334.70

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STAGE-DISCHARGE RELATIONSHIP: Facility Hydraulics

SWMF-2

Orifice Calculations			
$Q_o = C_d \cdot A_o \cdot (2 \cdot g \cdot H_o)^{0.5}$			
	Orifice 1	Orifice 2	Orifice 3
C_d	0.63	0.63	0.63
Invert (m)	333.40	500.00	500.00
Width (m)			
Diameter/Height (m)	0.130		
Type (H/V)	V	V	V
Control	MOE & 25mm		

C_d	Description
0.63	Orifice Plate
0.80	Orifice Tube

Weir Calculations		
$Q_w = 2/3 \cdot C_d \cdot (2g)^{1/2} \cdot L \cdot H_w^{3/2} + 8/15 \cdot C_d \cdot (2g)^{1/2} \cdot \tan \theta \cdot H_w^{5/2}$		
	Cutout Weir	Emergency Weir
C_d	0.50	0.50
Invert (m)	333.91	334.30
Length (m)	1.250	5.000
Side Slope (H:V)	0	10
Side Slope (rad)	0.000	1.471
Control	5yr-100yr	Regional

Stage	Active Volume	Orifice 1 - MOE & 25mm Drawdown			Orifice 2			Orifice 3			Cutout Weir 25yr-100yr Flow Control	Emergency Weir Flow	Total Flow
		Area	H_o	Flow	Area	H_o	Flow	Area	H_o	Flow			
m	m^3	m^2	m	m^3/s	m^2	m	m^3/s	m^2	m	m^3/s	m^3/s		m^3/s
333.40	0	0.00	0.00	0.0000	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0000
333.50	285	0.01	0.05	0.0068	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0068
333.60	585	0.01	0.14	0.0136	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0136
333.70	898	0.01	0.24	0.0180	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0180
333.80	1224	0.01	0.34	0.0214	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0214
333.90	1564	0.01	0.44	0.0244	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0244
334.00	1918	0.01	0.54	0.0271	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0498	0.0000	0.0769
334.10	2285	0.01	0.64	0.0295	0.00	0.00	0.0000	0.00	0.00	0.0000	0.1529	0.0000	0.1824
334.20	2661	0.01	0.74	0.0318	0.00	0.00	0.0000	0.00	0.00	0.0000	0.2882	0.0000	0.3200
334.30	3048	0.01	0.84	0.0338	0.00	0.00	0.0000	0.00	0.00	0.0000	0.4495	0.0000	0.4834
334.40	3445	0.01	0.94	0.0358	0.00	0.00	0.0000	0.00	0.00	0.0000	0.6330	0.2708	0.9397
334.50	3853	0.01	1.04	0.0377	0.00	0.00	0.0000	0.00	0.00	0.0000	0.8364	0.8716	1.7457
334.60	4271	0.01	1.14	0.0395	0.00	0.00	0.0000	0.00	0.00	0.0000	1.0578	1.7953	2.8926
334.70	4701	0.01	1.24	0.0412	0.00	0.00	0.0000	0.00	0.00	0.0000	1.2959	3.0629	4.4000

GID STORMWATER MANAGEMENT

Guelph, Ontario

Project Number: 46927-104
Date: June 2, 2026
Design By: MPW
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FOREBAY DESIGN CALCULATIONS: Forebay

SWMF-2

Reference: Section 4.6.2 Wet Ponds, MOE Stormwater Management Planning and Design Manual, March 2003

Forebay Design Flows

Flow into forebay during 1.5yr Storm Event 1.481 m³/s *From MTE STM Sewer Design Spreadsheet using Rational Flow
Estimated pipe flow capacity for inlet pipe into forebay designed for the 1.5yr Storm Event 1.454 m³/s *Pipe designed for 90% Capacity
Flow into forebay during the 25 mm - 4 hour design storm event 0.962 m³/s *From MTE STM SWMHYMO
Peak flow from main pond outlet for the 25mm design storm 0.024 m³/s *From MTE STM SWMHYMO

Forebay Characteristics

b = 13.5 m bottom width
y = 1.5 m depth
z = 3.8 :1 side slope
w = 19.2 m average width
R = 1.14 m hydraulic radius
A = 28.8 m² cross-sectional area

1. Length Calculation Based on Settling Velocity

Reference: MOE SWM P&D Manual, Equation 4.5: Forebay Settling Length

L = forebay flow length (m)
r = length-to-width ratio
Q_p = peak flow rate through forebay (m³/s)
v_s = settling velocity (m/s)

a) Required Settling Length (assuming Q_p = forebay through-flow & v_s = 0.0055 m/s)

Q_p = 0.962 m³/s peak flow rate through forebay
v_s = 0.0055 m/s settling velocity
r = 0.47 length-to-width ratio
L = 9.1 m required settling length
L = 9.1 m trial length

Check Calculation with Design Forebay

Q_p = 0.962 m³/s
v_s = 0.0055 m/s
r = 2.00
Dist. = 18.7 m
L_{design} = 38.4 m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

Table 1: Average settling velocities		
Mass Removed	Particle Size Range	Average Settling Velocity
%	µm	m/s
Enhanced: 80 - 100	x ≤ 20	0.00000254
Normal: 70 - 80	20 < x ≤ 40	0.00001300
Basic: 60 - 70	40 < x ≤ 60	0.00002540
Medium Sand: 40 - 60	60 < x ≤ 130	0.00012700
Gross Grit: 20 - 40	130 < x ≤ 400	0.00059267
	400 < x ≤ 4000	0.0050333

b) Required Settling Length (assuming Q_p = pond discharge & v_s = 0.0003 m/s)

Q_p = 0.024 m³/s peak flow rate through forebay
v_s = 0.0003 m/s settling velocity
r = 0.22 length-to-width ratio
L = 4.2 m required settling length
L = 4.2 m trial length

Check Calculation with Design Forebay

Q_p = 0.024 m³/s
v_s = 0.0003 m/s
r = 2.00
Dist. = 12.6 m
L_{design} = 38.4 m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

2. Length Calculation Based on Flow Dispersion Length

Reference: MOE SWM P&D Manual, Equation 4.6: Dispersion Length

Q = 1.45 m³/s inlet flow rate
d = 1.5 m depth of permanent pool in forebay
V_f = 0.50 m/s desired velocity in forebay (typical value ≤ 0.50 m/s)
L = 15.5 m required length of dispersion

3. Required Forebay Length

L_{min} = 15.5 m Minimum required design length
L_{design} = 38.4 m Proposed design length
r = 2.00 design length-to-width ratio (typical minimum of 2.0)

4. Scour Velocity

Reference: MOE SWM P&D Manual, Sect. 4 Pg 56

v_s = 0.15 m/s scour velocity (typical value = 0.15 m/s)
v = 0.050 m/s actual velocity
OK The actual velocity through the forebay is less than the scour velocity.

5. Weir Flow From Forebay

Reference: MOE SWM P&D Manual, Equation 4.4: Weir Flow

L = 7.5 m length of crest of weir
α = 1.65 coefficient
H = 0.3 m head
Q = 2.03 m³/s discharge
OK The weir flow from the forebay exceeds the flow entering the forebay

6. Estimated Cleanout Frequencies

A) MOE Clean-Out Frequency Estimate (For Reference Only)

(Reference: 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57 & App. H Pg. 12)

Total Forebay Design Volume = 1199 m³
Selected TSS Removal Efficiency = 80%
Estimated Catchment Impervious level = 66.90 %
Estimated annual sediment loading = 2.6 m³/ha
Catchment Contributing area = 10.05 ha
Calculated Annual sediment volume = 21 m³/yr
MOE Clean-out Frequency Estimate = 57.1 years

Estimated clean-out frequency meets MOE recommended minimum of 10yrs (Ref. 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57)

Table 2: Annual sediment loading	
Impervious Level	Annual Loading
%	m ³ /ha
35	0.6
55	1.9
70	2.8
85	3.8

B) City of Guelph Development Manual and Operational Objective

(Reference: 2023 CoG Development Engineering Manual, Figure 4)

Total Forebay Volume at 0.5m above bottom = 296 m³
Estimated Forebay TSS Removal Efficiency = 80%
Estimated Catchment Impervious level = 66.90 %
Estimated annual sediment loading = 2.6 m³/ha
Catchment Contributing area = 10.05 ha
Calculated Annual sediment volume = 21 m³/yr
Cleanout frequency for 0.5m sediment accumulation = 14.1 years

Discharge Header Length Design

ORIFICE FLOW (m³/s)

Orifice equation used $Q = C_d \times A_o \times (2gh)^{0.5}$

To use this spreadsheet, enter the diameter of the orifice and confirm the coefficient of discharge.

Cd = 0.820000 Diameter = 0.00794 metres
 *based on hole diameter of 300mm pipe size
 Corr/m = 20
 *based on hole diameter of 300mm pipe size

Cd Description
 0.63 Orifice Plate
 0.82 Orifice Pipe

100yr event (peak outflow)



FLOW	
L/s	(m³/s)
772	0.772

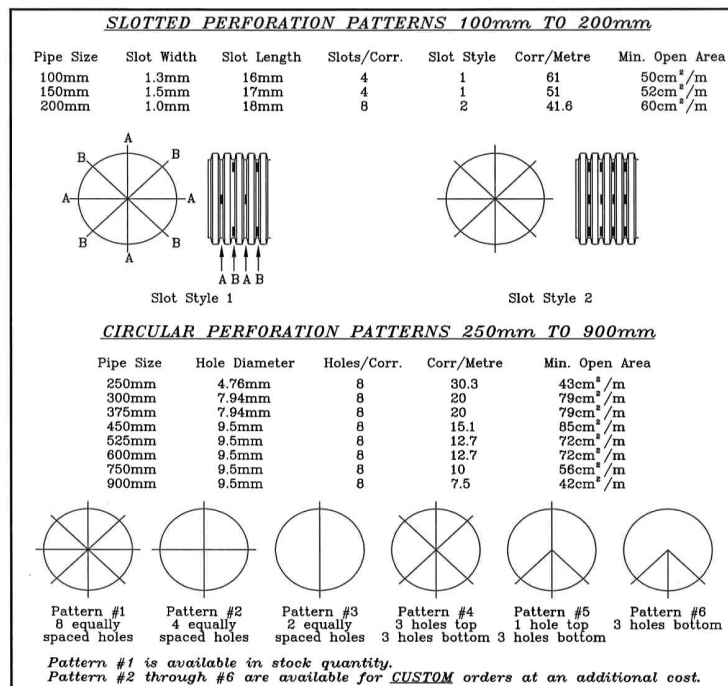
*Max allowable head is 0.85m based on header height

Flow at Maximum 0.85m Head

Flow by Pipe Perforations (8 Active Holes/Perimeter)			
Head	flow (m³/s)		
0.85	0.000166	0.000166	x1
0.80	0.000161	0.000322	x2
0.70	0.000150	0.000301	x2
0.60	0.000139	0.000279	x2
0.55	0.000133	0.000133	x1
Total Flow Per Perimeter		0.001200 (m³/s)	
Total Flow/Pipe meter		0.02400887 (m³/s)	

*Max head from 100 year ponding level to obvert of discharge header pipe

Min. Pipe Length (m)
32
Design Pipe Length (m)
35



Calculatons based on Pattern #1

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Water Quality Sizing Criteria MOE Volumes

SWMF-3

Step 1: Choose Level of Water Quality Control

Enhanced 80% long-term S.S. removal

Step 2: Choose Type of Facility

Wet Pond

Step 3: Define Catchment area and Imperviousness

Catchment Area (ha)

24.10

Imperviousness (%)

71.50

Table 2.3 Interpolated Storage Volume Requirement (m³/ha)

227.50

Total Storage Volume Required (m³)

5482.75

Extended Detention Volume Required (m³)

964.00

Total Permanent Pool Required (m³)

4518.75

Reference: Section 3.3 Water Quality, MOE Stormwater Management Planning and Design Manual, March 2003

Table 3.2 Water Quality Storage Requirements based on Receiving Waters

Protection Level	SWMP Type	Storage Volume (m ³ /ha) for Impervious Level			
		35	55	70	85
Enhanced 80% long-term S.S. removal	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250
Normal 70% long-term S.S. Removal	Wetlands	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
Basic 60% long-term S.S. Removal	Wetlands	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240



STAGE-STORAGE RELATIONSHIP: Facility Volumes **SWMF-3**

Stage	Active Depth	Forebay			Wet Cell			Total Pond Volume	Active Storage Volume	Volume Summary	Ponding Elevation	Comments	Infiltration Cell						Stage
		Area	Volume	Cumulative Volume	Area	Volume	Cumulative Volume						Area	Volume	Cumulative Volume	Volume Summary	Ponding Elevation	Comments	
<i>m</i>	<i>m</i>	<i>m</i> ²	<i>m</i> ³	<i>m</i> ³	<i>m</i> ²	<i>m</i> ³	<i>m</i> ³	<i>m</i> ³	<i>m</i> ³	<i>m</i> ³	<i>m</i>		<i>m</i> ²	<i>m</i> ³	<i>m</i> ³	<i>m</i> ³	<i>m</i>		<i>m</i>
329.90		1352	0	0	2724	0	0	0											329.90
330.00		1407	138	138	2810	277	277	415											330.00
330.10		1462	143	281	2897	285	562	843											330.10
330.20		1517	149	430	2984	294	856	1286											330.20
330.30		1573	155	585	3072	303	1159	1744											330.30
330.40		1629	160	745	3162	312	1471	2216											330.40
330.50		1687	166	911	3250	321	1791	2702											330.50
330.60		1745	172	1082	3340	330	2121	3203											330.60
330.70		1804	177	1260	3432	339	2459	3719											330.70
330.80		1865	183	1443	3526	348	2807	4250					2742	0	0				330.80
330.90		1937	190	1633	3641	358	3166	4799					2811	278	278	83	330.83	5yr	330.90
331.00		2010	197	1831	3759	370	3536	5366					2881	285	562				331.00
331.10		2085	205	2035	3879	382	3917	5953					2951	292	854				331.10
331.20		2161	212	2248	4000	394	4311	6559					3021	299	1152	675	331.04	25yr	331.20
331.30		2239	220	2468	4122	406	4718	7185					3093	306	1458	1397	331.28	100yr	331.30
331.40		2302	227	2695	4216	417	5134	7829		7829		Permanent Pool	3165	313	1771				331.40
331.40	0.00				6518	0	0	7829	0				3165	313	1771				331.40
331.50	0.10				6795	666	666	8495	666				3237	320	2091	2059	331.49	Regional	331.50
331.60	0.20				7000	690	1355	9185	1355	964	331.55	MECP Extended Detention	3310	327	2419				331.60
331.70	0.30				7323	716	2072	9901	2072				3384	335	2753				331.70
331.80	0.40				7479	740	2812	10641	2812				3458	342	3095				331.80
331.90	0.50				7635	756	3567	11397	3567				3533	350	3445				331.90
332.00	0.60				7793	771	4339	12168	4339				3608	357	3802				332.00
332.10	0.70				7903	785	5124	12953	5124				3684	365	4167				332.10
332.20	0.80				8015	796	5919	13749	5919										332.20
332.30	0.90				8126	807	6727	14556	6727	6162	332.23	5yr							332.30

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 Guelph, Ontario

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 Design By: MPW
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STAGE-DISCHARGE RELATIONSHIP: Facility Hydraulics - Wet Cell

SWMF-3

Orifice Calculations			
$Q_o = C_d \cdot A_o \cdot (2 \cdot g \cdot H_o)^{0.5}$			
C_d	Orifice 1	Orifice 2	Orifice 3
0.63	0.63	0.63	0.80
Invert (m)	331.40	331.60	331.40
Width (m)			
Diameter/Height (m)	0.100	0.100	0.525
Type (H/V)	V	V	H
Drawdown Control			INF Ponding
Outlet	To INF Cell		

C_d	Description
0.63	Orifice Plate
0.80	Orifice Tube

Weir Calculations		
$Q_w = 2/3 \cdot C_d \cdot (2g)^{1/2} \cdot L \cdot H_w^{3/2} + 8/15 \cdot C_d \cdot (2g)^{1/2} \cdot \tan \theta \cdot H_w^{5/2}$		
C_d	Emergency Weir	Weir 2
0.50	0.50	0.50
Invert (m)	334.00	500.00
Length (m)	20.000	
Side Slope (H:V)	3	
Side Slope (rad)	1.249	0.000
Outlet	Victoria Rd	

		INFILTRATION CELL (Infiltrating up to and including 100yr storm)							Regional Storm Overflow					
Stage	Active Volume	Orifice 1			Orifice 2			Total Flow to INF Cell	Orifice 3			Emergency Weir Emergency Outlet	Weir 2	Total Flow
		Area	H _o	Flow	Area	H _o	Flow		Area	H _o	Flow			
m	m ³	m ²	m	m ³ /s	m ²	m	m ³ /s	m ³ /s	m ²	m	m ³ /s	m ³ /s	m3/s	m ³ /s
331.40	0	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.22	0.00	0.0000	0.0000	0.0000	0.0000
331.50	666	0.01	0.05	0.0049	0.00	0.00	0.0000	0.0049	0.22	0.10	0.2426	0.0000	0.0000	0.0049
331.60	1355	0.01	0.15	0.0085	0.00	0.00	0.0000	0.0085	0.22	0.20	0.3431	0.0000	0.0000	0.0085
331.70	2072	0.01	0.25	0.0110	0.01	0.05	0.0049	0.0159	0.22	0.30	0.4202	0.0000	0.0000	0.0159
331.80	2812	0.01	0.35	0.0130	0.01	0.15	0.0085	0.0215	0.22	0.40	0.4852	0.0000	0.0000	0.0215
331.90	3567	0.01	0.45	0.0147	0.01	0.25	0.0110	0.0257	0.22	0.50	0.5424	0.0000	0.0000	0.0257
332.00	4339	0.01	0.55	0.0163	0.01	0.35	0.0130	0.0292	0.22	0.60	0.5942	0.0000	0.0000	0.0292
332.10	5124	0.01	0.65	0.0177	0.01	0.45	0.0147	0.0324	0.22	0.70	0.6418	0.0000	0.0000	0.0324
332.20	5919	0.01	0.75	0.0190	0.01	0.55	0.0163	0.0352	0.22	0.80	0.6861	0.0000	0.0000	0.0352
332.30	6727	0.01	0.85	0.0202	0.01	0.65	0.0177	0.0379	0.22	0.90	0.7277	0.0000	0.0000	0.0379
332.40	7545	0.01	0.95	0.0214	0.01	0.75	0.0190	0.0403	0.22	1.00	0.7671	0.0000	0.0000	0.0403
332.50	8374	0.01	1.05	0.0225	0.01	0.85	0.0202	0.0427	0.22	1.10	0.8045	0.0000	0.0000	0.0427
332.60	9215	0.01	1.15	0.0235	0.01	0.95	0.0214	0.0449	0.22	1.20	0.8403	0.0000	0.0000	0.0449
332.70	10068	0.01	1.25	0.0245	0.01	1.05	0.0225	0.0470	0.22	1.30	0.8746	0.0000	0.0000	0.0470
332.80	10933	0.01	1.35	0.0255	0.01	1.15	0.0235	0.0490	0.22	1.40	0.9076	0.0000	0.0000	0.0490
332.90	11809	0.01	1.45	0.0264	0.01	1.25	0.0245	0.0509	0.22	1.50	0.9395	0.0000	0.0000	0.0509
333.00	12697	0.01	1.55	0.0273	0.01	1.35	0.0255	0.0528	0.22	1.60	0.9703	0.0000	0.0000	0.0528
333.10	13598	0.01	1.65	0.0282	0.01	1.45	0.0264	0.0545	0.22	1.70	1.0002	0.0000	0.0000	0.0545
333.20	14510	0.01	1.75	0.0290	0.01	1.55	0.0273	0.0563	0.22	1.80	1.0292	0.0000	0.0000	0.0563
333.30	15434	0.01	1.85	0.0298	0.01	1.65	0.0282	0.0580	0.22	1.90	1.0574	0.0000	0.0000	0.0580
333.40	16371	0.01	1.95	0.0306	0.01	1.75	0.0290	0.0596	0.22	2.00	1.0848	0.0000	0.0000	0.0596
333.50	17319	0.01	2.05	0.0314	0.01	1.85	0.0298	0.0612	0.22	2.10	1.1116	0.0000	0.0000	0.0612
333.60	18280	0.01	2.15	0.0321	0.01	1.95	0.0306	0.0627	0.22	2.20	1.1378	0.0000	0.0000	0.0627
333.70	19254	0.01	2.25	0.0329	0.01	2.05	0.0314	0.0643	0.22	2.30	1.1634	0.0000	0.0000	0.0643
333.80	20241	0.01	2.35	0.0336	0.01	2.15	0.0321	0.0657	0.22	2.40	1.1884	0.0000	0.0000	0.0657
333.90	21240	0.01	2.45	0.0343	0.01	2.25	0.0329	0.0672	0.22	2.50	1.2129	0.0000	0.0000	0.0672
334.00	22251	0.01	2.55	0.0350	0.01	2.35	0.0336	0.0686	0.22	2.60	1.2369	0.0000	0.0000	0.0686
334.10	23269	0.01	2.65	0.0357	0.01	2.45	0.0343	0.0700	0.22	2.70	1.2605	0.9450	0.0000	1.0150
334.20	24294	0.01	2.75	0.0363	0.01	2.55	0.0350	0.0713	0.22	2.80	1.2836	2.7046	0.0000	2.7759
334.30	25324	0.01	2.85	0.0370	0.01	2.65	0.0357	0.0727	0.22	2.90	1.3063	5.0269	0.0000	5.0996
334.40	26360	0.01	2.95	0.0376	0.01	2.75	0.0363	0.0740	0.22	3.00	1.3286	7.8291	0.0000	7.9030
334.50	27402	0.01	3.05	0.0383	0.01	2.85	0.0370	0.0753	0.22	3.10	1.3506	11.0667	0.0000	11.1420

GID
STORMWATER MANAGEMENT
 Guelph, Ontario

Project Number: 46927-104
 Date: June 11, 2026
 Design By: MPW
 File: Q:\46927\104\SWM\SWMF 3\46927-104_SWMF 3 Master Design Sheet - June 2026.xlsx

STAGE-DISCHARGE RELATIONSHIP: Facility Hydraulics - INF Cell

SWMF-3

Infiltration Calculations		
Hydraulic Conductivity, k =	3.50E-05	m/s
Equation used for Hydraulic Conductivity =	Kozeny-Carmen Formula	
Infiltration Rate Calculation Used =	OBC	
Calculated Unfactored Design Infiltration Rate =	93	mm/hr
Factor Safety =	2.5	
Design Infiltration Rate =	37	mm/hr
Infiltration Cell Bottom Design Contact Area =	2742	m ²
Q _{Infiltration, SWMHYMO} =	0.028 m ³ /s	

Weir Calculations		
$Q_w = 2/3 \cdot C_d \cdot (2g)^{1/2} \cdot L \cdot H_w^{3/2} + 8/15 \cdot C_d \cdot (2g)^{1/2} \cdot \tan \theta \cdot H_w^{5/2}$		
	INF Cell Overflow D.I.	Weir 2
C _d	0.50	0.50
Invert (m)	331.40	500.00
Length (m)	0.600	20.000
Side Slope (H:V)	3	10
Side Slope (rad)	1.249	1.471
Outlet	To Victoria Road Swale	To Victoria Road Swale

STAGE-DISCHARGE RELATIONSHIP

Stage	Infiltration				INF Cell Overflow			Total Flow Flow
	Active Volume	Infiltration	Total Infiltration	Increment Volume	INF Cell Overflow D.I.	Weir 2	Total Overflow	
m	m ³	m ³ /s	m ³ /s	m ³	m ³ /s	m ³ /s	m ³ /s	m ³ /s
330.80	0	0.000	0.000	28	0.0000	0.0000	0.0000	0.0000
330.81	28	0.028	0.028	250	0.0000		0.0000	0.0284
330.90	278	0.028	0.028	285	0.0000		0.0000	0.0284
331.00	562	0.028	0.028	292	0.0000		0.0000	0.0284
331.10	854	0.028	0.028	299	0.0000		0.0000	0.0284
331.20	1152	0.028	0.028	306	0.0000		0.0000	0.0284
331.30	1458	0.028	0.028	313	0.0000		0.0000	0.0284
331.40	1771	0.028	0.028	320	0.0000		0.0000	0.0284
331.50	2091	0.028	0.028	327	0.0392		0.0392	0.0676
331.60	2419	0.028	0.028	335	0.1426		0.1426	0.1711
331.70	2753	0.028	0.028	342	0.3202		0.3202	0.3487
331.80	3095	0.028	0.028	350	0.5827		0.5827	0.6111
331.90	3445	0.028	0.028		0.9396		0.9396	0.9681

GID STORMWATER MANAGEMENT

Project Number: 46927-104
Date: June 11, 2026
Design By: MPW
File: Q:\46927\104\SWM\SWMF 3\46927-104_SWMF 3 Master Design Sheet.xlsx

FOREBAY DESIGN CALCULATIONS: Forebay

SWMF-3

Reference: Section 4.6.2 Wet Ponds, MOE Stormwater Management Planning and Design Manual, March 2003

Forebay Design Flows

Flow into forebay during 1.5yr Storm Event
Estimated pipe flow capacity for inlet pipe into forebay designed for the 1.5yr Storm Event
Flow into forebay during the 25 mm - 4 hour design storm event
Peak flow from main pond outlet for the 25mm design storm

2.663 m³/s
3.038 m³/s
2.564 m³/s
0.035 m³/s

*From MTE STM Sewer Design Spreadsheet using Rational Flow
*Pipe designed for 90% Capacity
*From MTE STM SWMHYMO
*From MTE STM SWMHYMO

Forebay Characteristics

b = 23.2 m bottom width
y = 1.5 m depth
z = 3.8 :1 side slope
w = 28.9 m average width
R = 1.24 m hydraulic radius
A = 43.3 m² cross-sectional area

1. Length Calculation Based on Settling Velocity

Reference: MOE SWM P&D Manual, Equation 4.5: Forebay Settling Length

L = forebay flow length (m)
r = length-to-width ratio
Q_p = peak flow rate through forebay (m³/s)
v_s = settling velocity (m/s)

a) Required Settling Length (assuming Q_p = forebay through-flow & v_s = 0.0055 m/s)

Q_p = 2.564 m³/s peak flow rate through forebay
v_s = 0.0055 m/s settling velocity
r = 0.56 length-to-width ratio
L = 16.1 m required settling length
L = 16.1 m trial length

Check Calculation with Design Forebay

Q_p = 2.564 m³/s
v_s = 0.0055 m/s
r = 2.00
Dist. = 30.5 m
L_{design} = 57.7 m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

Table 1: Average settling velocities		
Mass Removed	Particle Size Range	Average Settling Velocity
%	µm	m/s
Enhanced: 80 - 100	x ≤ 20	0.00000254
Normal: 70 - 80	20 < x ≤ 40	0.00001300
Basic: 60 - 70	40 < x ≤ 60	0.00002540
Medium Sand: 40 - 60	60 < x ≤ 130	0.00012700
Gross Grit: 20 - 40	130 < x ≤ 400	0.00059267
	400 < x ≤ 4000	0.00550333

b) Required Settling Length (assuming Q_p = pond discharge & v_s = 0.0003 m/s)

Q_p = 0.035 m³/s peak flow rate through forebay
v_s = 0.0003 m/s settling velocity
r = 0.14 length-to-width ratio
L = 4.0 m required settling length
L = 4 m trial length

Check Calculation with Design Forebay

Q_p = 0.035 m³/s
v_s = 0.0003 m/s
r = 2.00
Dist. = 15.3 m
L_{design} = 57.7 m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

2. Length Calculation Based on Flow Dispersion Length

Reference: MOE SWM P&D Manual, Equation 4.6: Dispersion Length

Q = 3.04 m³/s inlet flow rate
d = 1.5 m depth of permanent pool in forebay
V_d = 0.50 m/s desired velocity in forebay (typical value ≤ 0.50 m/s)
L = 32.4 m required length of dispersion

3. Required Forebay Length

L_{min} = 32.4 m Minimum required design length
L_{design} = 57.7 m Proposed design length
r = 2.00 design length-to-width ratio (typical minimum of 2.0)

4. Scour Velocity

Reference: MOE SWM P&D Manual, Sect. 4 Pg 56

v_s = 0.15 m/s scour velocity (typical value = 0.15 m/s)
v = 0.070 m/s actual velocity

OK The actual velocity through the forebay is less than the scour velocity.

5. Weir Flow From Forebay

Reference: MOE SWM P&D Manual, Equation 4.4: Weir Flow

L = 13 m length of crest of weir
α = 1.65 coefficient
H = 0.4 m head
Q = 5.43 m³/s discharge

OK The weir flow from the forebay exceeds the flow entering the forebay

6. Estimated Cleanout Frequencies

A) MOE Clean-Out Frequency Estimate (For Reference Only)

(Reference: 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57 & App. H Pg. 12)

Total Forebay Design Volume = 2695 m³
Selected TSS Removal Efficiency = 80%
Estimated Catchment Impervious level = 71.50 %
Estimated annual sediment loading = 2.9 m³/ha
Catchment Contributing area = 24.10 ha
Calculated Annual sediment volume = 56 m³/yr
MOE Clean-out Frequency Estimate = 48.2 years

Estimated clean-out frequency meets MOE recommended minimum of 10yrs (Ref. 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57)

B) City of Guelph Development Manual and Operational Objective

(Reference: 2023 CoG Development Engineering Manual, Figure 4)

Total Forebay Volume at 0.5m above bottom = 745 m³
Estimated Forebay TSS Removal Efficiency = 80%
Estimated Catchment Impervious level = 71.50 %
Estimated annual sediment loading = 2.9 m³/ha
Catchment Contributing area = 24.10 ha
Calculated Annual sediment volume = 56 m³/yr
Cleanout frequency for 0.5m sediment accumulation = 13.3 years

Table 2: Annual sediment loading	
Impervious Level	Annual Loading
%	m ³ /ha
35	0.6
55	1.9
70	2.8
85	3.8

Appendix D

Overland Flow Design Calculations

Internal Overland Flow Analysis

Overland Flow Conveyance Analysis - Summary
Guelph Innovation District, City of Guelph

Project: 46927-104
Date: June 10, 2026
By: MPW

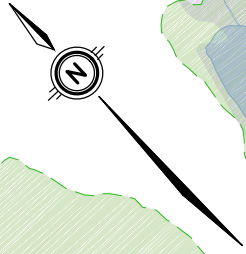
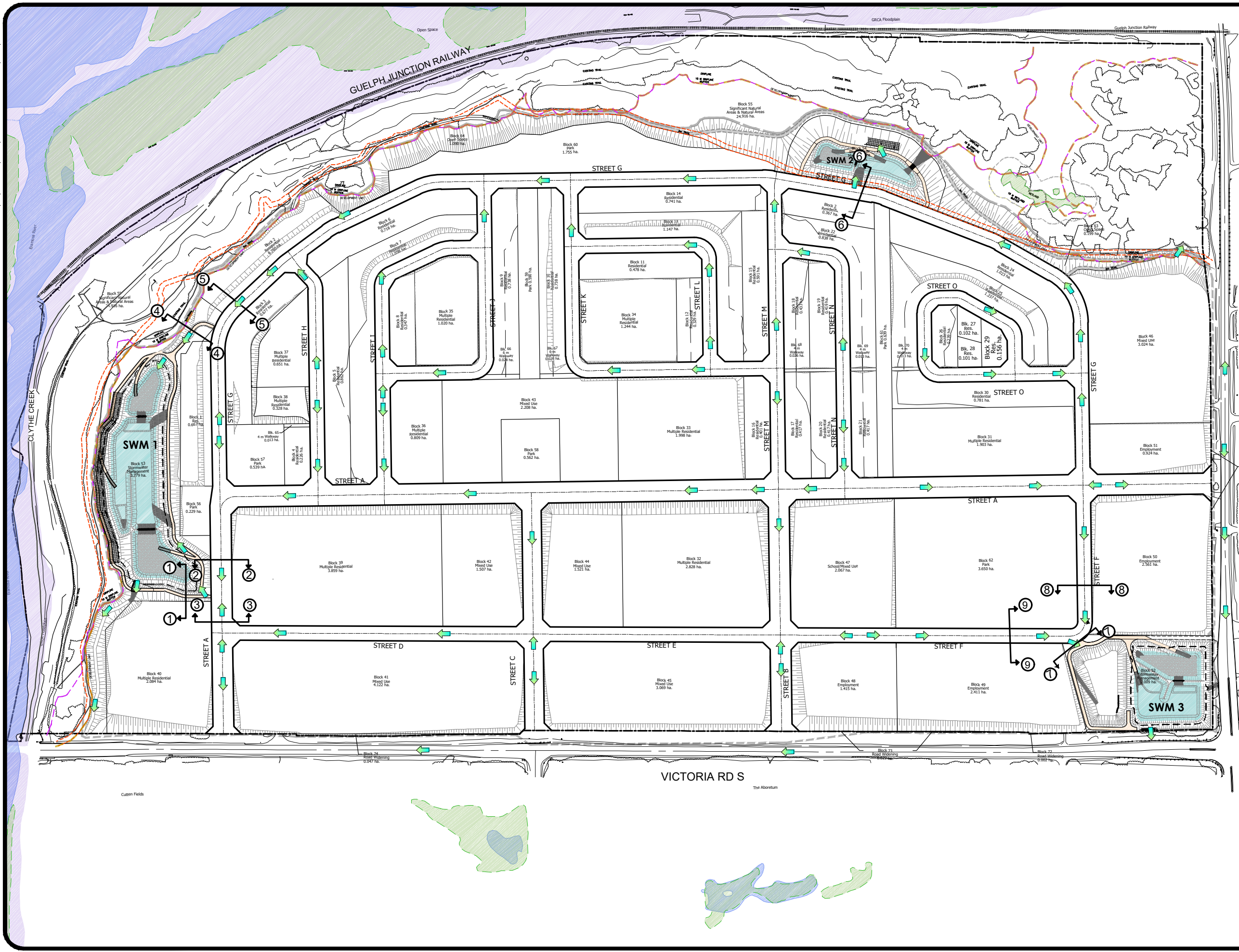


					Results		Notes
Section	Sewer Capacity (L/s) *from Rational Method	100yr Flow (L/s) *from PCSWMM	100yr - Capacity (L/s)	100yr - Capacity (m ³ /s)	Flow Depth Above Centreline (m)	Freeboard to R.O.W. Limit (m)	
Section 1-1 (SWMF1 Block 58)	6800.391	16870.000	10069.609	10.070	n/a	n/a	Modified OPSD 600.110 650mm exposed barrier curb is required.
Section 2-2 (Street A)	3019.943	5432.140	2412.197	2.412	0.022	0.172	Flow is contained within the R.O.W.
Section 3-3 (Street A)	8128.022	15925.280	7797.258	7.797	0.294	-0.100	Flooding outside of the R.O.W.
Section 4-4 (SWMF1 Block 67)	3774.113	10790.000	7015.887	7.016	n/a	n/a	Modified OPSD 600.110 450mm exposed barrier curb is required.
Section 5-5 (Street G)	3774.113	10790.000	7015.887	7.016	0.314	-0.140	Flooding outside of the R.O.W.
Section 6-6 (Street G)	1930.914	5640.000	3709.086	3.709	0.255	0.015	Flow is contained within the R.O.W.
Section 7-7 (SWMF3 Access)	3375.669	7340.000	3964.331	3.964	n/a	n/a	Modified OPSD 600.110 300mm barrier curb is required.
Section 8-8 (Street F)	3957.197	6482.101	2524.904	2.525	0.023	0.151	Flow is contained within the R.O.W.
Section 9-9 (Street F)	1930.914	3579.057	1648.143	1.648	0.159	0.015	Flow is contained within the R.O.W.

* Overland Flows has been calculated using the hydrologic modelled flows and subtracting the 100% pipe capacity carried by the storm sewer in a minor system from total flow under the 100 year storm. The flow depth (m) has been calculated using FlowMaster software. The depth and extent of street flooding in new developments, including all road classifications, shall be limited to the right-of-way.

**26.0m wide cross sections for Street A are modelled using the current 26.0m wide standard cross section (5-49b). 18.0m wide cross sections are modelled using the proposed "complete streets" cross section.

***In cases where flooding is modelled within the R.O.W. or excessively high barrier curb is required, an additional analysis of the overland flows has been completed using PCSWMM modelling. The results of this analysis follow in Appendix D.



LEGEND:

- SITE BOUNDARY
- DEVELOPMENT LIMIT
- MAJOR OVERLAND FLOW ROUTE
- CROSS SECTION FOR OVERLAND FLOW CONVEYANCE CALCULATIONS



Engineers, Scientists, Surveyors

PROJECT

GUELPH INNOVATION DISTRICT LANDS

TITLE

OVERLAND FLOW CONVEYANCE CROSS-SECTIONS

Drawn	AXL	Scale	1:4500	Figure
Checked	MPW	Project No.	46927-104	
Date	2025-03-10	Rev No.	0	

D1

Worksheet for Section 1-1 (SWM1 West)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.800 %
Discharge	10.070 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00	0.610
0+00	0.610
0+00	-0.040
0+02	0.000
0+04	0.040
0+04	0.690
0+04	0.690

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.610)	(0+00, 0.610)	0.013
(0+00, 0.610)	(0+00, -0.040)	0.013
(0+00, -0.040)	(0+02, 0.000)	0.013
(0+02, 0.000)	(0+04, 0.040)	0.013
(0+04, 0.040)	(0+04, 0.690)	0.013
(0+04, 0.690)	(0+04, 0.690)	0.013

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	648.4 mm
Roughness Coefficient	0.013
Elevation	0.608 m
Elevation Range	-0.040 to 0.690 m
Flow Area	2.4 m ²
Wetted Perimeter	5.218 m
Hydraulic Radius	466.4 mm
Top Width	4.00 m
Normal Depth	648.4 mm

Worksheet for Section 1-1 (SWM1 Block 58)

Results

Critical Depth	909.2 mm
Critical Slope	0.278 %
Velocity	4.14 m/s
Velocity Head	0.873 m
Specific Energy	1.52 m
Froude Number	1.694
Flow Type	Supercritical

GVF Input Data

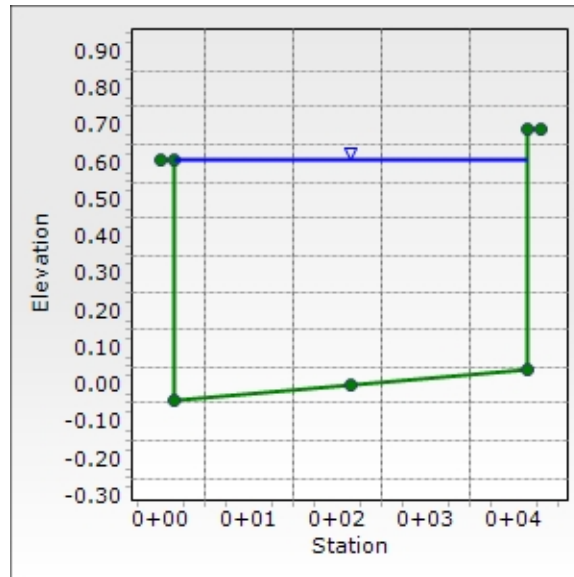
Downstream Depth	0.0 mm
Length	0.000 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 mm
Profile Description	N/A
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	648.4 mm
Critical Depth	909.2 mm
Channel Slope	0.800 %
Critical Slope	0.278 %

Cross Section for Section 1-1 (SWM1 West)

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.800 %
Normal Depth	648.4 mm
Discharge	10.070 m ³ /s



Worksheet for Section 2-2 (Street A)

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	5.000 %
Discharge	2.412 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00	0.194
0+02	0.164
0+03	0.134
0+08	0.044
0+08	0.044
0+08	-0.106
0+08	-0.100
0+13	0.000
0+18	-0.100
0+18	-0.106
0+18	0.044
0+19	0.044
0+23	0.134
0+25	0.164
0+26	0.194

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.194)	(0+02, 0.164)	0.030
(0+02, 0.164)	(0+03, 0.134)	0.013
(0+03, 0.134)	(0+08, 0.044)	0.030
(0+08, 0.044)	(0+08, 0.044)	0.013
(0+08, 0.044)	(0+08, -0.106)	0.013
(0+08, -0.106)	(0+08, -0.100)	0.013
(0+08, -0.100)	(0+13, 0.000)	0.013
(0+13, 0.000)	(0+18, -0.100)	0.013
(0+18, -0.100)	(0+18, -0.106)	0.013
(0+18, -0.106)	(0+18, 0.044)	0.013
(0+18, 0.044)	(0+19, 0.044)	0.013
(0+19, 0.044)	(0+23, 0.134)	0.030
(0+23, 0.134)	(0+25, 0.164)	0.013
(0+25, 0.164)	(0+26, 0.194)	0.030

Options

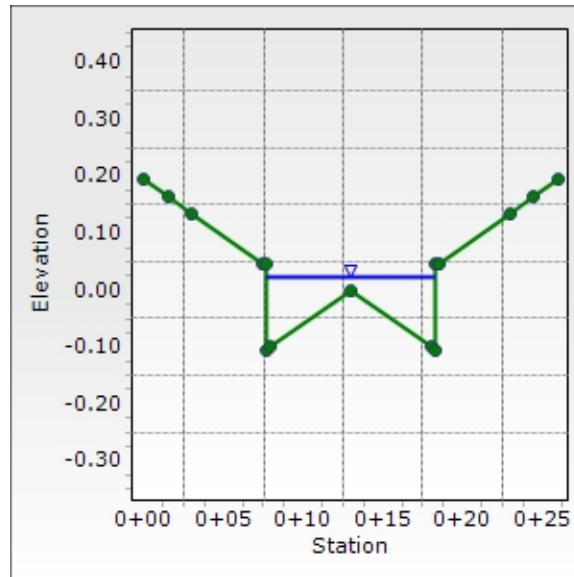
Current Roughness Weighted Method	Pavlovskii's Method
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Worksheet for Section 2-2 (Street A)

Options	
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method
Results	
Normal Depth	128.3 mm
Roughness Coefficient	0.013
Elevation	0.022 m
Elevation Range	-0.106 to 0.194 m
Flow Area	0.8 m ²
Wetted Perimeter	10.859 m
Hydraulic Radius	73.5 mm
Top Width	10.60 m
Normal Depth	128.3 mm
Critical Depth	230.9 mm
Critical Slope	0.345 %
Velocity	3.02 m/s
Velocity Head	0.465 m
Specific Energy	0.59 m
Froude Number	3.514
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 mm
Length	0.000 m
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 mm
Profile Description	N/A
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	128.3 mm
Critical Depth	230.9 mm
Channel Slope	5.000 %
Critical Slope	0.345 %

Cross Section for Section 2-2 (Street A)

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	5.000 %
Normal Depth	128.3 mm
Discharge	2.412 m ³ /s



Worksheet for Section 3-3 (Street A)

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.500 %
Discharge	7.797 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00	0.194
0+02	0.164
0+03	0.134
0+08	0.044
0+08	0.044
0+08	-0.106
0+08	-0.100
0+13	0.000
0+18	-0.100
0+18	-0.106
0+18	0.044
0+19	0.044
0+23	0.134
0+25	0.164
0+26	0.194

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.194)	(0+02, 0.164)	0.030
(0+02, 0.164)	(0+03, 0.134)	0.013
(0+03, 0.134)	(0+08, 0.044)	0.030
(0+08, 0.044)	(0+08, 0.044)	0.013
(0+08, 0.044)	(0+08, -0.106)	0.013
(0+08, -0.106)	(0+08, -0.100)	0.013
(0+08, -0.100)	(0+13, 0.000)	0.013
(0+13, 0.000)	(0+18, -0.100)	0.013
(0+18, -0.100)	(0+18, -0.106)	0.013
(0+18, -0.106)	(0+18, 0.044)	0.013
(0+18, 0.044)	(0+19, 0.044)	0.013
(0+19, 0.044)	(0+23, 0.134)	0.030
(0+23, 0.134)	(0+25, 0.164)	0.013
(0+25, 0.164)	(0+26, 0.194)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
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Worksheet for Section 3-3 (Street A)

Options

Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	399.7 mm
Roughness Coefficient	0.022
Elevation	0.294 m
Elevation Range	-0.106 to 0.194 m
Flow Area	6.4 m ²
Wetted Perimeter	26.504 m
Hydraulic Radius	241.3 mm
Top Width	26.00 m
Normal Depth	399.7 mm
Critical Depth	363.0 mm
Critical Slope	0.853 %
Velocity	1.22 m/s
Velocity Head	0.076 m
Specific Energy	0.48 m
Froude Number	0.785
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 mm
Length	0.000 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 mm
Profile Description	N/A
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	399.7 mm
Critical Depth	363.0 mm
Channel Slope	0.500 %
Critical Slope	0.853 %

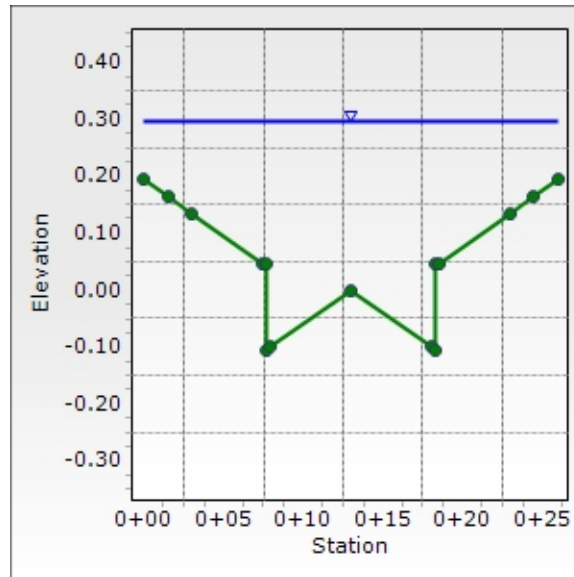
Worksheet for Section 3-3 (Street A)

Messages:

Water Surface Elevation exceeds lowest end station by 0.327177499355908ft.

Cross Section for Section 3-3 (Street A)

Project Description	
Friction Method	Manning
Solve For	Formula Normal Depth
Input Data	
Channel Slope	0.500 %
Normal Depth	399.7 mm
Discharge	7.797 m ³ /s



Worksheet for Section 4-4 (SWM1 East)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.500 %
Discharge	7.016 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00	0.490
0+00	0.490
0+00	0.040
0+02	0.000
0+04	-0.040
0+04	0.410
0+04	0.410

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.490)	(0+00, 0.490)	0.013
(0+00, 0.490)	(0+00, 0.040)	0.013
(0+00, 0.040)	(0+02, 0.000)	0.013
(0+02, 0.000)	(0+04, -0.040)	0.013
(0+04, -0.040)	(0+04, 0.410)	0.013
(0+04, 0.410)	(0+04, 0.410)	0.013

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	431.7 mm
Roughness Coefficient	0.013
Elevation	0.392 m
Elevation Range	-0.040 to 0.490 m
Flow Area	1.6 m ²
Wetted Perimeter	4.784 m
Hydraulic Radius	327.5 mm
Top Width	4.00 m
Normal Depth	431.7 mm

Worksheet for Section 4-4 (SWM1 East)

Results

Critical Depth	718.6 mm
Critical Slope	0.276 %
Velocity	4.48 m/s
Velocity Head	1.022 m
Specific Energy	1.45 m
Froude Number	2.284
Flow Type	Supercritical

GVF Input Data

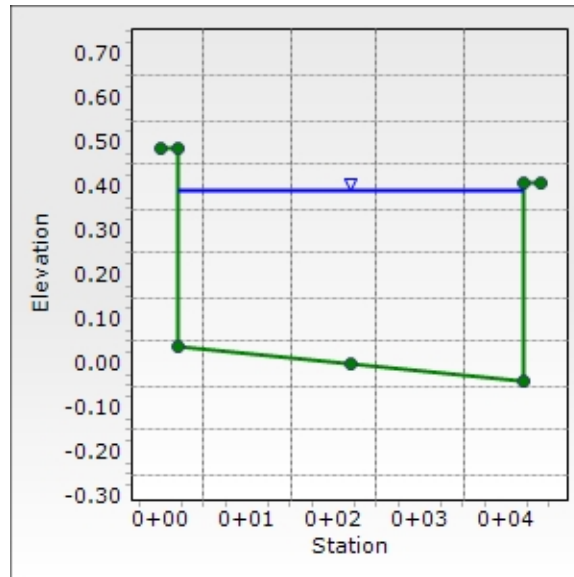
Downstream Depth	0.0 mm
Length	0.000 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 mm
Profile Description	N/A
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	431.7 mm
Critical Depth	718.6 mm
Channel Slope	1.500 %
Critical Slope	0.276 %

Cross Section for Section 4-4 (SWM1 East)

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	1.500 %
Normal Depth	431.7 mm
Discharge	7.016 m ³ /s



Worksheet for Section 5-5 (Street G)

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.500 %
Discharge	7.016 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00	0.174
0+01	0.160
0+03	0.124
0+05	0.074
0+05	-0.076
0+06	-0.070
0+09	0.000
0+13	-0.070
0+13	-0.076
0+13	0.074
0+15	0.114
0+17	0.150
0+18	0.174

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.174)	(0+01, 0.160)	0.030
(0+01, 0.160)	(0+03, 0.124)	0.013
(0+03, 0.124)	(0+05, 0.074)	0.030
(0+05, 0.074)	(0+05, -0.076)	0.013
(0+05, -0.076)	(0+06, -0.070)	0.013
(0+06, -0.070)	(0+09, 0.000)	0.013
(0+09, 0.000)	(0+13, -0.070)	0.013
(0+13, -0.070)	(0+13, -0.076)	0.013
(0+13, -0.076)	(0+13, 0.074)	0.013
(0+13, 0.074)	(0+15, 0.114)	0.030
(0+15, 0.114)	(0+17, 0.150)	0.013
(0+17, 0.150)	(0+18, 0.174)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for Section 5-5 (Street G)

Results

Normal Depth	404.5 mm
Roughness Coefficient	0.021
Elevation	0.328 m
Elevation Range	-0.076 to 0.174 m
Flow Area	5.0 m ²
Wetted Perimeter	18.412 m
Hydraulic Radius	269.5 mm
Top Width	18.00 m
Normal Depth	404.5 mm
Critical Depth	378.1 mm
Critical Slope	0.697 %
Velocity	1.41 m/s
Velocity Head	0.102 m
Specific Energy	0.51 m
Froude Number	0.860
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 mm
Length	0.000 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 mm
Profile Description	N/A
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	404.5 mm
Critical Depth	378.1 mm
Channel Slope	0.500 %
Critical Slope	0.697 %

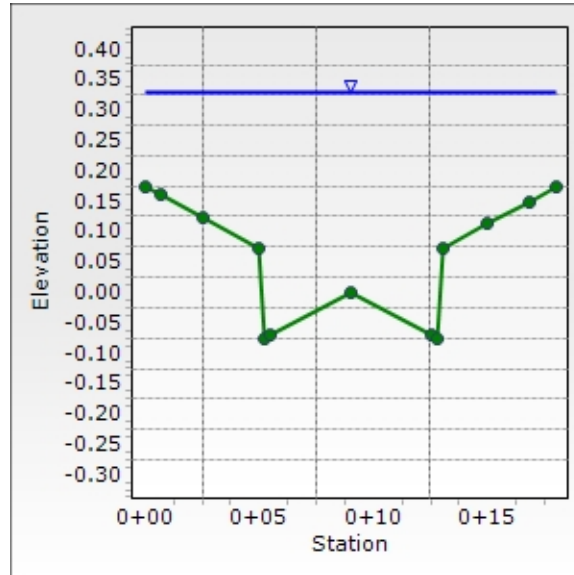
Worksheet for Section 5-5 (Street G)

Messages:

Water Surface Elevation exceeds lowest end station by 0.50684619035225ft.

Cross Section for Section 5-5 (Street G)

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.500 %
Normal Depth	404.5 mm
Discharge	7.016 m ³ /s



Worksheet for Section 6-6 (Street G)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.600 %
Discharge	3.709 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00	0.270
0+01	0.235
0+03	0.199
0+05	0.074
0+05	-0.076
0+06	-0.070
0+09	0.000
0+13	-0.070
0+13	-0.076
0+13	0.074
0+15	0.174
0+17	0.210
0+18	0.270

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.270)	(0+01, 0.235)	0.030
(0+01, 0.235)	(0+03, 0.199)	0.013
(0+03, 0.199)	(0+05, 0.074)	0.030
(0+05, 0.074)	(0+05, -0.076)	0.013
(0+05, -0.076)	(0+06, -0.070)	0.013
(0+06, -0.070)	(0+09, 0.000)	0.013
(0+09, 0.000)	(0+13, -0.070)	0.013
(0+13, -0.070)	(0+13, -0.076)	0.013
(0+13, -0.076)	(0+13, 0.074)	0.013
(0+13, 0.074)	(0+15, 0.174)	0.030
(0+15, 0.174)	(0+17, 0.210)	0.013
(0+17, 0.210)	(0+18, 0.270)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for Section 6-6 (Street G)

Results

Normal Depth	330.5 mm
Roughness Coefficient	0.020
Elevation	0.255 m
Elevation Range	-0.076 to 0.270 m
Flow Area	3.1 m ²
Wetted Perimeter	17.490 m
Hydraulic Radius	176.4 mm
Top Width	17.38 m
Normal Depth	330.5 mm
Critical Depth	318.1 mm
Critical Slope	0.734 %
Velocity	1.20 m/s
Velocity Head	0.074 m
Specific Energy	0.40 m
Froude Number	0.911
Flow Type	Subcritical

GVF Input Data

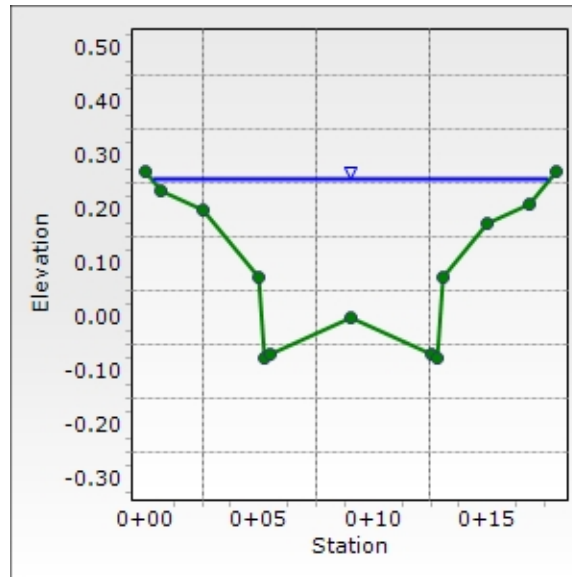
Downstream Depth	0.0 mm
Length	0.000 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 mm
Profile Description	N/A
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	330.5 mm
Critical Depth	318.1 mm
Channel Slope	0.600 %
Critical Slope	0.734 %

Cross Section for Section 6-6 (Street G)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.600 %
Normal Depth	330.5 mm
Discharge	3.709 m ³ /s



Worksheet for Section 7-7 (SWM3 Access)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	2.000 %
Discharge	3.054 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00	0.340
0+00	0.340
0+00	0.040
0+02	0.000
0+04	-0.040
0+04	0.260
0+04	0.260

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.340)	(0+00, 0.340)	0.013
(0+00, 0.340)	(0+00, 0.040)	0.013
(0+00, 0.040)	(0+02, 0.000)	0.013
(0+02, 0.000)	(0+04, -0.040)	0.013
(0+04, -0.040)	(0+04, 0.260)	0.013
(0+04, 0.260)	(0+04, 0.260)	0.013

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	251.4 mm
Roughness Coefficient	0.013
Elevation	0.211 m
Elevation Range	-0.040 to 0.340 m
Flow Area	0.8 m ²
Wetted Perimeter	4.424 m
Hydraulic Radius	191.2 mm
Top Width	4.00 m
Normal Depth	251.4 mm

Worksheet for Section 7-7 (SWM3 Access)

Results

Critical Depth	433.5 mm
Critical Slope	0.289 %
Velocity	3.61 m/s
Velocity Head	0.665 m
Specific Energy	0.92 m
Froude Number	2.508
Flow Type	Supercritical

GVF Input Data

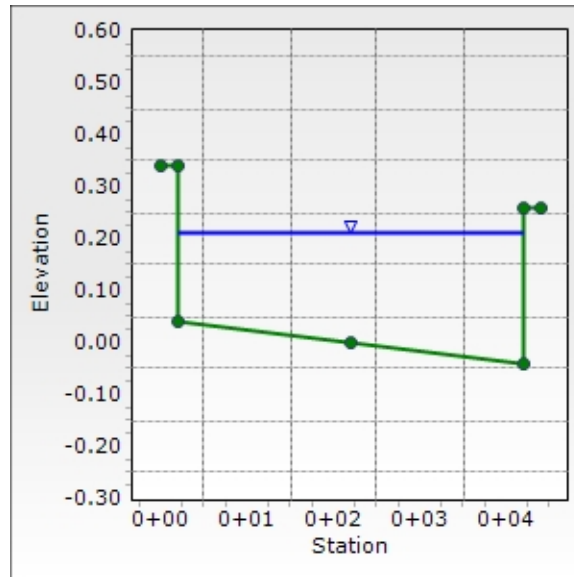
Downstream Depth	0.0 mm
Length	0.000 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 mm
Profile Description	N/A
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	251.4 mm
Critical Depth	433.5 mm
Channel Slope	2.000 %
Critical Slope	0.289 %

Cross Section for Section 7-7 (SWM3 Access)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	2.000 %
Normal Depth	251.4 mm
Discharge	3.054 m ³ /s



Worksheet for Section 8-8 (Street F)

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	20.000 %
Discharge	2.525 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00	0.174
0+01	0.160
0+03	0.124
0+05	0.074
0+05	-0.076
0+06	-0.070
0+09	0.000
0+13	-0.070
0+13	-0.076
0+13	0.074
0+15	0.114
0+17	0.150
0+18	0.174

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.174)	(0+01, 0.160)	0.030
(0+01, 0.160)	(0+03, 0.124)	0.013
(0+03, 0.124)	(0+05, 0.074)	0.030
(0+05, 0.074)	(0+05, -0.076)	0.013
(0+05, -0.076)	(0+06, -0.070)	0.013
(0+06, -0.070)	(0+09, 0.000)	0.013
(0+09, 0.000)	(0+13, -0.070)	0.013
(0+13, -0.070)	(0+13, -0.076)	0.013
(0+13, -0.076)	(0+13, 0.074)	0.013
(0+13, 0.074)	(0+15, 0.114)	0.030
(0+15, 0.114)	(0+17, 0.150)	0.013
(0+17, 0.150)	(0+18, 0.174)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for Section 8-8 (Street F)

Results

Normal Depth	99.2 mm
Roughness Coefficient	0.013
Elevation	0.023 m
Elevation Range	-0.076 to 0.174 m
Flow Area	0.5 m ²
Wetted Perimeter	7.932 m
Hydraulic Radius	60.2 mm
Top Width	7.86 m
Normal Depth	99.2 mm
Critical Depth	254.9 mm
Critical Slope	0.333 %
Velocity	5.28 m/s
Velocity Head	1.424 m
Specific Energy	1.52 m
Froude Number	6.845
Flow Type	Supercritical

GVF Input Data

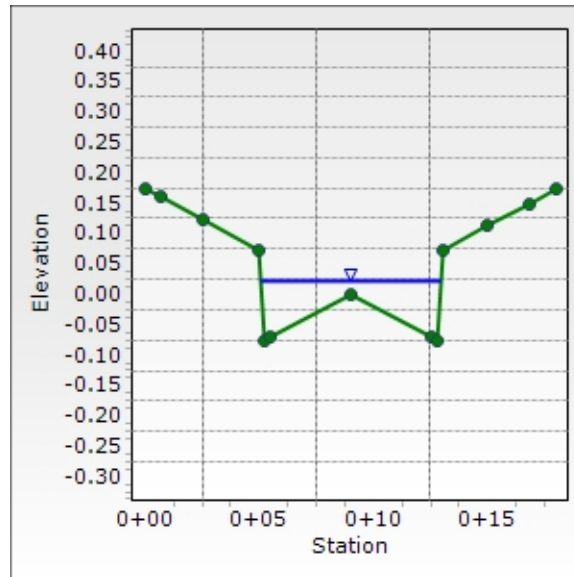
Downstream Depth	0.0 mm
Length	0.000 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 mm
Profile Description	N/A
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	99.2 mm
Critical Depth	254.9 mm
Channel Slope	20.000 %
Critical Slope	0.333 %

Cross Section for Section 8-8 (Street F)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	20.000 %
Normal Depth	99.2 mm
Discharge	2.525 m ³ /s



Worksheet for Section 9-9 (Street F)

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.500 %
Discharge	1.648 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00	0.174
0+01	0.160
0+03	0.124
0+05	0.074
0+05	-0.076
0+06	-0.070
0+09	0.000
0+13	-0.070
0+13	-0.076
0+13	0.074
0+15	0.114
0+17	0.150
0+18	0.174

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.174)	(0+01, 0.160)	0.030
(0+01, 0.160)	(0+03, 0.124)	0.013
(0+03, 0.124)	(0+05, 0.074)	0.030
(0+05, 0.074)	(0+05, -0.076)	0.013
(0+05, -0.076)	(0+06, -0.070)	0.013
(0+06, -0.070)	(0+09, 0.000)	0.013
(0+09, 0.000)	(0+13, -0.070)	0.013
(0+13, -0.070)	(0+13, -0.076)	0.013
(0+13, -0.076)	(0+13, 0.074)	0.013
(0+13, 0.074)	(0+15, 0.114)	0.030
(0+15, 0.114)	(0+17, 0.150)	0.013
(0+17, 0.150)	(0+18, 0.174)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for Section 9-9 (Street F)

Results

Normal Depth	235.4 mm
Roughness Coefficient	0.020
Elevation	0.159 m
Elevation Range	-0.076 to 0.174 m
Flow Area	1.9 m ²
Wetted Perimeter	16.646 m
Hydraulic Radius	115.9 mm
Top Width	16.54 m
Normal Depth	235.4 mm
Critical Depth	212.9 mm
Critical Slope	0.799 %
Velocity	0.85 m/s
Velocity Head	0.037 m
Specific Energy	0.27 m
Froude Number	0.799
Flow Type	Subcritical

GVF Input Data

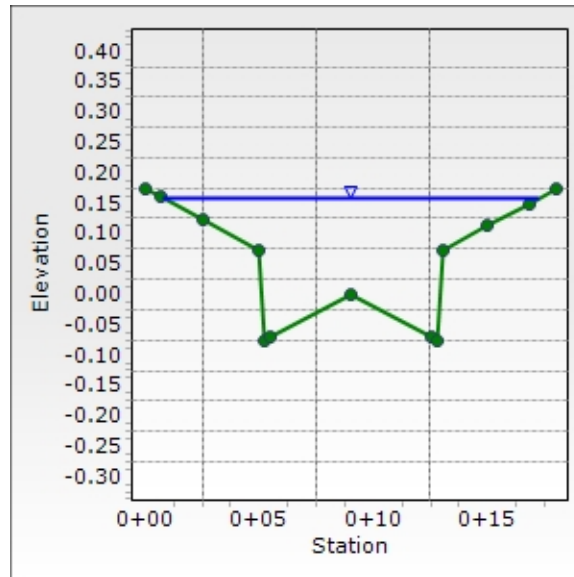
Downstream Depth	0.0 mm
Length	0.000 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 mm
Profile Description	N/A
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	235.4 mm
Critical Depth	212.9 mm
Channel Slope	0.500 %
Critical Slope	0.799 %

Cross Section for Section 9-9 (Street F)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.500 %
Normal Depth	235.4 mm
Discharge	1.648 m ³ /s



GID

CITY OF GUELPH

Project Number: 46927-104

Date: June 10, 2026

Design By: OXR/ALN/MPW

Checked By: VAL

File: Q:\46927\104\STM\46927-104_Storm Sewer Design Sheet (June 26).xlsx

STORM SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Drainage Area Plan No: 46927-104-F4.4

Design Parameters

5 YEAR STORM

Q=kAIC, k=0.00278

Manning's "n" 0.013

Intensity (I) = a(tc)^b

a = 632.750

b = -0.741

c = 0

Min. Velocity 0.60 m/s

Max. Velocity 6.00 m/s



LOCATION				STORMWATER FLOW 5 YEAR STORM								DESIGN						
STREET	AREA NUMBER	MANHOLE LOCATION		AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME		RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW		PIPE FULL
		FROM MH	TO MH					TOTAL	IN PIPE							VELOCITY	ACTUAL VELOCITY	
SWM 1 NE FB	101			3.410	0.66	2.2506	2.2506	10.0000	1.2218	114.87675	718.74571	675	250.0	1.90	1158.67080	3.2379	3.4102	62.03
	102			1.530	0.66	1.0098	3.2604	11.2218	1.6909	105.47150	955.98444	825	253.0	0.70	1200.97164	2.2466	2.4937	79.60
								12.9127										
	103			1.920	0.66	1.2672	1.2672	10.0000	2.4327	114.87675	404.68967	600	310.0	0.80	549.18862	1.9424	2.1238	73.69
								12.4327										
	104			2.330	0.72	1.6776	6.2052	12.9127	1.0791	95.05338	1639.71423	975	242.0	1.40	2651.64997	3.5515	3.7378	61.84
	105			1.540	0.50	0.7700	6.9752	13.9918	0.4365	89.56525	1736.76477	1050	107.0	1.70	3560.43007	4.1118	4.0856	48.78
								14.4283										
	106			3.520	0.69	2.4288	2.4288	10.0000	2.1189	114.87675	775.65519	825	295.0	0.65	1157.28523	2.1649	2.3204	67.02
								12.1189										
	107			1.640	0.66	1.0824	10.4864	14.4283	1.2226	87.54949	2552.25945	1350	260.0	0.90	5063.50417	3.5375	3.5443	50.41
								15.6509										
	108			1.650	0.70	1.1550	1.1550	10.0000	0.8088	114.87675	368.85777	450	185.0	4.00	570.21228	3.5853	3.8121	64.69
								10.8088										
	109			1.800	0.68	1.2240	12.8654	15.6509	0.7201	82.42866	2948.12813	1350	126.0	0.50	3774.11318	2.6367	2.9161	78.11
SWM BLOCK			0.000	0.00	0.0000	12.8654	16.3711	0.5205	79.72625	2851.47391	1350	90.5	0.50	3774.11318	2.6367	2.8978	75.55	
SWM 1 SW FB	401			1.720	0.67	1.1524	1.1524	10.0000	1.4423	114.87675	368.02744	525	201.0	1.10	451.05312	2.0836	2.3227	81.59
	402			3.910	0.73	2.8543	4.0067	11.4423	1.8794	103.96180	1157.99163	900	304.0	0.75	1567.77545	2.4644	2.6959	73.86
	403			3.120	0.65	2.0280	6.0347	13.3217	1.2159	92.88237	1558.23789	1050	181.0	0.50	1930.91431	2.2299	2.4811	80.70
	404			1.360	0.67	0.9112	6.9459	14.5376	0.5410	87.06139	1681.12084	1200	83.0	0.50	2756.81862	2.4376	2.5570	60.98
	405			1.490	0.53	0.7897	7.7356	15.0786	1.4614	84.73584	1822.24148	1200	245.0	0.60	3019.94349	2.6702	2.7942	60.34
								16.5400										
	406			2.270	0.75	1.7025	1.7025	5.0000	0.4156	191.99741	908.71416	675	107.0	3.00	1455.94138	4.0686	4.2914	62.41
	407			8.170	0.74	6.0458	7.7483	5.4156	1.6308	180.96822	3898.10501	1500	306.0	0.50	4998.44473	2.8285	3.1273	77.99
	408			10.460	0.75	7.8450	15.5933	7.0464	2.4456	148.89842	6454.65333	1800	520.0	0.50	8128.02225	3.1941	3.5438	79.41
	409			1.950	0.75	1.4625	17.0558	9.4920	0.2511	119.40179	5661.45056	1800	52.0	0.50	8128.02225	3.1941	3.4518	69.65
								9.7431										
	SWM BLOCK			0.000	0.00	0.0000	24.7914	16.5400	0.1992	79.12217	5453.10742	1800	35.5	0.35	6800.39131	2.6724	2.9701	80.19

LOCATION				STORMWATER FLOW 5 YEAR STORM								DESIGN						
STREET	AREA NUMBER	MANHOLE LOCATION		AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME		RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY	PIPE FULL
		FROM MH	TO MH					TOTAL	IN PIPE									
				ha		ha	ha	min	min	mm/hr	L/s	mm	m	%	L/s	m/s	m/s	%
SWM 2																		
	201			2.610	0.66	1.7226	1.7226	10.0000	1.8440	114.87675	550.12501	675	260.0	0.85	774.98398	2.1657	2.3500	70.99
	202			3.000	0.75	2.2500	3.9726	11.8440	0.7422	101.33768	1119.15596	975	110.0	0.60	1735.91239	2.3250	2.4703	64.47
	203			1.940	0.66	1.2804	5.2530	12.5861	1.5740	96.87512	1414.70036	1050	230.0	0.50	1930.91431	2.2299	2.4354	73.27
	204			1.880	0.52	0.9776	6.2306	14.1601	0.7406	88.77519	1537.68108	1050	110.0	0.50	1930.91431	2.2299	2.4754	79.63
								14.9007										
	SWM BLOCK			0.000	0.00	0.0000	6.2306	14.9007	0.1457	85.48405	1480.67505	1050	18.5	0.35	1615.51882	1.8657	2.1158	91.65
								15.0465										
SWM 3																		
	301			4.050	0.74	2.9970	2.9970	5.0000	1.5939	191.99741	1599.65718	1050	273.0	0.70	2284.68862	2.6385	2.8545	70.02
	302			2.740	0.88	2.4112	5.4082	6.5939	0.5736	156.40309	2351.48856	1050	164.0	2.10	3957.19677	4.5700	4.7653	59.42
								7.1675										
	303			7.260	0.56	4.0656	4.0656	10.0000	1.8814	114.87675	1298.37934	1050	270.0	0.50	1930.91431	2.2299	2.3919	67.24
								11.8814										
	SWM BLOCK			0.000	0.00	0.0000	9.4738	11.8814	0.4159	101.10112	2662.71674	1350	65.2	0.40	3375.66945	2.3583	2.6131	78.88

*All storm sewers are to be designed using 5-year design storm outlined on the City of Guelph Intensity-Duration Frequency Curves and shall operate without surcharge.Parks and single detached residential shall use a 10-minute time of concentration. All other land uses shall use a 5-minute time of concentration. (Development Engineering Manual-City of Guelph-October 2023).

PCSWMM HGL Analysis

Overland Flow Conveyance Analysis - Summary (PCSWMM HGL Analysis)
Guelph Innovation District, City of Guelph



Project: 46927-104
Date: June 11, 2026
By: MPW

Section	Initial PCSWMM Peak Flow Results		PCSWMM HGL Analysis Results		Comments
	Flow Depth Above Centreline (m)	Freeboard to R.O.W. Limit (m)	Flow Depth Above Storm Sewer T/G (m)	Freeboard to R.O.W. Limit (m)	
Section 1-1 (SWMF1 Block 58)	n/a	n/a	0.120	0.284	Curb height can be reduced to OPSD 600.110 200mm exposed barrier curb.
Section 2-2 (Street A)	0.022	0.172	0.141	0.143	Flow is contained within the R.O.W.
Section 3-3 (Street A)	0.280	-0.086	0.191	0.093	Flow is contained within the R.O.W.
Section 4-4 (SWMF1 Block 67)	n/a	n/a	0.150	0.284	Curb height can be reduced to OPSD 600.110 200mm exposed barrier curb.
Section 5-5 (Street G)	0.291	-0.117	0.250	0.050	Flow is contained within the R.O.W.
Section 6-6 (Street G)	0.231	0.007	Not modelled	Not modelled	Flow is contained within the R.O.W.
Section 7-7 (SWMF3 Access)	n/a	n/a	Not modelled	Not modelled	Modified OPSD 600.110 250mm barrier curb is required.
Section 8-8 (Street F)	0.023	0.151	Not modelled	Not modelled	Flow is contained within the R.O.W.
Section 9-9 (Street F)	0.148	0.026	Not modelled	Not modelled	Flow is contained within the R.O.W.

* HGL and overland flow depths were modelled in PCSWMM. Comments above note the appropriate adjustments to the original results of the overland flow analysis. Catchments to SWMF2 and SWMF3 were not modelled as there were no concerns under the original analysis.

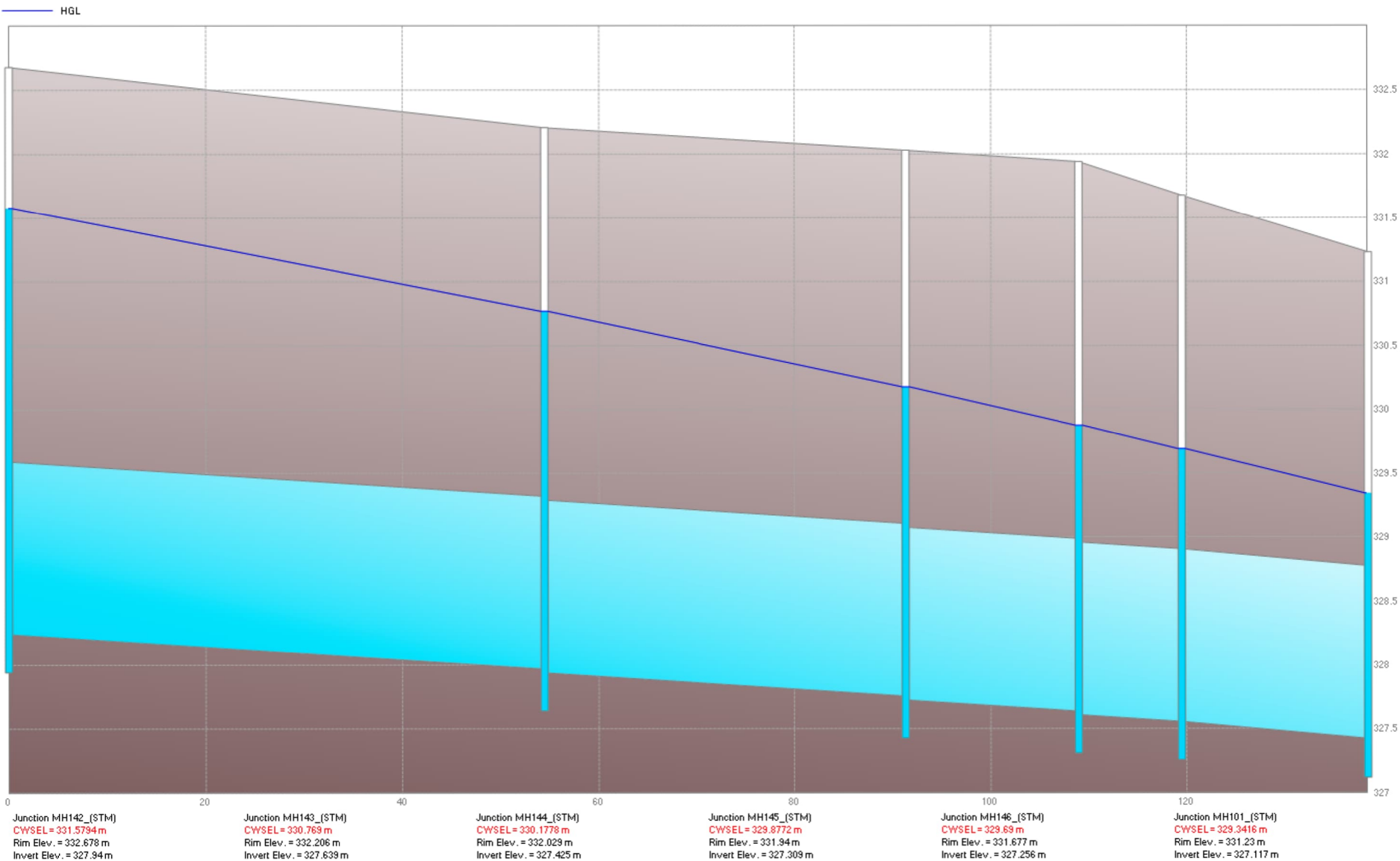
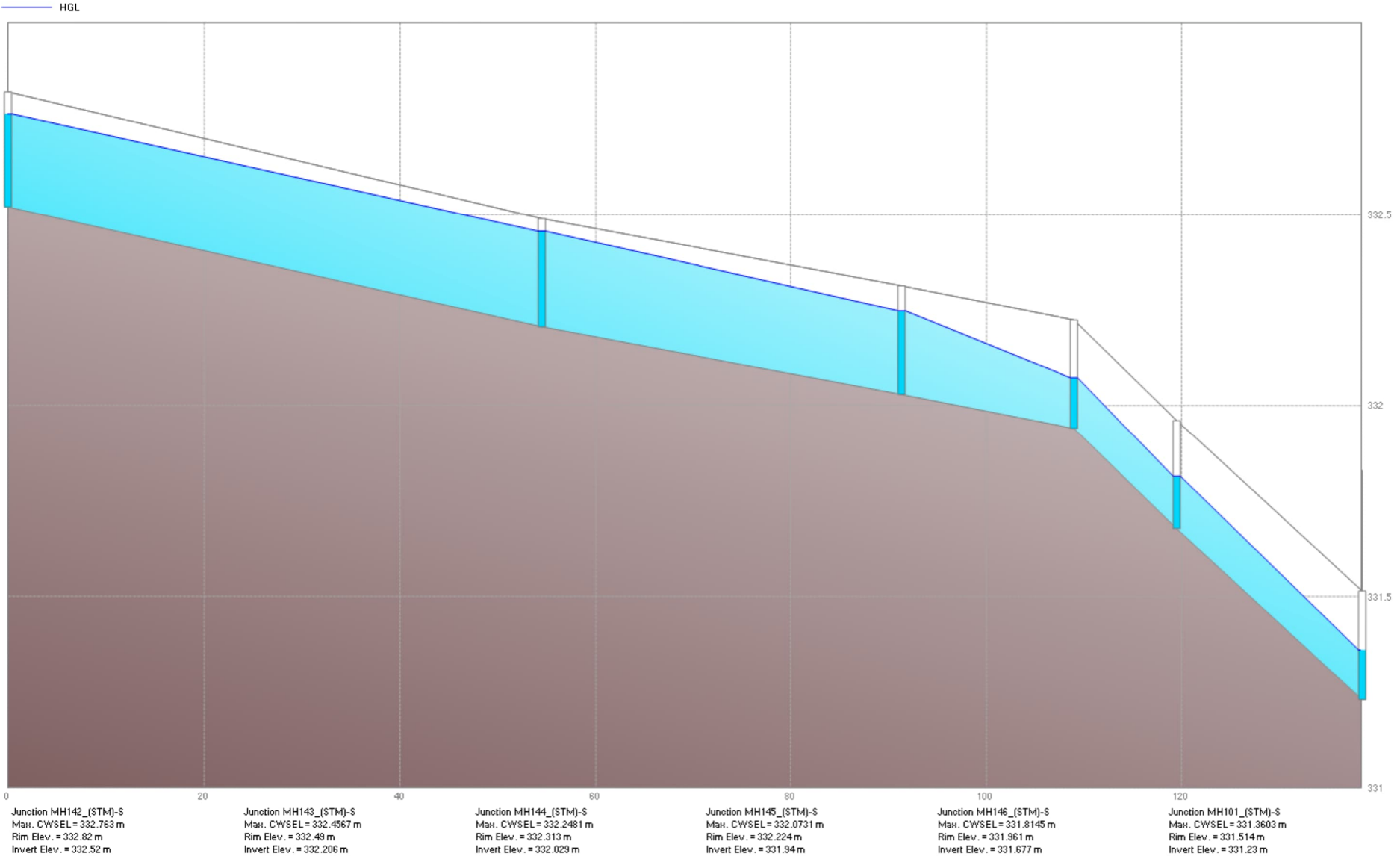
** Note that under the HGL analysis the storm sewer rim elevations are not under centreline of road, flow depths provided above are based on flow above the storm sewer rim elevations.



Junction Information

Junction	Rim Elev. (m)	Invert Elev. (m)	Max. HGL (m)
MH142_(STM)	332.520	327.940	332.160
MH142_(STM)-S	332.820	332.520	332.770
MH143_(STM)	332.206	327.639	331.210
MH143_(STM)-S	332.490	332.206	332.460
MH144_(STM)	332.029	327.425	330.620
MH144_(STM)-S	332.313	332.029	332.260
MH145_(STM)	331.940	327.309	330.270
MH145_(STM)-S	332.224	331.940	332.080
MH146_(STM)	331.677	327.256	330.010
MH146_(STM)-S	331.961	331.677	331.830
MH101_(STM)	331.230	327.117	329.670
MH101_(STM)-S	331.514	331.230	331.380

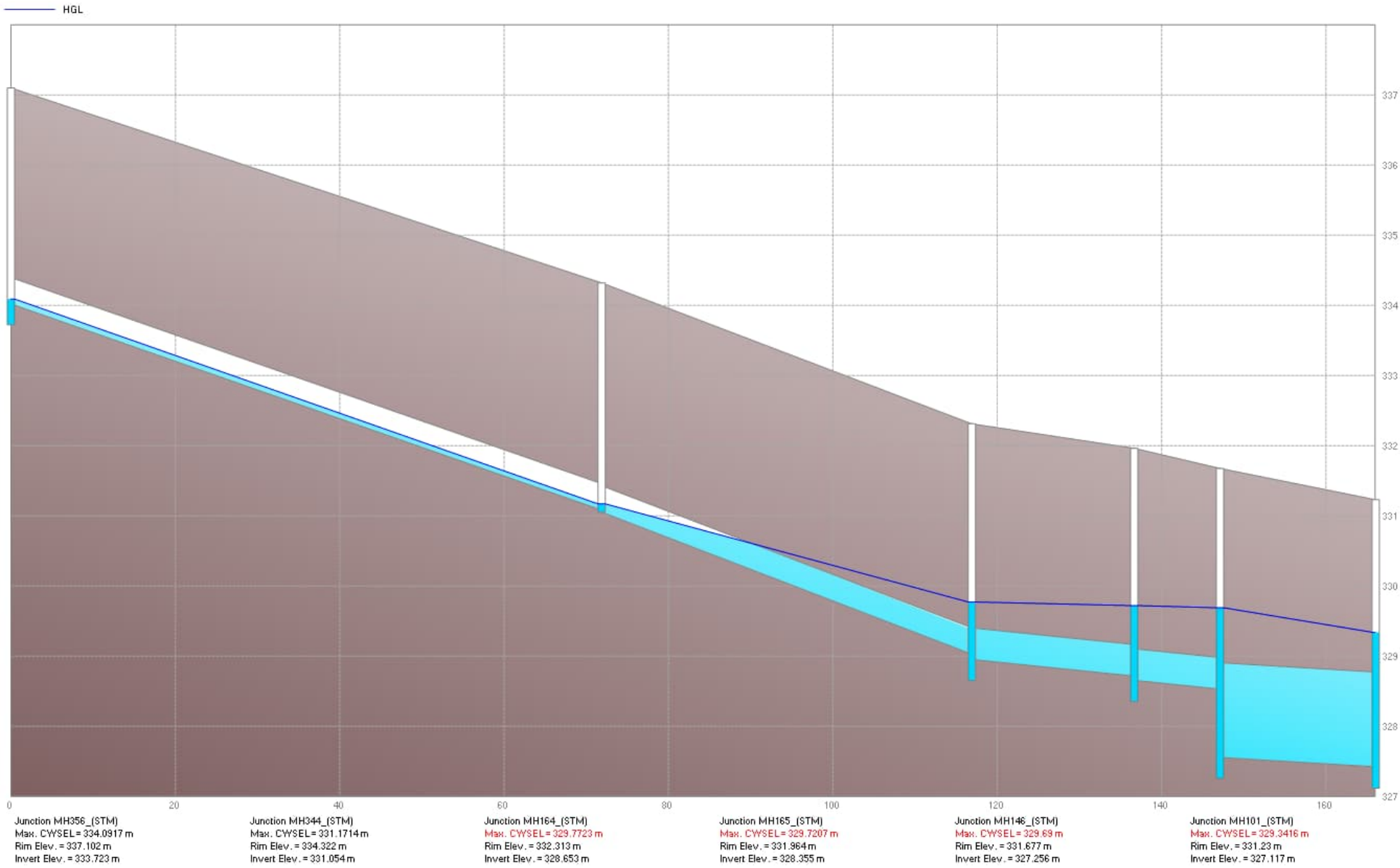
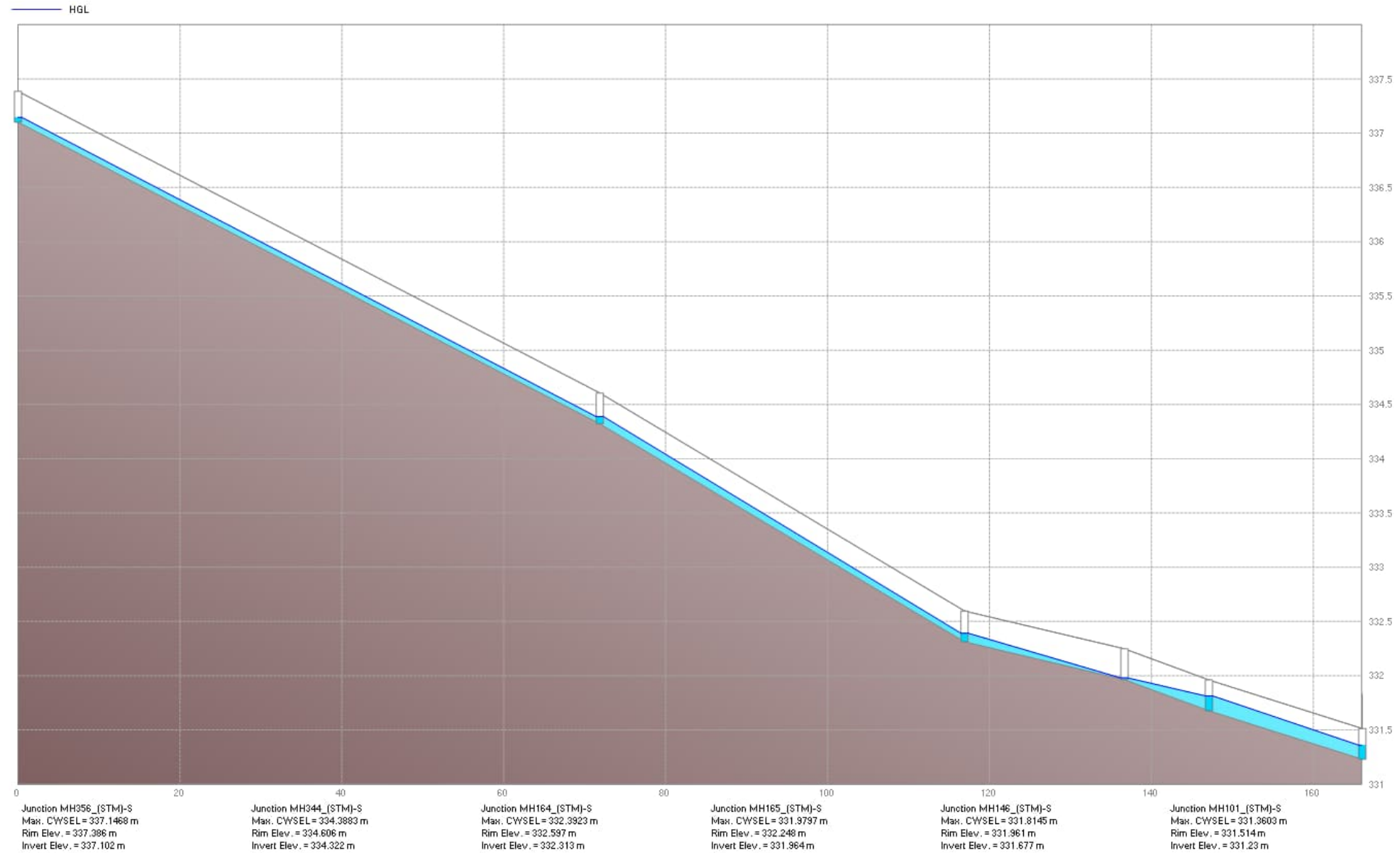
Note: '-S' denotes major overland system junctions. Rim elevations for major overland junctions denote property line elevations (max allowable ponding).



Junction Information

Junction	Rim Elev. (m)	Invert Elev. (m)	Max. HGL (m)
MH356_(STM)	337.102	333.723	334.110
MH356_(STM)-S	337.386	337.102	337.170
MH344_(STM)	334.322	331.054	331.230
MH344_(STM)-S	334.606	334.322	334.420
MH164_(STM)	332.313	328.653	330.860
MH164_(STM)-S	332.597	332.313	332.420
MH165_(STM)	331.964	328.355	330.200
MH165_(STM)-S	332.248	331.964	332.000
MH146_(STM)	331.677	327.256	330.010
MH146_(STM)-S	331.961	331.677	331.830
MH101_(STM)	331.230	327.117	329.670
MH101_(STM)-S	331.514	331.230	331.380

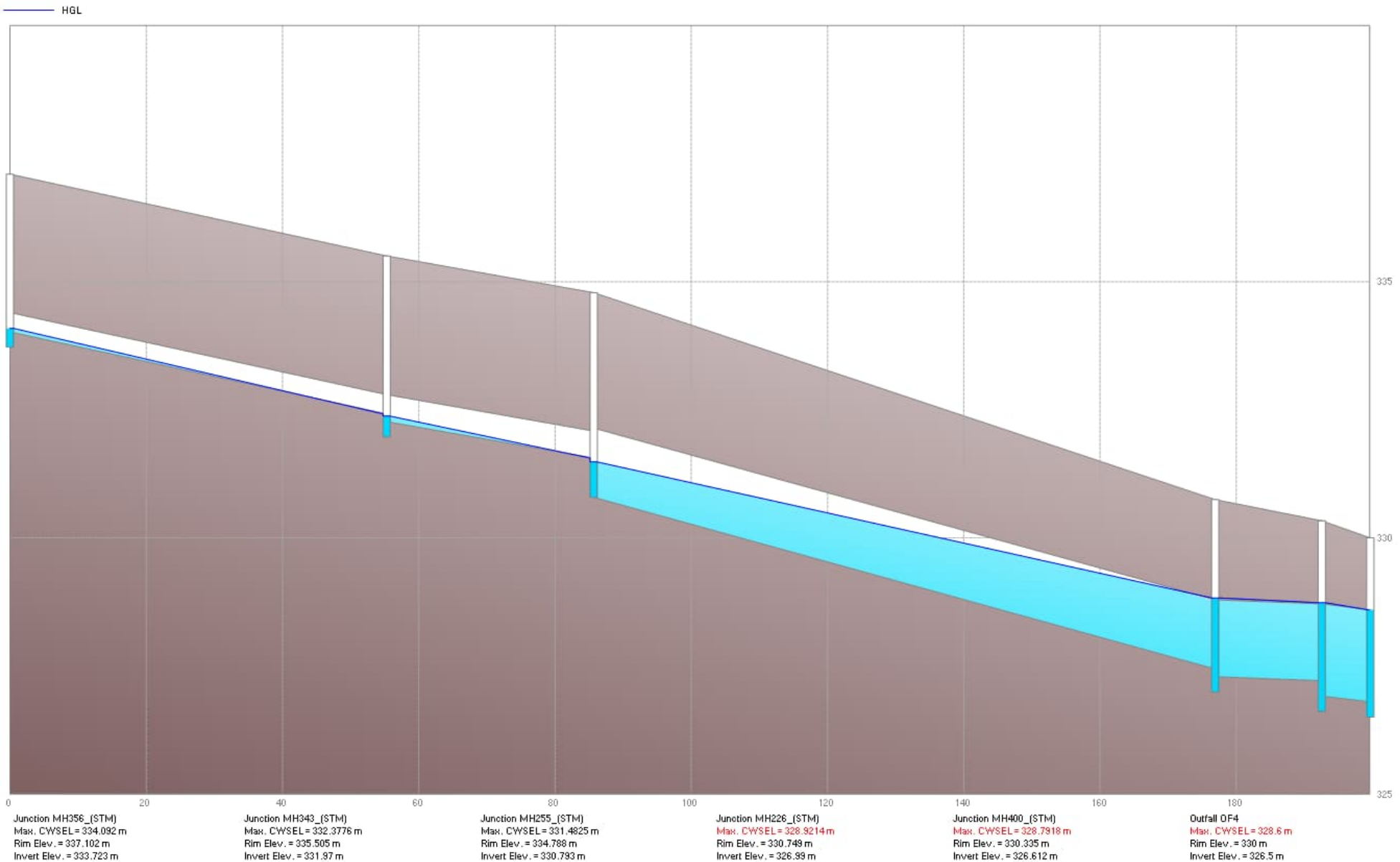
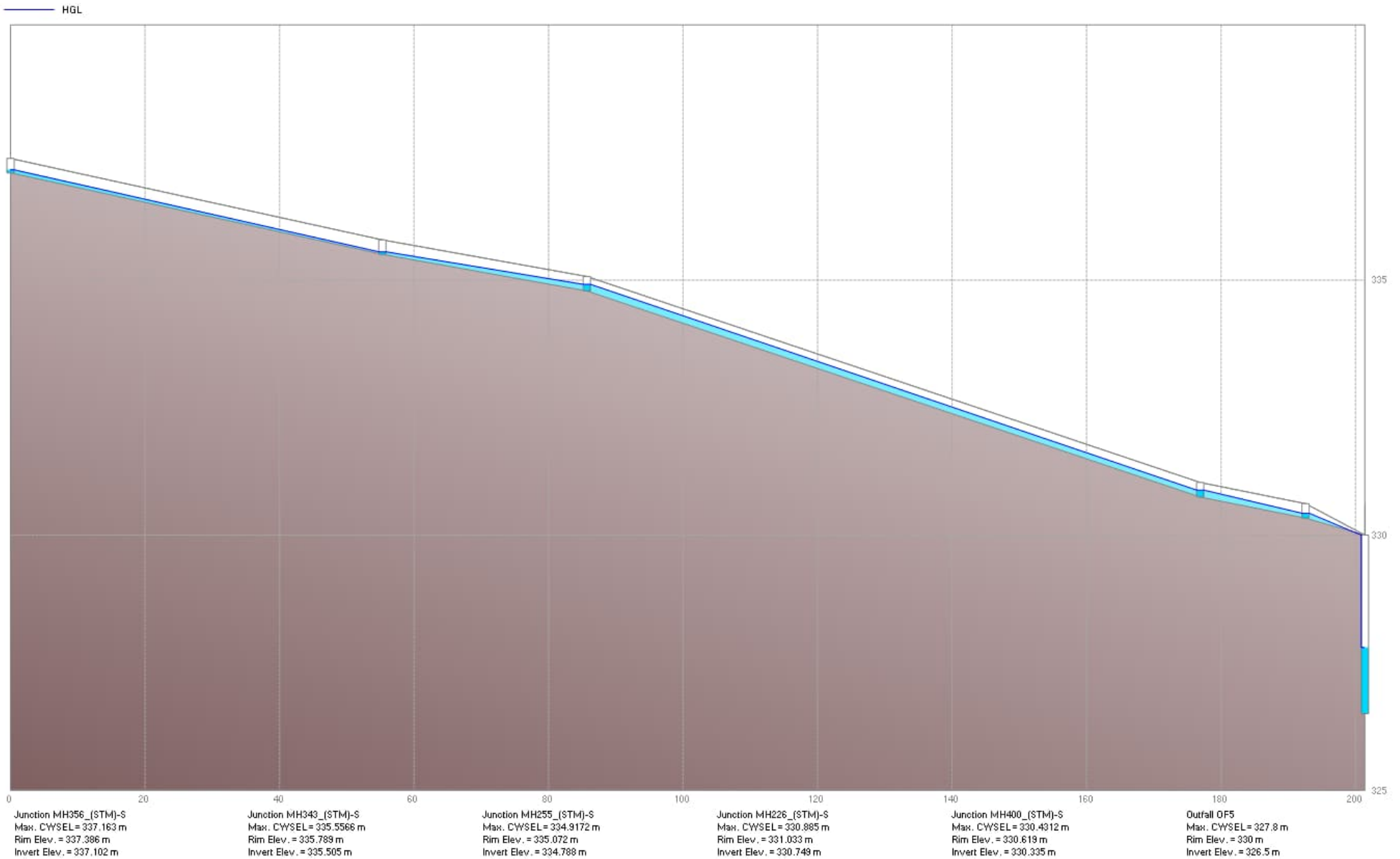
Note: '-S' denotes major overland system junctions. Rim elevations for major overland junctions denote property line elevations (max allowable ponding).



Junction Information

Junction	Rim Elev. (m)	Invert Elev. (m)	Max. HGL (m)
MH356_(STM)	337.102	333.723	334.090
MH356_(STM)-S	337.386	337.102	337.170
MH343_(STM)	335.505	331.970	332.380
MH343_(STM)-S	335.789	335.505	335.560
MH255_(STM)	334.788	330.793	331.480
MH255_(STM)-S	335.072	334.788	334.920
MH226_(STM)	330.749	326.990	328.930
MH226_(STM)-S	331.033	330.749	330.890
MH400_(STM)	330.335	326.612	328.790
MH400_(STM)-S	330.619	330.335	330.430

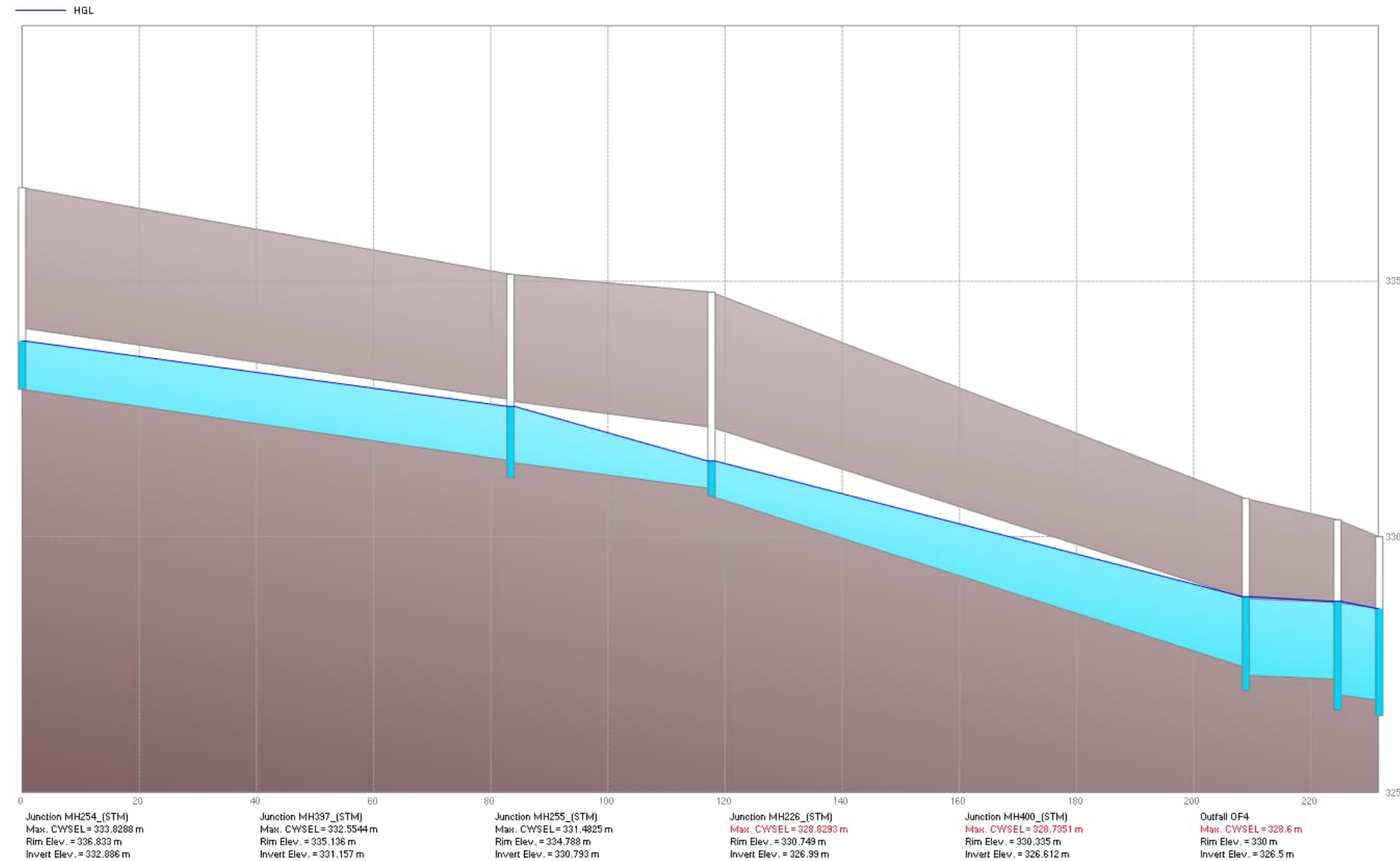
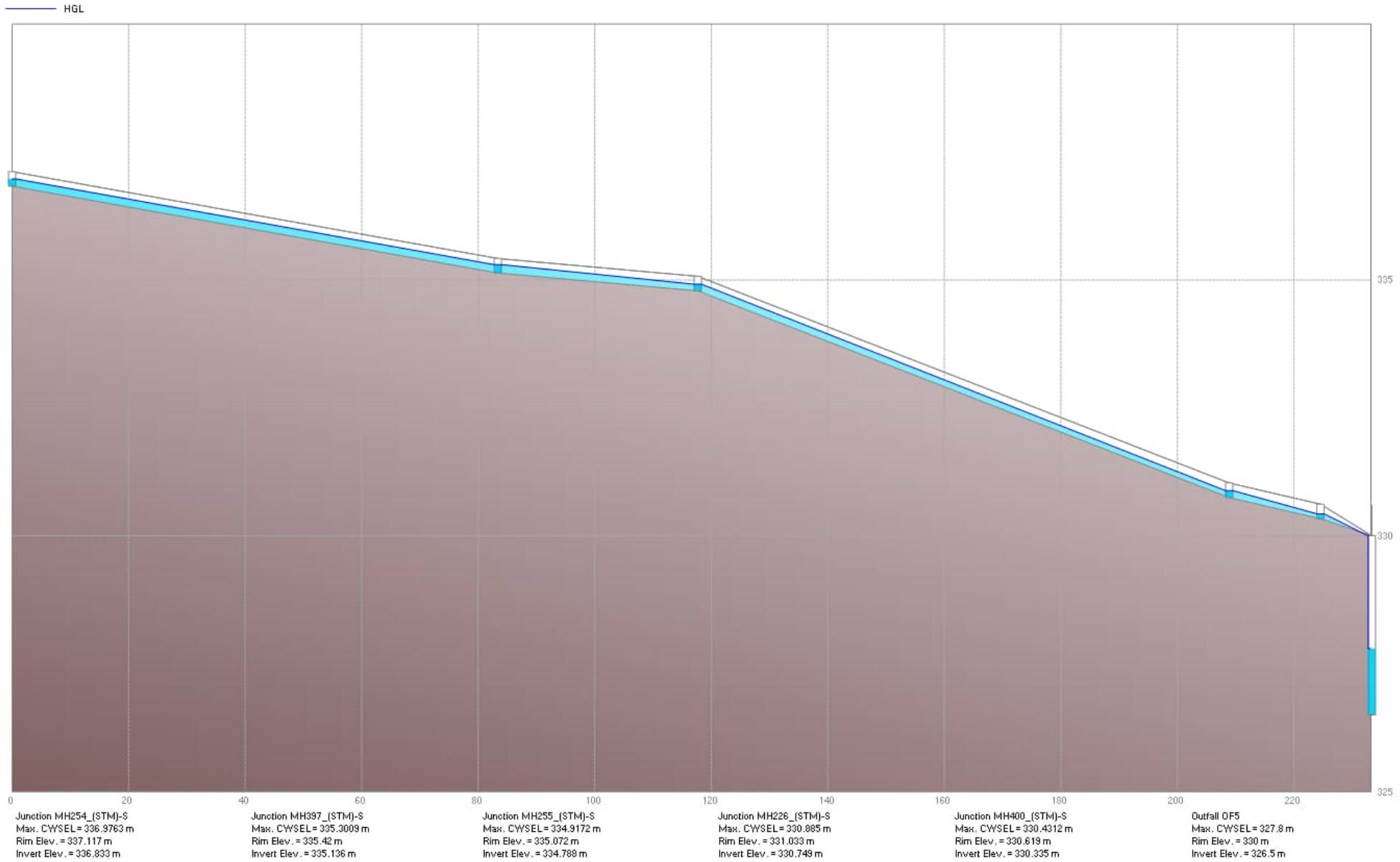
Note: '-S' denotes major overland system junctions. Rim elevations for major overland junctions denote property line elevations (max allowable ponding).



Junction Information

Junction	Rim Elev. (m)	Invert Elev. (m)	Max. HGL (m)
MH254_(STM)	336.833	332.886	333.850
MH254_(STM)-S	337.117	336.833	336.980
MH397_(STM)	335.136	331.157	332.600
MH397_(STM)-S	335.420	335.136	335.300
MH255_(STM)	334.788	330.793	331.480
MH255_(STM)-S	335.072	334.788	334.920
MH226_(STM)	330.749	326.990	328.930
MH226_(STM)-S	331.033	330.749	330.890
MH400_(STM)	330.335	326.612	328.790
MH400_(STM)-S	330.619	330.335	330.430

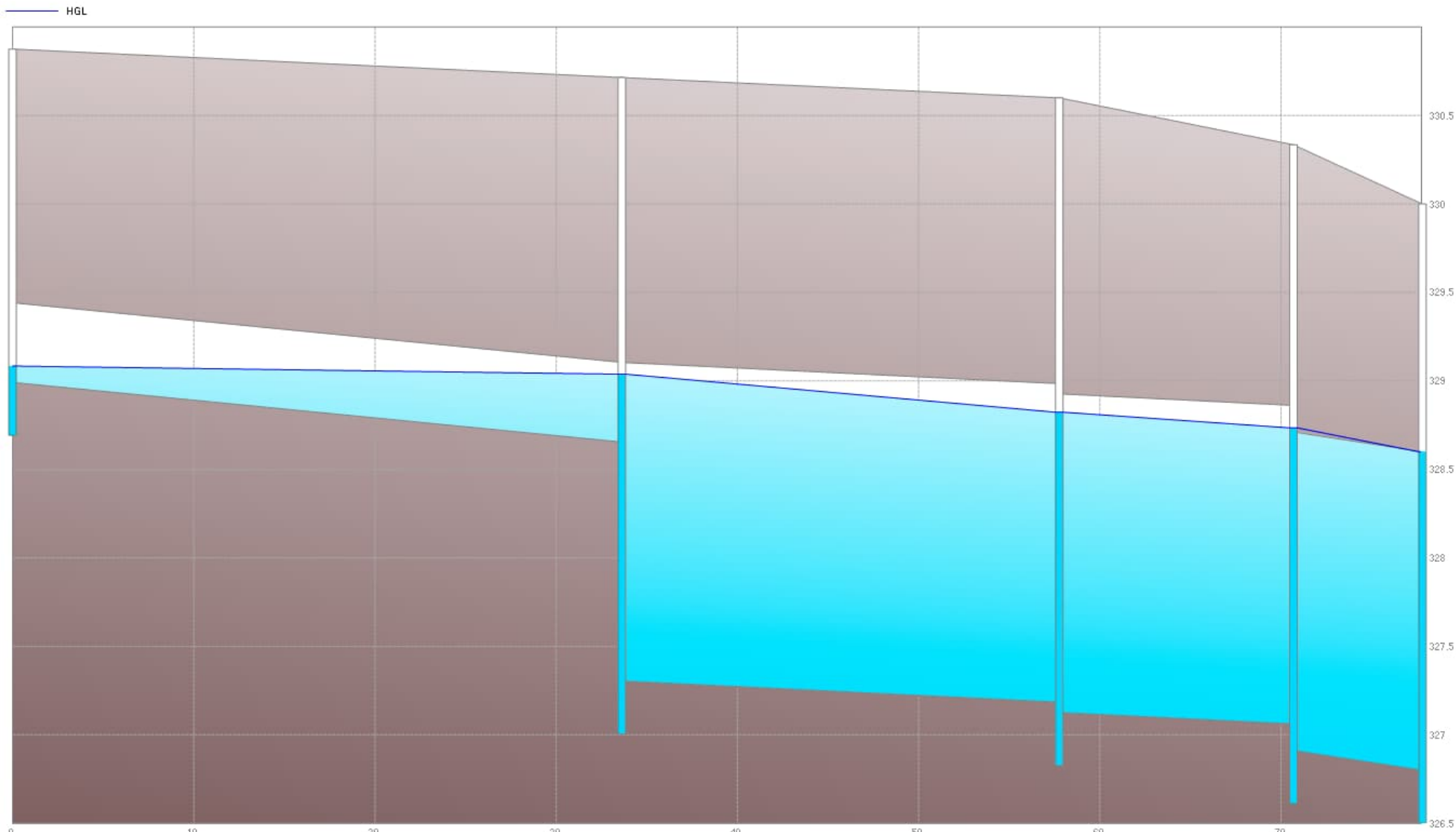
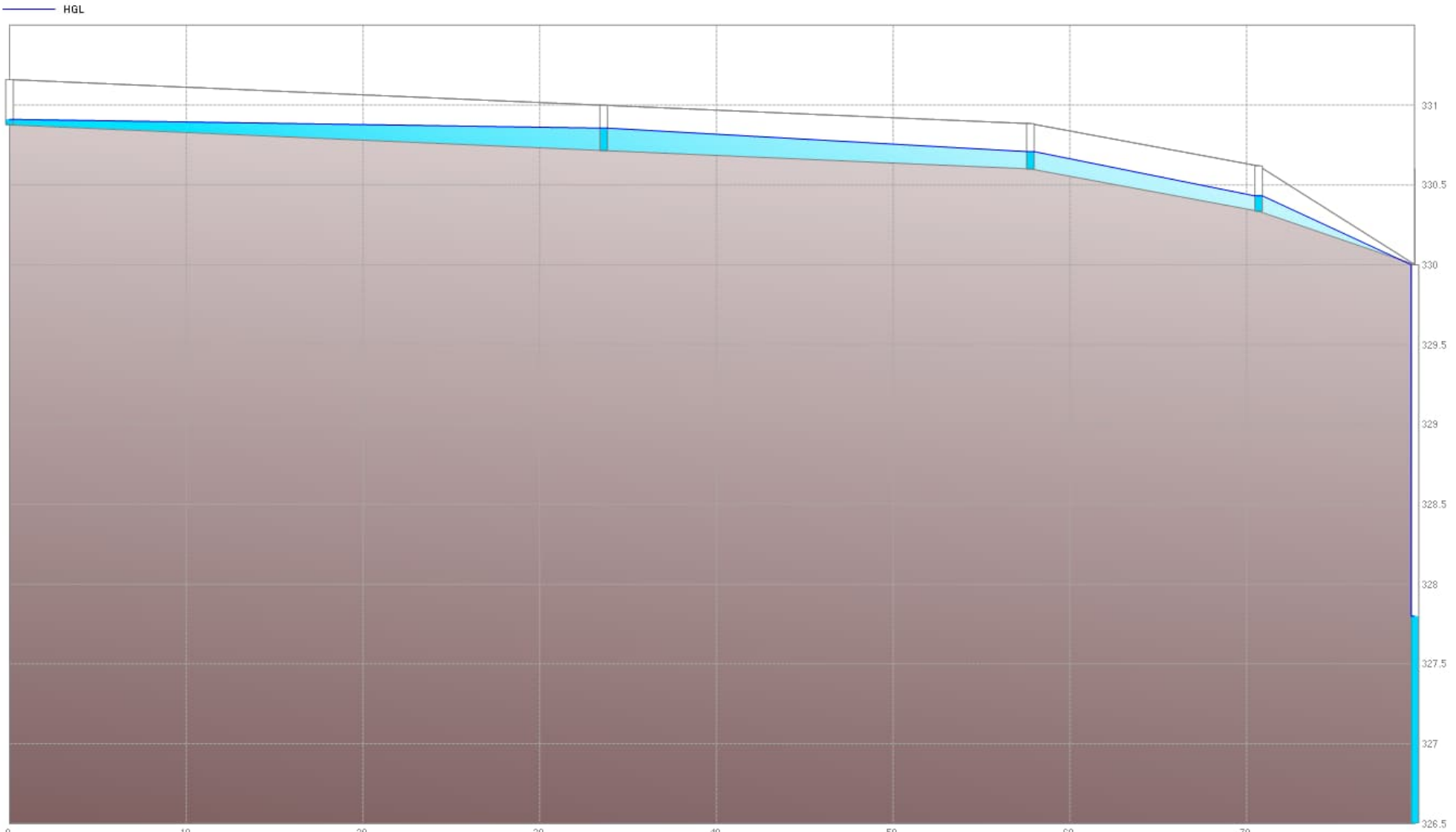
Note: ‘-S’ denotes major overland system junctions. Rim elevations for major overland junctions denote property line elevations (max allowable ponding).



Junction Information

Junction	Rim Elev. (m)	Invert Elev. (m)	Max. HGL (m)
MH594_(STM)	330.876	328.692	329.090
MH594_(STM)-S	331.160	330.876	330.910
MH227_(STM)	330.715	327.005	329.100
MH227_(STM)-S	330.999	330.715	330.870
MH230_(STM)	330.600	326.827	328.940
MH230_(STM)-S	330.884	330.600	330.720
MH400_(STM)	330.335	326.612	328.790
MH400_(STM)-S	330.619	330.335	330.430

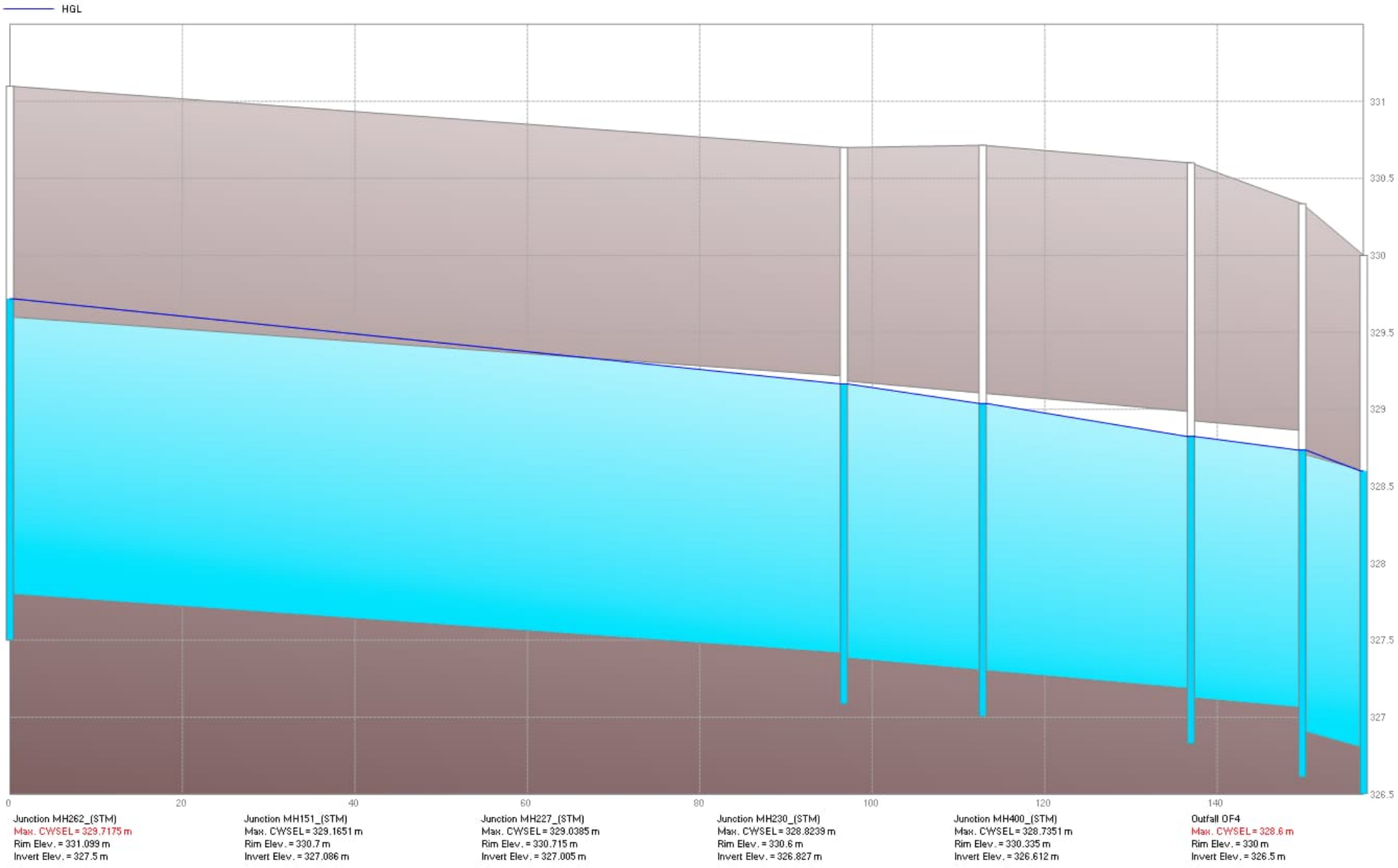
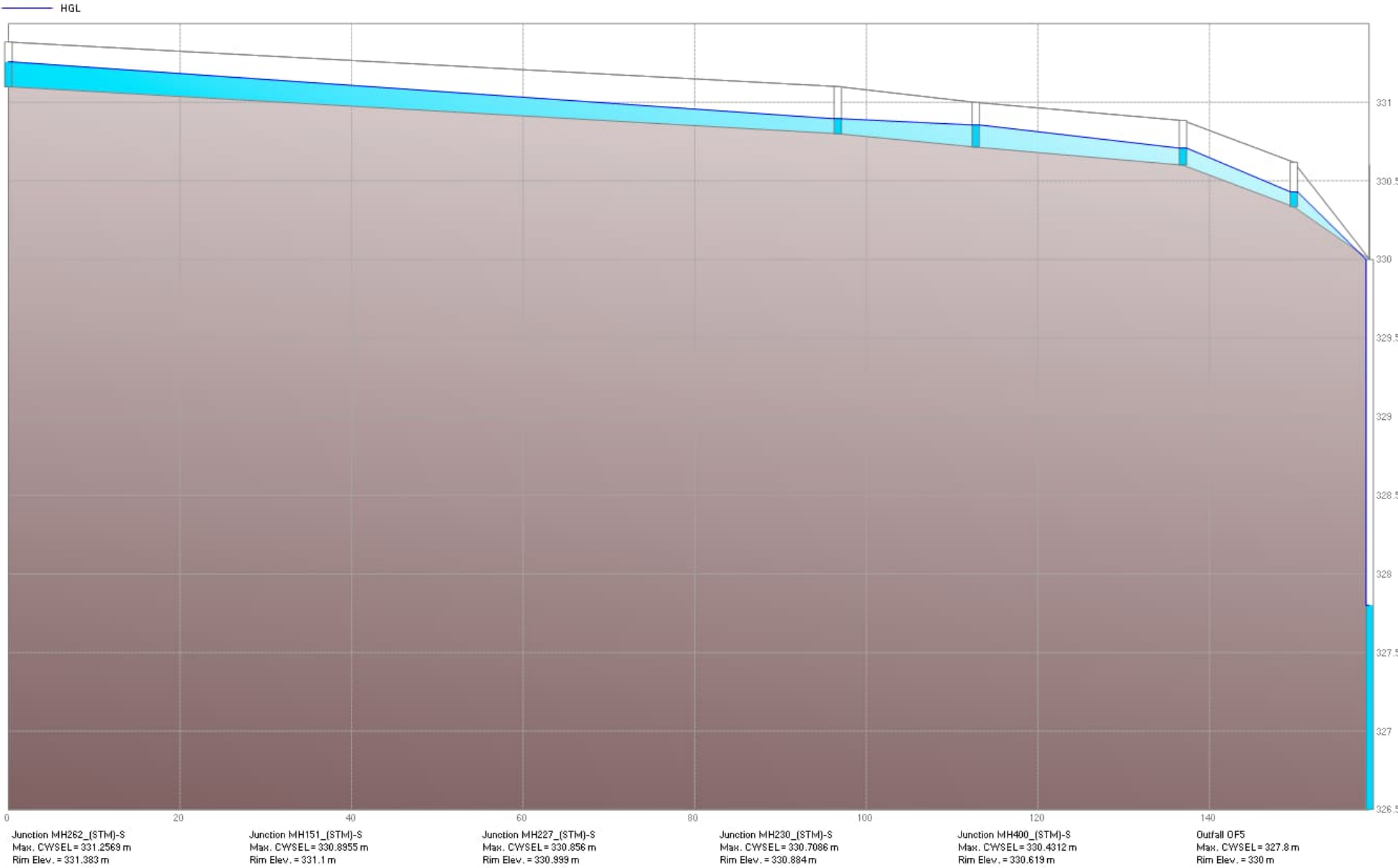
Note: ‘-S’ denotes major overland system junctions. Rim elevations for major overland junctions denote property line elevations (max allowable ponding).



Junction Information

Junction	Rim Elev. (m)	Invert Elev. (m)	Max. HGL (m)
MH262_(STM)	331.099	327.500	329.840
MH262_(STM)-S	331.383	331.099	331.290
MH151_(STM)	330.700	327.086	329.230
MH151_(STM)-S	331.100	330.800	330.960
MH227_(STM)	330.715	327.005	329.100
MH227_(STM)-S	330.999	330.715	330.870
MH230_(STM)	330.600	326.827	328.940
MH230_(STM)-S	330.884	330.600	330.720
MH400_(STM)	330.335	326.612	328.790
MH400_(STM)-S	330.619	330.335	330.430

Note: '-S' denotes major overland system junctions. Rim elevations for major overland junctions denote property line elevations (max allowable ponding).



SWMF1 Outlet Overland Flow Analysis

Worksheet for Section 1-1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.50 %
Discharge	6.577 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00.00	330.0000
0+07.50	327.4600
0+11.50	327.4600
0+23.50	331.1700

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 330.0000)	(0+07.50, 327.4600)	0.030
(0+07.50, 327.4600)	(0+11.50, 327.4600)	0.013
(0+11.50, 327.4600)	(0+23.50, 331.1700)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.62 m
Roughness Coefficient	0.023
Elevation	328.0761 m
Elevation Range	327.4600 to 331.1700 m
Flow Area	3.64 m ²
Wetted Perimeter	8.0067 m
Hydraulic Radius	0.45 m
Top Width	7.81 m
Normal Depth	0.62 m
Critical Depth	0.56 m
Critical Slope	0.72 %
Velocity	1.81 m/s
Velocity Head	0.1666 m
Specific Energy	0.7827 m
Froude Number	0.846

Worksheet for Section 1-1

Results	
Flow Type	Subcritical
GVF Input Data	
Upstream Depth	0.00 m
Length	0.0000 m
Number Of Steps	0
GVF Output Data	
Downstream Depth	0.00 m
Profile Description	
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	0.62 m
Critical Depth	0.56 m
Channel Slope	0.50 %
Critical Slope	0.72 %

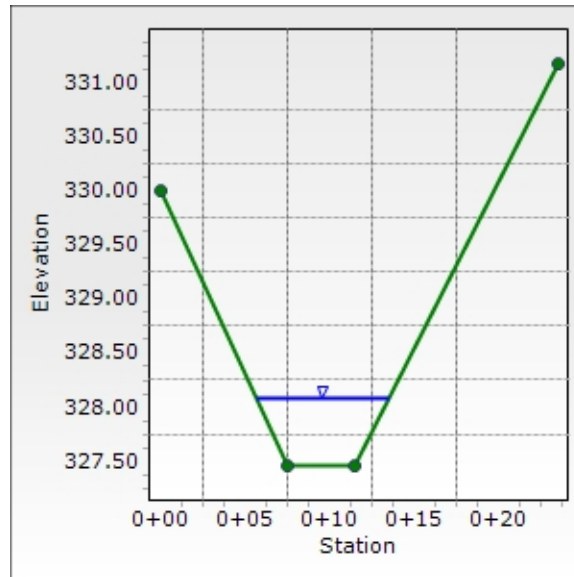
Worksheet for Section 1-1

Notes:

Solved for Normal Depth and assuming 0.50% channel slope.

Cross Section for Section 1-1

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.50 %
Normal Depth	0.62 m
Discharge	6.577 m ³ /s



Worksheet for Section 2-2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.50 %
Discharge	6.577 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00.00	328.6000
0+04.50	327.1000
0+08.50	327.1000
0+22.50	331.7400

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 328.6000)	(0+04.50, 327.1000)	0.030
(0+04.50, 327.1000)	(0+08.50, 327.1000)	0.013
(0+08.50, 327.1000)	(0+22.50, 331.7400)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.62 m
Roughness Coefficient	0.023
Elevation	327.7168 m
Elevation Range	327.1000 to 331.7400 m
Flow Area	3.61 m ²
Wetted Perimeter	7.9114 m
Hydraulic Radius	0.46 m
Top Width	7.71 m
Normal Depth	0.62 m
Critical Depth	0.56 m
Critical Slope	0.71 %
Velocity	1.82 m/s
Velocity Head	0.1690 m
Specific Energy	0.7859 m
Froude Number	0.850

Worksheet for Section 2-2

Results	
Flow Type	Subcritical
GVF Input Data	
Upstream Depth	0.00 m
Length	0.0000 m
Number Of Steps	0
GVF Output Data	
Downstream Depth	0.00 m
Profile Description	
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	0.62 m
Critical Depth	0.56 m
Channel Slope	0.50 %
Critical Slope	0.71 %

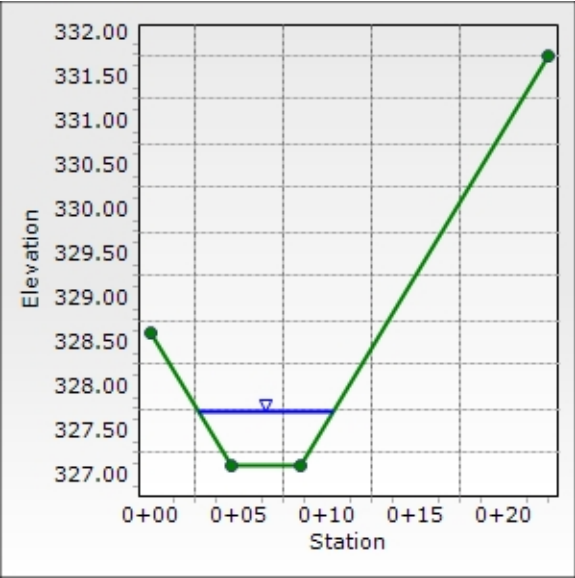
Worksheet for Section 2-2

Notes:

Solved for Normal Depth and assuming 0.50% channel slope.

Cross Section for Section 2-2

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.50 %
Normal Depth	0.62 m
Discharge	6.577 m³/s



Worksheet for Section 3-3

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	8.00 %
Discharge	6.577 m ³ /s

Section Definitions

Station (m)	Elevation (m)
0+00.00	326.1500
0+01.50	325.6200
0+05.50	325.6200
0+14.00	326.2000

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 326.1500)	(0+01.50, 325.6200)	0.030
(0+01.50, 325.6200)	(0+05.50, 325.6200)	0.013
(0+05.50, 325.6200)	(0+14.00, 326.2000)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.26 m
Roughness Coefficient	0.024
Elevation	325.8833 m
Elevation Range	325.6200 to 326.2000 m
Flow Area	1.66 m ²
Wetted Perimeter	8.6583 m
Hydraulic Radius	0.19 m
Top Width	8.60 m
Normal Depth	0.26 m
Critical Depth	0.47 m
Critical Slope	0.82 %
Velocity	3.96 m/s
Velocity Head	0.8009 m
Specific Energy	1.0642 m
Froude Number	2.882

Worksheet for Section 3-3

Results	
Flow Type	Supercritical
GVF Input Data	
Upstream Depth	0.00 m
Length	0.0000 m
Number Of Steps	0
GVF Output Data	
Downstream Depth	0.00 m
Profile Description	
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	0.26 m
Critical Depth	0.47 m
Channel Slope	8.00 %
Critical Slope	0.82 %

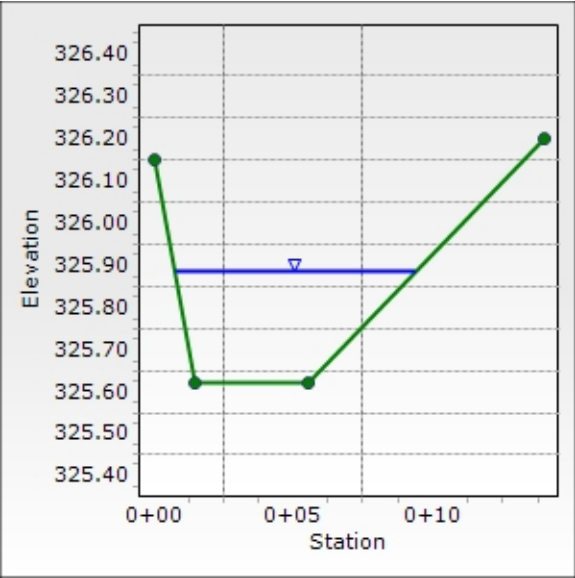
Worksheet for Section 3-3

Notes:

Solved for Normal Depth and assuming 0.50% channel slope.

Cross Section for Section 3-3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	8.00 %
Normal Depth	0.26 m
Discharge	6.577 m³/s



Appendix E

Water Balance Calculations

Infiltration Calculations and GWMS and Block/Lot Level Gallery Sizing

Infiltration Analysis
Guelph Innovation District, City of Guelph
Project: 46927-104
Date: 6/3/2026
By: MPW



Infiltration Volume Criteria Target				
Catchment	Total Area (ha.)	Area with High GW (ha)*	Area outside High GW (ha)	27mm Rainfall Depth Volume (cu.m)
201	60.77	32.56	28.21	16,407.90
202	15.11	2.62	12.49	4,079.70
203	24.10	6.91	17.19	6,507.00
Total 27mm Rainfall				26,994.6 cu.m

*Active infiltration via the end of pipe galleries or SWM infiltration cell (orange), and lot/block level galleries (yellow). Red italics denote runoff areas that do not drain towards a SWMF and therefore cannot be captured to infiltrate. Purple cells denote reductions in available infiltration volume, due to rainfall directed via surface runoff to supplement wetland water balance.
**ET, Infiltration, and Runoff percentages are from MOE Table 3.1 Hydrologic Cycle Component Values (Flat, Urban Lawns Soil Group B).

							Area within High GW					Area outside High GW						
Drainage Area	Area (ha)	Type	Area (ha)	Area with High GW (ha)*	Area outside High GW (ha)	Impervious %	Pervious Area (ha.)	Pervious - ET Volume (cu.m) (65.04%)	Pervious - Passive Infiltration Volume (cu.m) (22.72%)	Pervious - Runoff Volume (cu.m) (12.24%)	Impervious Area (ha.)	Impervious - Runoff Volume (cu.m)	Pervious Area (ha.)	Pervious - ET Volume (cu.m) (65.04%)	Pervious - Passive Infiltration Volume (cu.m) (22.72%)	Pervious - Runoff Volume (cu.m) (12.24%)	Impervious Area (ha.)	Impervious - Runoff Volume (cu.m)
201-1	19.37 ha	Low Density Res.	10.01	7.30	2.71	65%	2.56	448.68	156.73	84.44	4.75	1281.15	0.95	166.56	58.18	31.35	1.76	475.61
		Med. Density Res.	2.92	2.92	0.00	80%	0.58	102.56	35.82	19.30	2.34	630.72	0.00	0.00	0.00	0.00	0.00	0.00
		R.O.W.	5.44	3.23	2.21	70%	0.97	170.16	59.44	32.02	2.26	610.47	0.66	116.43	40.67	21.91	1.55	417.69
		SWM	0.03	0.00	0.03	59%	0.00	0.00	0.00	0.00	0.00	0.00	0.01	2.16	0.75	0.41	0.02	4.78
		Walkway	0.08	0.08	0.00	38%	0.05	8.71	3.04	1.64	0.03	8.21	0.00	0.00	0.00	0.00	0.00	0.00
		Park	0.67	0.43	0.24	7%	0.40	70.23	24.53	13.22	0.03	8.13	0.22	39.20	13.69	7.38	0.02	4.54
		G.M. Frost Building	0.22	0.03	0.19	24%	0.02	4.00	1.40	0.75	0.01	1.94	0.14	25.36	8.86	4.77	0.05	12.31
201-2	34.21 ha	Low Density Res.	2.16	2.04	0.12	65%	0.71	125.38	43.80	23.60	1.33	358.02	0.04	7.38	2.58	1.39	0.08	21.06
		Med. Density Res.	11.26	5.63	5.63	80%	1.13	197.73	69.07	37.21	4.50	1216.08	1.13	197.73	69.07	37.21	4.50	1216.08
		Mixed Use	11.78	3.73	8.05	80%	0.75	131.14	45.81	24.68	2.99	806.52	1.61	282.59	98.72	53.18	6.44	1737.96
		Employment	0.02	0.02	0.00	100%	0.00	0.00	0.00	0.00	0.02	5.40	0.00	0.00	0.00	0.00	0.00	0.00
		R.O.W.	5.78	4.08	1.70	70%	1.22	214.94	75.09	40.45	2.86	771.12	0.51	89.56	31.29	16.85	1.19	321.30
		School	2.07	2.07	0.00	80%	0.41	72.70	25.40	13.68	1.66	447.12	0.00	0.00	0.00	0.00	0.00	0.00
		Walkway	0.01	0.01	0.00	38%	0.01	1.09	0.38	0.20	0.00	1.03	0.00	0.00	0.00	0.00	0.00	0.00
		Park	1.02	0.84	0.18	7%	0.78	137.18	47.92	25.82	0.06	15.88	0.17	29.40	10.27	5.53	0.01	3.40
		G.M. Frost Building	0.11	0.11	0.00	24%	0.08	14.68	5.13	2.76	0.03	7.13	0.00	0.00	0.00	0.00	0.00	0.00
201-3	2.68 ha	Med. Density Res. (Slope)	0.34	0.00	0.34	80%	0.00	0.00	0.00	0.00	0.00	0.00	0.07	11.94	4.17	2.25	0.27	73.44
		Mixed Use (Slope)	0.67	0.00	0.67	80%	0.00	0.00	0.00	0.00	0.00	0.00	0.13	23.53	8.22	4.43	0.54	144.72
		Employment (Slope)	0.54	0.00	0.54	100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	145.80
		R.O.W.	0.72	0.04	0.68	70%	0.01	2.11	0.74	0.40	0.03	7.56	0.20	35.82	12.51	6.74	0.48	128.52
		SWM (Overland Outlet)	0.41	0.00	0.41	23%	0.00	0.00	0.00	0.00	0.00	0.00	0.32	55.44	19.37	10.43	0.09	25.46
		Low Density Res.	0.51	0.00	0.51	65%	0.00	0.00	0.00	0.00	0.00	0.00	0.18	31.35	10.95	5.90	0.33	89.51
201-4	0.75 ha	Open Space	0.03	0.00	0.03	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.03	5.27	1.84	0.99	0.00	0.00
		SWM (Slope)	0.21	0.00	0.21	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.21	36.88	12.88	6.94	0.00	0.00
		Low Density Res.	0.48	0.00	0.48	65%	0.00	0.00	0.00	0.00	0.00	0.00	0.17	29.50	10.31	5.55	0.31	84.24
201-5	3.76 ha	Park	0.17	0.00	0.17	7%	0.00	0.00	0.00	0.00	0.00	0.00	0.16	27.76	9.70	5.22	0.01	3.21
		SWM	3.11	0.00	3.11	59%	0.00	0.00	0.00	0.00	0.00	0.00	1.28	223.92	78.22	42.14	1.83	495.42
		202-1	9.33 ha	Low Density Res.	4.48	1.82	2.66	65%	0.64	111.86	39.08	21.05	1.18	319.41	0.93	163.49	57.11	30.77
Mixed Use	2.66			0.00	2.66	80%	0.00	0.00	0.00	0.00	0.00	0.00	0.53	93.42	32.64	17.58	2.13	574.56
R.O.W.	1.73			0.45	1.28	70%	0.14	23.71	8.28	4.46	0.32	85.05	0.38	67.43	23.56	12.69	0.90	241.92
Walkway	0.01			0.01	0.00	38%	0.01	1.09	0.38	0.20	0.00	1.03	0.00	0.00	0.00	0.00	0.00	0.00
Park	0.45			0.34	0.11	7%	0.32	55.53	19.40	10.45	0.02	6.43	0.10	17.96	6.28	3.38	0.01	2.08
202-2	2.89 ha	Park	1.76	0.00	1.76	7%	0.00	0.00	0.00	0.00	0.00	0.00	1.64	287.44	100.41	54.09	0.12	33.26
		Open Space	1.13	0.00	1.13	7%	0.00	0.00	0.00	0.00	0.00	0.00	1.05	184.55	64.47	34.73	0.08	21.36
202-3	2.17 ha	Mixed Use (Slope)	0.36	0.00	0.36	80%	0.00	0.00	0.00	0.00	0.00	0.00	0.07	12.64	4.42	2.38	0.29	77.76
		Open Space	0.20	0.00	0.20	7%	0.00	0.00	0.00	0.00	0.00	0.00	0.19	32.66	11.41	6.15	0.01	3.78
		Natural Areas	0.93	0.00	0.93	7%	0.00	0.00	0.00	0.00	0.00	0.00	0.86	151.88	53.06	28.58	0.07	17.58
		SWM (Slope)	0.68	0.00	0.68	5%	0.00	0.00	0.00	0.00	0.00	0.00	0.65	113.44	39.63	21.35	0.03	9.18
202-4	0.72 ha	SWM	0.72	0.00	0.72	55%	0.00	0.00	0.00	0.00	0.00	0.00	0.32	56.90	19.88	10.71	0.40	106.92
Wetland #6		Mixed Use (Block 46) Roof Area	-0.23	0.00	-0.23	100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.23	-61.29
203-1	14.32 ha	Low Density Res.	0.17	0.17	0.00	65%	0.06	10.45	3.65	1.97	0.11	29.84	0.00	0.00	0.00	0.00	0.00	0.00
		Med. Density Res.	1.91	1.82	0.09	80%	0.36	63.92	22.33	12.03	1.46	393.12	0.02	3.16	1.10	0.59	0.07	19.44
		Employment	6.64	0.02	6.62	100%	0.00	0.00	0.00	0.00	0.02	5.40	0.00	0.00	0.00	0.00	6.62	1787.40
		R.O.W.	1.77	1.21	0.56	70%	0.36	63.75	22.27	12.00	0.85	228.69	0.17	29.50	10.31	5.55	0.39	105.84
		Park	3.83	3.69	0.14	7%	3.43	602.63	210.51	113.41	0.26	69.74	0.13	22.86	7.99	4.30	0.01	2.65
203-2	7.78 ha	Employment (Slope)	0.12	0.00	0.12	100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	32.40
		R.O.W.	0.34	0.00	0.34	70%	0.00	0.00	0.00	0.00	0.00	0.00	0.10	17.91	6.26	3.37	0.24	64.26
		External Lands	7.32	0.00	7.32	78%	0.00	0.00	0.00	0.00	0.00	0.00	1.61	282.80	98.79	53.22	5.71	1541.59
203-3	2 ha	SWM	2.00	0.00	2.00	44%	0.00	0.00	0.00	0.00	0.00	1.12	196.68	68.71	37.01	0.88	237.60	
							2,634.2 cu.m	920.2 cu.m	495.7 cu.m	7,315.2 cu.m	3,172.5 cu.m	1,108.2 cu.m	597.0 cu.m	10,751.4 cu.m				

Total ET Volume	5,806.8 cu.m
Total Passive Infiltration Volume	2,028.4 cu.m
Total Runoff Volume	19,159.4 cu.m
Infiltration Target Volume (Passive Infiltration + Runoff)	21,187.8 cu.m
Total 27mm Rainfall Volume	26,994.6 cu.m

Total Passive Infiltration - Within High GW	920.2 cu.m
Total Passive Infiltration - Outside High GW	1,108.2 cu.m
Total Passive Infiltration Volume	2,028.4 cu.m

Total Lot / Block Level - Catchment 201	3,630.6 cu.m	*See Summary of Lot / Block Level Infiltration Galleries for confirmation that this volume is provided
Total Lot / Block Level - Catchment 202	1,059.0 cu.m	*See Summary of Lot / Block Level Infiltration Galleries for confirmation that this volume is provided
Total Lot / Block Level - Catchment 203	1,792.8 cu.m	*See Summary of Lot / Block Level Infiltration Galleries for confirmation that this volume is provided
Total Lot / Block Level Infiltration Volume	6,482.4 cu.m	

Adjusted Volume		
Total End of Pipe - SWMF1	7,978.1 cu.m	7,978.1 cu.m
Total End of Pipe - SWMF2	738.9 cu.m	539.4 cu.m
Total End of Pipe - SWMF3	2,968.6 cu.m	2,968.6 cu.m
Total End of Pipe Infiltration Volume	11,685.6 cu.m	11,486.1 cu.m

*Maximum gallery volume available is 4,319m³, designed to infiltrate full volume of 7,342.3 m³ in less than 48hr drawdown. Additional storage is provided by the SWMF 1 wet cell.
*Maximum gallery size available is 292m³, designed to infiltrate full volume of 738.9 m³ in less than 48hr drawdown. However 27% of runoff volume has been dedicated to outlet to surface to maintain the Wetland #3 water balance.

Total Infiltration Volume	19,996.9 cu.m
Infiltration Target Volume	21,187.8 cu.m
% of Target Infiltration Achieved	94%
Revised Infiltration Target	25.48 mm

*Allowed to be reduced up to 75% of 27mm criteria

Guelph Innovation District
Summary of Lot / Block Level Infiltration Galleries
Conceptual Design
City of Guelph



Date: June 3, 2026
Project: 46927-104
File: Q:\46927\104\Water Balance\20mm Criteria\46927-104_Infiltration Gallery Designs - Revised Methodology.xls

0.027 m

Rainfall Depth

Locations referenced from Draft Plan dated May 28, 2026 by MHBC Planning Ltd.

Lot / Block Level Infiltration Galleries

Facility No.	Pond Catchment	Location	Nearest Borehole	Existing Soil Type Below Inv.	Seasonal High Groundwater Elevation (m)	Proposed Road CL (m)	Proposed FG Above Gallery (m)	Cover Above Gallery (m)	Depth of Gallery (m)	Proposed Facility Invert (m)	Groundwater Separation (m)	Drainage Area (ha)	Percent Impervious (%)	Impervious Area (ha.)	Pervious Area (ha.)	Required Infiltration Volume (m³)	Gallery Volume Provided (m³)	Contact Area (m²)	Nearest Test Pit	Infiltration Rate (mm/hr)**	Porosity of Gallery	Estimated Drawdown Time (hr)	Estimated Configuration	
																							Width (m)	Length (m)
Catchment 201																3,658.42								
Lot Level Galleries	201-1	Residential (Block 1)	BH502-22	Gravelly Silt Till	324.50	332.25	330.90	1.5	1.5	327.90	3.40	0.466	65	0.303	0.163	81.78	81.78	129.08	Conservative Assumption	40	0.33	48	n/a	n/a
Lot Level Galleries	201-1	Residential (Block 2)	n/a (Fill Area)	n/a (Fill Area)	323.00	332.60	330.00	1.5	1.5	327.00	4.00	0.760	65	0.494	0.266	133.38	133.38	210.51	Conservative Assumption	40	0.33	48	n/a	n/a
Lot Level Galleries	201-1	Residential (Block 9)	BH429-20 BH206-19	Sand and Gravel	330.00	335.20	337.00	1.5	1.5	334.00	4.00	0.136	65	0.088	0.048	23.87	23.87	37.67	Conservative Assumption	40	0.33	48	n/a	n/a
Lot Level Galleries	201-1	Residential (Block 10)	BH429-20 BH206-19	Sand and Gravel	331.00	337.20	337.00	1.5	1.5	334.00	3.00	0.161	65	0.105	0.056	28.26	28.26	44.60	Conservative Assumption	40	0.33	48	n/a	n/a
Lot Level Galleries	201-1	Residential (Block 14)	BH635-22	Sand and Gravel	332.00	337.50	338.55	1.5	1.5	335.55	3.55	0.385	65	0.250	0.135	67.57	67.57	106.64	Conservative Assumption	40	0.33	48	n/a	n/a
Lot Level Galleries	201-2	Residential (Block 1)	BH502-22	Gravelly Silt Till	324.50	336.65	333.90	1.5	1.5	330.90	6.40	0.204	65	0.133	0.071	35.80	35.80	56.51	Conservative Assumption	40	0.33	48	n/a	n/a
1	201-2	Multi-Residential (Block 40)	MW601-22 MW501-22	Sand	321.00	330.70	331.10	0.45	1.41	329.24	8.24	2.084	80	1.667	0.417	467.98	469.08	596.84	TP104-26	70.8	0.56	20	6.25	95.52
2	201-2	Mixed Use (Block 41)	MW516-22 MW606-22	n/a (Fill Area)	322.00	330.90	331.20	0.45	1.41	329.34	7.34	4.122	80	3.298	0.824	925.63	923.34	1164.67	TP104-26	70.8	0.56	20	9.14	128.06
3	201-2	Multi-Residential (Block 39)	MW12-17 MW608-22	Sand	325.00	330.90	331.40	0.45	1.41	329.54	4.54	3.859	80	3.087	0.772	866.57	864.33	1092.98	TP104-26	70.8	0.56	20	7.70	143.24
4	201-2	Mixed Use (Block 42)	n/a (Fill Area)	n/a (Fill Area)	328.00	332.15	332.60	0.45	1.41	330.74	2.74	1.507	80	1.206	0.301	338.41	370.25	472.03	TP104-26	70.8	0.56	18	6.25	76.05
5	201-2	Mixed Use (Block 45)	n/a (Fill Area)	n/a (Fill Area)	329.00	332.90	333.50	0.45	1.41	331.64	2.64	3.069	80	2.455	0.614	689.17	691.42	873.43	TP105-26	70.8	0.56	20	9.14	95.52
Catchment 202																975.83								
Lot Level Galleries	202-1	Residential (Block 23)	MW210-19 BH508-22	Gravelly Silt Till	335.00	337.75	339.30	1.5	1.5	336.30	1.30	0.281	65	0.183	0.098	53.52	53.52	84.48	Conservative Assumption	40	0.33	48	n/a	n/a
Lot Level Galleries	202-1	Residential (Block 24)	MW210-19 BH508-22	Gravelly Silt Till	334.00	339.30	340.75	1.5	1.5	337.75	3.75	0.789	65	0.513	0.276	150.29	150.29	237.20	Conservative Assumption	40	0.33	48	n/a	n/a
Lot Level Galleries	202-1	Residential (Block 25)	MW210-19 BH508-22	Gravelly Silt Till	334.00	341.00	340.75	1.5	1.5	337.75	3.75	0.488	65	0.317	0.171	92.95	92.95	146.71	Conservative Assumption	40	0.33	48	n/a	n/a
6	202-1	Mixed Use (Block 46)	MW11-17 MW308-20	n/a (Fill Area)	330.00	339.50	340.50	0.45	1.41	338.64	8.64	3.024	80	2.419	0.605	679.07	681.26	860.86	TP110-26	70.44	0.56	20	9.14	95.52
Catchment 203																1,973.97								
7	203	Employment (Block 48)	MW605-22	Sandy Silt Till	329.00	336.00	338.00	0.45	1.41	336.14	7.14	1.415	100	1.415	0.000	382.05	383.51	488.72	TP106-26	82.48	0.56	17	6.25	78.22
8	203	Employment (Block 49)	BH519-22	Sandy Silt Till	330.00	336.50	337.50	0.45	1.41	335.64	5.64	2.411	100	2.411	0.000	650.97	652.20	824.34	TP106-26	82.48	0.56	17	9.14	91.18
9	203	Employment (Block 50)	MW4-11, MW1-11 MW217-19, MW3-11	Sand and Gravel	329.00	336.50	337.00	0.45	1.41	335.14	6.14	2.561	100	2.561	0.000	691.47	691.42	873.43	TP109-26	30.04	0.56	47	9.14	95.52
10	203	Employment (Block 51)	n/a (Fill Area)	n/a (Fill Area)	331.00	339.85	340.75	0.45	1.41	338.89	7.89	0.924	100	0.924	0.000	249.48	254.62	325.43	TP110-26	70.44	0.56	19	7.70	43.51

1. Infiltration facilities assume roof capture runoff during the 27mm storm event.
2. In-situ infiltration testing results have been used where available, with the noted test pit reference. A conservative estimate for all other areas of the site, of 40 mm/hr for sandy soils has been assumed. This assumed rate is well below the average measured in-situ infiltration rate across the subject lands.
3. Estimated drawdown time is calculated using Equation 4.3 from the MOE Stormwater Management Planning and Design Manual.
4. Design dimensions for block level galleries (area, depth, etc) based on using ADS DC-780 (1414 mm depth incl. stone). Stone below the ADS chambers is 500mm thick.
5. Design dimensions (area, depth, etc) for lot level infiltration galleries will be determined based on proposed house size.
6. No borehole information in noted locations due to fill operations significantly above existing subgrade.

Guelph Innovation District Subdivision

SWM #1 and SWM #2- End-of-pipe StormTank Infiltration Galleries Sizing

Guelph, Ontario

Project Number: 46927-104
 Date: June 3, 2026
 Design By: ALN/MPW
 File: Q:\46927\104\Water Balance\20mm Criteria\46927-104_Infiltration Gallery Designs - Revised Methodology.xls

SWM #1 - Infiltration Gallery

MOE Infiltration Trench Bottom Area

A=1,000V/(PnDT) MOE SWMP&DM Eq. 4.3

Runoff V (m ³)	7,342
*Inf. Rate P (mm/h)	92.6
Void Ratio (storage) n	0.96
Retention Time t (h)	48
Min Bottom Area A (m ²)	1,720
Provided Surface Contact Area (m2)	2,461
Provided Storage Volume (m3)	4,319
Outflow Rate (m ³ /s)	0.061

Contact Area Calculation

SWM #1-Gallery Size-Minimum Required Contact Area Used for Infiltration

Length (m)	Width (m)	Side Perimeter (m)	Height (m)	Total Contact Area (sq.m)
214	11.46	450.9158879	1.828	2,452

SWM #1-Gallery Size-Provided Contact Area Used for Infiltration

Length	Width	Side Perimeter	Height	Total Contact Area
214	11.5	451	1.828	2,461

Gallery is positioned under the SWM Facility embankment at/below permanent pool elevation to receive by gravity clean water for infiltration.

SWM #2 - Infiltration Gallery

MOE Infiltration Trench Bottom Area

A=1,000V/(PnDT) MOE SWMP&DM Eq. 4.3

Runoff V (m ³)	739
**Inf. Rate P (mm/h)	50.0
Void Ratio (storage) n	0.96
Retention Time t (h)	48
Min Bottom Area A (m ²)	321
Provided Surface Contact Area (m2)	333
Provided Storage Volume (m3)	292
Outflow Rate (m ³ /s)	0.004

Contact Area Calculation

SWM #2-Gallery Size-Minimum Required Contact Area Used for Infiltration

Length (m)	Width (m)	Side Perimeter (m)	Height (m)	Total Contact Area (sq.m)
37	8.97	91.94594595	0.914	332

SWM #2-Gallery Size-Provided Contact Area Used for Infiltration

Length	Width	Side Perimeter	Height	Total Contact Area
37	9	92	0.914	333

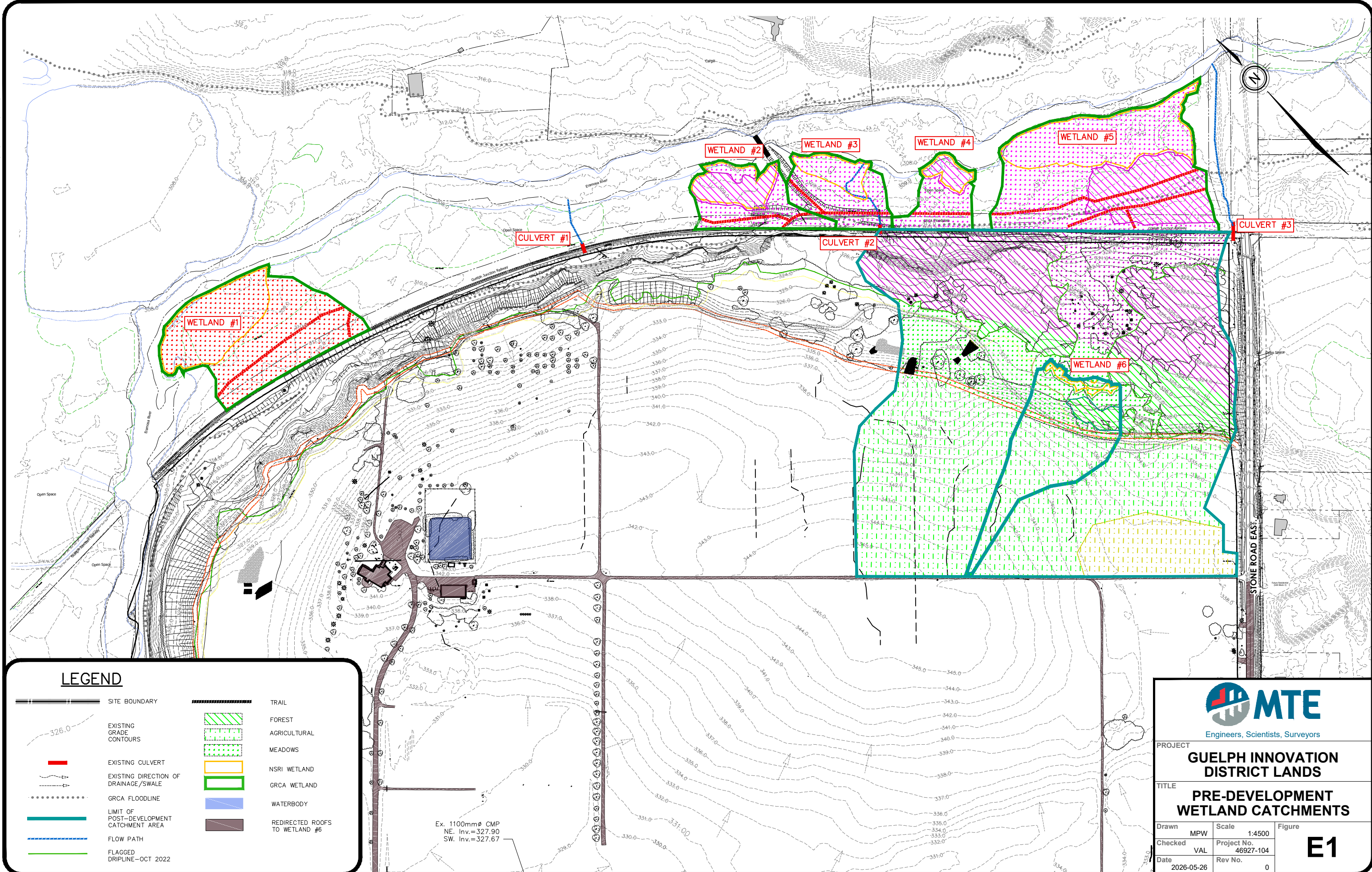
Gallery is positioned under the SWM Facility embankment at/below permanent pool elevation to receive by gravity clean water for infiltration.

Notes: Infiltration gallery is sized based on contact area of the bottom gallery, assuming the installation of Brentwood Stormtank or approved equivalent.

* The infiltration rate for SWMF1 gallery is based on the in-situ test result at TP102-26 (231.6 mm/hr) with an applied 2.5 Safety Factor.

** The in-situ test result at TP111-26 (36.8 mm/hr) was deemed inadequate to achieve 48hr drawdown in the available footprint. It is proposed that material will be replaced under the proposed SWMF2 gallery location during area grading operations to achieve a minimum 50mm/hr infiltration rate.

Wetland Water Balance Calculations



LEGEND

	SITE BOUNDARY		FOREST
	EXISTING GRADE CONTOURS		AGRICULTURAL
	EXISTING CULVERT		MEADOWS
	EXISTING DIRECTION OF DRAINAGE/SWALE		NSRI WETLAND
	GRCA FLOODLINE		GRCA WETLAND
	LIMIT OF POST-DEVELOPMENT CATCHMENT AREA		WATERBODY
	FLOW PATH		REDIRECTED ROOFS TO WETLAND #6
	FLAGGED DRIPLINE-OCT 2022		

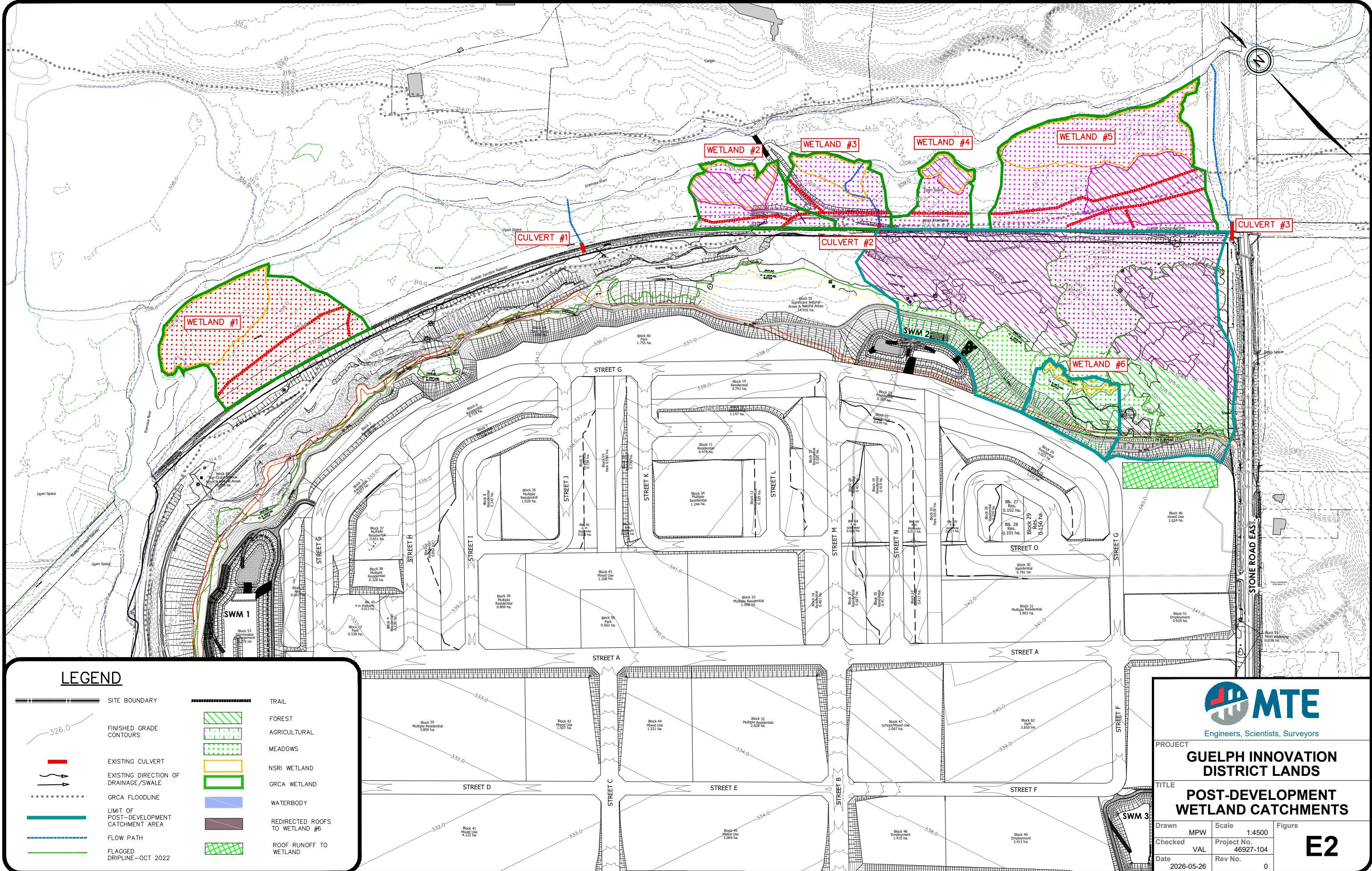


Engineers, Scientists, Surveyors

PROJECT
**GUELPH INNOVATION
DISTRICT LANDS**

TITLE
**PRE-DEVELOPMENT
WETLAND CATCHMENTS**

Drawn	MPW	Scale	1:4500	Figure	E1
Checked	VAL	Project No.	46927-104		
Date	2026-05-26	Rev No.	0		



LEGEND

- | | | | |
|--|--|--|--------------------------------|
| | SITE BOUNDARY | | TRAIL |
| | FINISHED GRADE CONTOURS | | FOREST |
| | EXISTING CULVERT | | AGRICULTURAL |
| | EXISTING DIRECTION OF DRAINAGE/SWALE | | MEADOWS |
| | GRCA FLOODLINE | | NSRI WETLAND |
| | LIMIT OF POST-DEVELOPMENT CATCHMENT AREA | | GRCA WETLAND |
| | FLOW PATH | | WATERBODY |
| | FLAGGED DRIPLINE-OCT 2022 | | REDIRECTED ROOFS TO WETLAND #6 |
| | | | ROOF RUNOFF TO WETLAND |



Engineers, Scientists, Surveyors

PROJECT
GUELPH INNOVATION DISTRICT LANDS
TITLE
POST-DEVELOPMENT WETLAND CATCHMENTS

Drawn	MPW	Scale	1:4500	Figure	E2
Checked	VAL	Project No.	46927-104		
Date	2026-05-26	Rev No.	0		

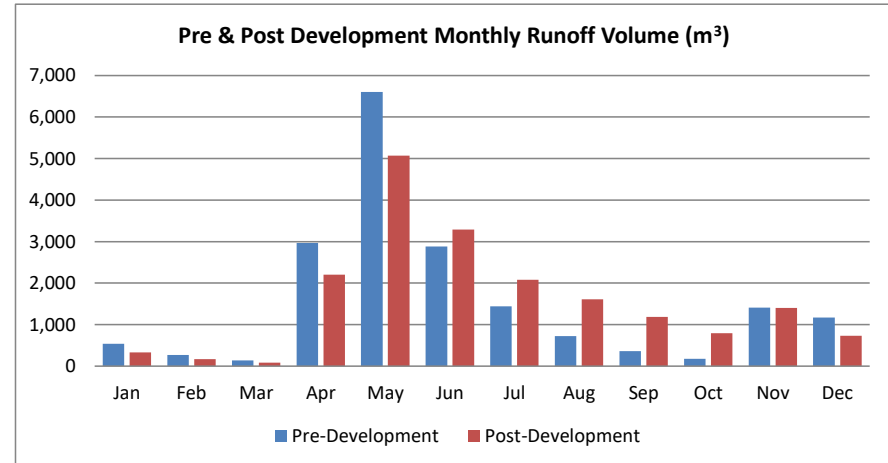
GID LANDS - WETLAND #3
WATER BALANCE (MONTHLY - SURFACE RUNOFF) ANALYSIS
Guelph, Ontario



Project Number: 46927-104
Date: June 3, 2026
Design By: mpw
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Month	Total Runoff Volume (m ³)			
	Pre-development	Post-development	Difference	Change %
Jan	539	334	-205	-38.0
Feb	270	167	-103	-38.0
Mar	135	83	-51	-38.0
Apr	2,964	2,204	-760	-25.6
May	6,603	5,067	-1,535	-23.3
Jun	2,881	3,287	405	14.1
Jul	1,441	2,084	644	44.7
Aug	720	1,610	890	123.5
Sep	360	1,185	825	229.0
Oct	180	790	610	338.6
Nov	1,406	1,399	-8	-0.5
Dec	1,168	731	-437	-37.4
Total	18,667	18,942	274	1.5

Note: Negative sign indicate a decrease under post-development conditions.



GID LANDS - WETLAND #3
WATER BALANCE ANALYSIS
Guelph, Ontario



Project Number: 46927-104
Date: June 3, 2026
Design By: mpw
File: Q:\46927\104\Water Balance\Wetlands\46927-104 Wetland_3_Water Balance(Thorntwaite-Mather).xlsx

PRE-DEVELOPMENT CONDITION

Contributing Catchments:	Wetland #3 / Culvert #2	Soil Type:	Silty sand till	Runoff Factor:	0.38
Contributing Areas:	19.825 ha	Vegetation:	Varies	Evapotranspiration	
Percent Impervious	0.0 %	Topography:	Varies	Factor for Impervious	
Weather Station:	Guelph SWM Master Plan App F Table 4.1	Soil Moisture Retention Capacity:	214 mm	Surfaces:	0.33

Month	Daily Average Temperature (C°)	Monthly Heat Index	Unadjusted Daily PE (mm)	Correction Factor	Adjusted PE (mm)	Average Precipitation (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (mm)	ΔS (mm)	Pervious ET (mm)	Actual ET (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Total Recharge & Runoff (m³)	Total Infiltration Depth (mm)	Total Infiltration Volume (m³)	Actual Runoff (mm)	Runoff Volume (m³)
Jan	-7.4	0.00	0.0	24.3	0.0	57.7	57.7	0.0	338.8	0.0	0.0	0.0	0.0	7.2	0.0	7.2	1,437	4.5	898	2.7	539
Feb	-6.5	0.00	0.0	24.5	0.0	50.9	50.9	0.0	389.7	0.0	0.0	0.0	0.0	3.6	0.0	3.6	719	2.3	449	1.4	270
Mar	-1.7	0.00	0.0	30.6	0.0	61.8	61.8	0.0	451.5	0.0	0.0	0.0	0.0	1.8	0.0	1.8	359	1.1	224	0.7	135
Apr	5.6	1.19	0.9	33.6	29.9	73.4	43.5	0.0	214.3	0.0	29.9	29.9	43.5	22.7	17.2	39.9	7,903	24.9	4,938	15.0	2,964
May	12	3.76	2.0	38.0	74.9	75	0.1	0.0	214.3	0.0	74.9	74.9	0.1	11.4	77.4	88.8	17,601	55.5	10,999	33.3	6,603
Jun	17.1	6.43	2.9	38.6	110.1	75.2	-34.9	-34.9	128.0	-86.3	161.5	161.5	0.0	0.1	38.7	38.7	7,681	24.2	4,800	14.5	2,881
Jul	19.6	7.91	3.3	38.9	127.9	80.4	-47.5	-82.4	118.0	-10.0	90.4	90.4	0.0	0.0	19.3	19.4	3,841	12.1	2,400	7.3	1,441
Aug	18.7	7.37	3.1	36.0	112.7	80.5	-32.2	-114.6	127.0	9.0	112.7	112.7	0.0	0.0	9.7	9.7	1,920	6.1	1,200	3.6	720
Sep	14.6	5.07	2.4	31.2	75.44	75.40	-0.04	-114.6	151.0	24.0	75.4	75.4	0.0	0.0	4.8	4.8	960	3.0	600	1.8	360
Oct	8.5	2.23	1.4	28.5	39.2	71	31.8	0.0	182.8	31.8	39.2	39.2	0.0	0.0	2.4	2.4	480	1.5	300	0.9	180
Nov	2.5	0.35	0.4	24.2	9.3	76.2	66.9	0.0	214.3	31.5	9.3	9.3	35.4	17.7	1.2	18.9	3,749	11.8	2,343	7.1	1,406
Dec	-3.7	0.00	0.0	23.0	0.0	66.8	66.8	0.0	281.1	0.0	0.0	0.0	0.0	14.5	1.2	15.7	3,114	9.8	1,946	5.9	1,168
Total		34.3	16.3		579.3	844.3	265.0				593.3		79.1	79.1	172.0	251.0	49,764	156.9	31,097	94.2	18,667

Note: P - Precipitation, PE - Potential Evapotranspiration, ΔS- Change in Soil Moisture Storage, ET - Evapotranspiration

GID LANDS - WETLAND #3
WATER BALANCE ANALYSIS
Guelph, Ontario



Project Number: 46927-104
Date: June 3, 2026
Design By: mpw
File: Q:\46927\104\Water Balance\Wetlands\46927-104 Wetland_3_Water Balance(Thorntwaite-Mather).xlsx

POST-DEVELOPMENT CONDITION

Contributing Catchments: Wetland #3 / Culvert #2

Contributing Areas: 9.961 ha

Percent Impervious: 1.1 %

Weather Station: Guelph SWM Master Plan App F Table 4.1

Soil Type: Silty sand till

Vegetation: Varies

Topography: Varies

Soil Moisture Retention Capacity: 243 mm

Runoff Factor: 0.29

Evapotranspiration Factor for Impervious Surfaces: 0.33

0.71

Month	Daily Average Temperature (C°)	Monthly Heat Index	Unadjusted Daily PE (mm)	Correction Factor	Adjusted PE (mm)	Average Precipitation (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (mm)	ΔS (mm)	Pervious ET (mm)	Actual ET (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Total Recharge & Runoff (m³)	Total Infiltration Depth (mm)	Total Infiltration Volume (m³)	Actual Runoff Volume (mm)	Actual Runoff (m³)
Jan	-7.4	0.00	0.0	24.3	0.0	57.7	57.7	0.0	367.3	0.0	0.0	0.0	0.0	4.4	0.0	4.4	434	3.1	308	1.3	126
Feb	-6.5	0.00	0.0	24.5	0.0	50.9	50.9	0.0	418.2	0.0	0.0	0.0	0.0	2.2	0.0	2.2	217	1.5	154	0.6	63
Mar	-1.7	0.00	0.0	30.6	0.0	61.8	61.8	0.0	480.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	108	0.8	77	0.3	32
Apr	5.6	1.19	0.9	33.6	29.9	73.4	43.5	0.0	242.8	0.0	29.9	29.7	43.7	22.4	17.0	39.4	3,926	27.9	2,784	11.5	1,142
May	12	3.76	2.0	38.0	74.9	75.0	0.1	0.0	242.8	0.0	74.9	74.3	0.7	11.5	76.5	88.0	8,769	62.4	6,218	25.6	2,551
Jun	17.1	6.43	2.9	38.6	110.1	75.2	-34.9	-34.9	154.0	-88.8	164.0	162.8	1.2	6.4	38.2	44.6	4,445	31.6	3,152	13.0	1,293
Jul	19.6	7.91	3.3	38.9	127.9	80.4	-47.5	-82.4	143.0	-11.0	91.4	90.7	0.7	3.5	19.1	22.7	2,256	16.1	1,600	6.6	656
Aug	18.7	7.37	3.1	36.0	112.7	80.5	-32.2	-114.6	153.0	10.0	112.7	111.9	0.8	2.2	9.6	11.7	1,170	8.3	829	3.4	340
Sep	14.6	5.07	2.4	31.2	75.4	75.4	0.0	-114.6	178.0	25.0	75.4	74.9	0.6	1.4	4.8	6.2	613	4.4	434	1.8	178
Oct	8.5	2.23	1.4	28.5	39.2	71.0	31.8	0.0	209.8	31.8	39.2	38.9	0.3	0.8	2.4	3.2	321	2.3	227	0.9	93
Nov	2.5	0.35	0.4	24.2	9.3	76.2	66.9	0.0	242.8	33.0	9.3	9.2	34.0	17.4	1.2	18.6	1,854	13.2	1,315	5.4	539
Dec	-3.7	0.00	0.0	23.0	0.0	66.8	66.8	0.0	309.6	0.0	0.0	0.0	0.0	8.7	1.2	9.9	986	7.0	699	2.9	287
Total		34.3	16.3		579.3	844.3	265.0				592.3		82.0	82.0	170.0	252.0	25,098	178.7	17,797	73.3	7,302

Note: P - Precipitation, PE - Potential Evapotranspiration, ΔS- Change in Soil Moisture Storage, ET - Evapotranspiration

GID LANDS - WETLAND #3
WATER BALANCE ANALYSIS
Guelph, Ontario



Project Number: 46927-104
Date: June 3, 2026
Design By: mpw
File: Q:\46927\104\Water Balance\Wetlands\46927-104 Wetland_3_ Water Balance(Thornthwaite-Mather).xlsx

POST-DEVELOPMENT CONDITION

Contributing Catchments: SWMF2 (202-1) Soil Type: Silty sand till Runoff Factor 0.81
Contributing Areas: 10.160 ha Vegetation: Lawn Evapotranspiration
Percent Impervious 66.0 % Topography: Flat Factor for Impervious Surfaces 0.33 0.19
Weather Station: Guelph SWM Master Plan App F Table 4.1 Soil Moisture Retention Capacity 125 mm

																						% to INF	73%
Month	Daily Average Temperature	Monthly Heat Index	Unadjusted Daily PE	Correction Factor	Adjusted PE	Average Precipitation	P-PE	Accum. Pot. Water Loss	Storage	ΔS	Pervious ET	Actual ET	Moisture Surplus	Water Runoff	Snow Melt Runoff	Total Recharge & Runoff	Total Recharge & Runoff	Total Infiltration Depth	Total Infiltration Volume	Actual Runoff Volume	Actual Runoff	SWMF2 Infiltration Volume	SWMF2 Runoff Volume
	(C°)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m³)	(mm)	(m³)	(mm)	(m³)	(m³)	(m³)
Jan	-7.4	0.00	0.0	24.3	0.0	57.7	57.7	0.0	249.5	0.0	0.0	0.0	0.0	9.3	0.0	9.3	947	1.7	177	7.6	770	562	208
Feb	-6.5	0.00	0.0	24.5	0.0	50.9	50.9	0.0	300.4	0.0	0.0	0.0	0.0	4.7	0.0	4.7	473	0.9	89	3.8	385	281	104
Mar	-1.7	0.00	0.0	30.6	0.0	61.8	61.8	0.0	362.2	0.0	0.0	0.0	0.0	2.3	0.0	2.3	237	0.4	44	1.9	192	140	52
Apr	5.6	1.19	0.9	33.6	29.9	73.4	43.5	0.0	125.0	0.0	29.9	16.7	56.7	29.5	18.1	47.6	4,839	8.9	905	38.7	3,934	2,872	1,062
May	12	3.76	2.0	38.0	74.9	75.0	0.1	0.0	125.0	0.0	74.9	41.8	33.2	31.4	81.4	112.8	11,462	21.1	2,143	91.7	9,319	6,803	2,516
Jun	17.1	6.43	2.9	38.6	110.1	75.2	-34.9	-34.9	51.0	-74.0	149.2	83.2	66.0	48.7	40.7	89.4	9,083	16.7	1,698	72.7	7,384	5,391	1,994
Jul	19.6	7.91	3.3	38.9	127.9	80.4	-47.5	-82.4	44.0	-7.0	87.4	48.8	38.6	43.7	20.4	64.0	6,505	12.0	1,216	52.1	5,288	3,860	1,428
Aug	18.7	7.37	3.1	36.0	112.7	80.5	-32.2	-114.6	54.0	10.0	112.7	62.9	49.8	46.7	10.2	56.9	5,784	10.6	1,082	46.3	4,702	3,433	1,270
Sep	14.6	5.07	2.4	31.2	75.4	75.4	0.0	-114.6	68.0	14.0	75.4	42.1	33.4	40.1	5.1	45.1	4,587	8.4	858	36.7	3,729	2,722	1,007
Oct	8.5	2.23	1.4	28.5	39.2	71.0	31.8	0.0	99.8	31.8	39.2	21.9	17.3	28.7	2.5	31.2	3,173	5.8	593	25.4	2,580	1,883	697
Nov	2.5	0.35	0.4	24.2	9.3	76.2	66.9	0.0	125.0	25.2	9.3	5.2	45.8	37.3	1.3	38.5	3,916	7.2	732	31.3	3,184	2,324	860
Dec	-3.7	0.00	0.0	23.0	0.0	66.8	66.8	0.0	191.8	0.0	0.0	0.0	0.0	18.6	1.3	19.9	2,023	3.7	378	16.2	1,644	1,200	444
Total		34.3	16.3		579.3	844.3	265.0				322.4		341.0	341.0	181.0	521.9	53,028	97.6	9,916	424.3	43,112	31,471	11,640

Note: P - Precipitation, PE - Potential Evapotranspiration, ΔS- Change in Soil Moisture Storage, ET - Evapotranspiration

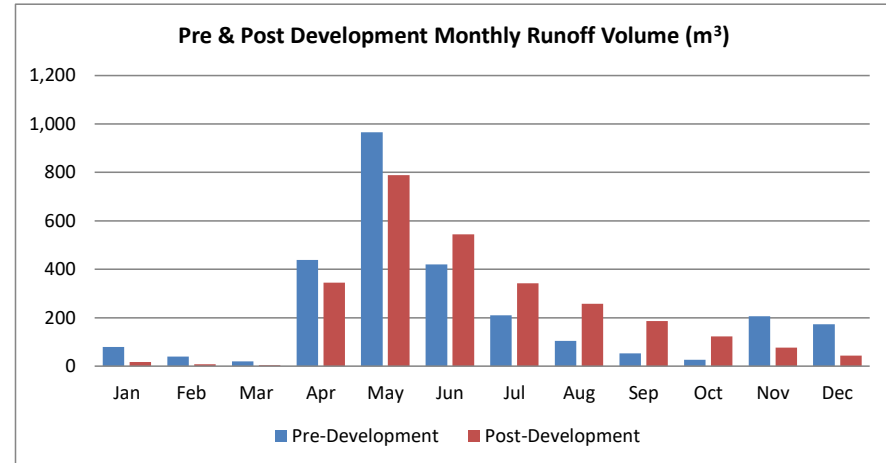
GID LANDS - WETLAND #6
WATER BALANCE (MONTHLY - SURFACE RUNOFF) ANALYSIS
Guelph, Ontario



Project Number: 46927-104
Date: June 3, 2026
Design By: mpw
File: Q:\46927\104\Water Balance\Wetlands\46927-104 Wetland_6_Water Balance(Thorntwaite-Mather).xlsx

Month	Total Runoff Volume (m ³)			
	Pre-development	Post-development	Difference	Change %
Jan	80	17	-63	-79.1
Feb	40	8	-31	-79.1
Mar	20	4	-16	-79.1
Apr	439	345	-94	-21.5
May	965	789	-176	-18.3
Jun	420	545	125	29.8
Jul	210	342	132	63.0
Aug	105	257	152	144.9
Sep	52	186	134	254.6
Oct	26	123	97	368.5
Nov	206	76	-129	-62.9
Dec	172	43	-129	-75.0
Total	2,735	2,735	0	0.0

Note: Negative sign indicate a decrease under post-development conditions.



GID LANDS - WETLAND #6
WATER BALANCE ANALYSIS
Guelph, Ontario



Project Number: 46927-104
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PRE-DEVELOPMENT CONDITION

Contributing Catchments: Wetland #6
Contributing Areas: 2.184 ha
Percent Impervious: 0.0 %
Weather Station: Guelph SWM Master Plan App F Table 4.1
Soil Type: Silty sand till
Vegetation: Varies
Topography: Varies
Soil Moisture Retention Capacity: 234 mm
Runoff Factor: 0.51
Evapotranspiration Factor for Impervious Surfaces: 0.33

Month	Daily Average Temperature (C°)	Monthly Heat Index	Unadjusted Daily PE (mm)	Correction Factor	Adjusted PE (mm)	Average Precipitation (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (mm)	ΔS (mm)	Pervious ET (mm)	Actual ET (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Total Recharge & Runoff (m³)	Total Infiltration Depth (mm)	Total Infiltration Volume (m³)	Actual Runoff (mm)	Runoff Volume (m³)
Jan	-7.4	0.00	0.0	24.3	0.0	57.7	57.7	0.0	358.7	0.0	0.0	0.0	0.0	7.1	0.0	7.1	156	3.5	76	3.6	80
Feb	-6.5	0.00	0.0	24.5	0.0	50.9	50.9	0.0	409.6	0.0	0.0	0.0	0.0	3.6	0.0	3.6	78	1.7	38	1.8	40
Mar	-1.7	0.00	0.0	30.6	0.0	61.8	61.8	0.0	471.4	0.0	0.0	0.0	0.0	1.8	0.0	1.8	39	0.9	19	0.9	20
Apr	5.6	1.19	0.9	33.6	29.9	73.4	43.5	0.0	234.2	0.0	29.9	29.9	43.5	22.7	16.7	39.3	859	19.3	420	20.1	439
May	12	3.76	2.0	38.0	74.9	75	0.1	0.0	234.2	0.0	74.9	74.9	0.1	11.4	75.1	86.5	1,890	42.3	925	44.2	965
Jun	17.1	6.43	2.9	38.6	110.1	75.2	-34.9	-34.9	146.0	-88.2	163.4	163.4	0.0	0.1	37.6	37.6	822	18.4	402	19.2	420
Jul	19.6	7.91	3.3	38.9	127.9	80.4	-47.5	-82.4	132.0	-14.0	94.4	94.4	0.0	0.0	18.8	18.8	411	9.2	201	9.6	210
Aug	18.7	7.37	3.1	36.0	112.7	80.5	-32.2	-114.6	145.0	13.0	112.7	112.7	0.0	0.0	9.4	9.4	205	4.6	100	4.8	105
Sep	14.6	5.07	2.4	31.2	75.44	75.40	-0.04	-114.6	170.0	25.0	75.4	75.4	0.0	0.0	4.7	4.7	103	2.3	50	2.4	52
Oct	8.5	2.23	1.4	28.5	39.2	71	31.8	0.0	201.8	31.8	39.2	39.2	0.0	0.0	2.3	2.4	51	1.2	25	1.2	26
Nov	2.5	0.35	0.4	24.2	9.3	76.2	66.9	0.0	234.2	32.4	9.3	9.3	34.5	17.3	1.2	18.4	403	9.0	197	9.4	206
Dec	-3.7	0.00	0.0	23.0	0.0	66.8	66.8	0.0	301.0	0.0	0.0	0.0	0.0	14.3	1.2	15.5	337	7.6	165	7.9	172
Total		34.3	16.3		579.3	844.3	265.0				599.1		78.2	78.2	167.0	245.2	5,354	119.9	2,620	125.2	2,735

Note: P - Precipitation, PE - Potential Evapotranspiration, ΔS- Change in Soil Moisture Storage, ET - Evapotranspiration

GID LANDS - WETLAND #6
WATER BALANCE ANALYSIS
Guelph, Ontario



Project Number: 46927-104
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POST-DEVELOPMENT CONDITION

Contributing Catchments:	Wetland #6	Soil Type:	Silty sand till	Runoff Factor	0.66
Contributing Areas:	1.261 ha	Vegetation:	Varies	Evapotranspiration	
Percent Impervious	27.5 %	Topography:	Varies	Factor for Impervious	
Weather Station:	Guelph SWM Master Plan App F Table 4.1	Soil Moisture Retention Capacity	282 mm	Surfaces	0.33 0.34

Month	Daily Average Temperature (C°)	Monthly Heat Index	Unadjusted Daily PE (mm)	Correction Factor	Adjusted PE (mm)	Average Precipitation (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (mm)	ΔS (mm)	Pervious ET (mm)	Actual ET (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Total Recharge & Runoff (m³)	Total Infiltration Depth (mm)	Total Infiltration Volume (m³)	Actual Runoff Volume (mm)	Actual Runoff (m³)
Jan	-7.4	0.00	0.0	24.3	0.0	57.7	57.7	0.0	406.3	0.0	0.0	0.0	0.0	2.0	0.0	2.0	25	0.7	9	1.3	17
Feb	-6.5	0.00	0.0	24.5	0.0	50.9	50.9	0.0	457.2	0.0	0.0	0.0	0.0	1.0	0.0	1.0	13	0.3	4	0.7	8
Mar	-1.7	0.00	0.0	30.6	0.0	61.8	61.8	0.0	519.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	6	0.2	2	0.3	4
Apr	5.6	1.19	0.9	33.6	29.9	73.4	43.5	0.0	281.8	0.0	29.9	24.4	49.0	24.8	16.9	41.7	525	14.3	181	27.3	345
May	12	3.76	2.0	38.0	74.9	75.0	0.1	0.0	281.8	0.0	74.9	61.1	13.9	19.4	76.0	95.4	1,203	32.8	414	62.5	789
Jun	17.1	6.43	2.9	38.6	110.1	75.2	-34.9	-34.9	160.0	-121.8	197.0	160.7	36.3	27.8	38.0	65.9	831	22.7	286	43.2	545
Jul	19.6	7.91	3.3	38.9	127.9	80.4	-47.5	-82.4	149.0	-11.0	91.4	74.5	16.9	22.4	19.0	41.4	522	14.2	180	27.1	342
Aug	18.7	7.37	3.1	36.0	112.7	80.5	-32.2	-114.6	159.0	10.0	112.7	91.9	20.8	21.6	9.5	31.1	392	10.7	135	20.4	257
Sep	14.6	5.07	2.4	31.2	75.4	75.4	0.0	-114.6	185.0	26.0	75.4	61.5	13.9	17.7	4.8	22.5	284	7.7	98	14.7	186
Oct	8.5	2.23	1.4	28.5	39.2	71.0	31.8	0.0	216.8	31.8	39.2	32.0	7.2	12.5	2.4	14.9	187	5.1	65	9.7	123
Nov	2.5	0.35	0.4	24.2	9.3	76.2	66.9	0.0	281.8	65.0	9.3	7.6	3.6	8.1	1.2	9.2	117	3.2	40	6.1	76
Dec	-3.7	0.00	0.0	23.0	0.0	66.8	66.8	0.0	348.6	0.0	0.0	0.0	0.0	4.0	1.2	5.2	66	1.8	23	3.4	43
Total		34.3	16.3		579.3	844.3	265.0				513.6		161.7	161.7	169.0	330.7	4,171	113.8	1,436	216.8	2,735

Note: P - Precipitation, PE - Potential Evapotranspiration, ΔS- Change in Soil Moisture Storage, ET - Evapotranspiration

Appendix F

Lot / Block Level SWM Criteria

Guelph Innovation District
Summary of Lot / Block Level SWM Criteria
City of Guelph



Date: June 10, 2026
Project: 46927-104
File: Q:\46927\104\Water Balance\27mm Criteria\46927-104_Infiltration Gallery Designs - Revised Methodology.xls

Locations referenced from Draft Plan dated May 28, 2026 by MHBC Planning Ltd.

Lot / Block Level SWM Criteria

Location	Size (ha.)	Quality Control			Quantity Control	Infiltration	
		Criteria	Provided Via	Block Level Treatment	Provided Via	Infiltration Target	Provided Via
Catchment 201							
Block 1 Residential	0.667	Enhanced	SWMF1	n/a	SWMF1	27mm	Rear Yard Galleries
Block 2 Residential	0.760	Enhanced	SWMF1	n/a	SWMF1	27mm	Rear Yard Galleries
Block 3 Residential	0.677	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 4 Residential	0.226	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 5 Residential	0.862	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 6 Residential	0.718	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 7 Residential	1.358	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 8 Residential	0.347	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 9 Residential	0.738	Enhanced	SWMF1	n/a	SWMF1	27mm	Rear Yard Galleries / SWMF1 Gallery
Block 10 Residential	0.738	Enhanced	SWMF1	n/a	SWMF1	27mm	Rear Yard Galleries / SWMF1 Gallery
Block 11 Residential	0.478	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 12 Residential	0.329	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 13 Residential	1.147	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 14 Residential	0.741	Enhanced	SWMF1	n/a	SWMF1	27mm	Rear Yard Galleries / SWMF1 Gallery
Block 15 Residential	0.591	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 16 Residential	0.401	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 17 Residential	0.417	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 18 Residential	0.433	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 19 Residential	0.419	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 20 Residential	0.417	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery

Lot / Block Level SWM Criteria

Location	Size (ha.)	Quality Control			Quantity Control	Infiltration	
		Criteria	Provided Via	Block Level Treatment	Provided Via	Infiltration Target	Provided Via
Block 21 Residential	0.417	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 22 Residential	0.838	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 32 Multi-Residential	2.828	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 33 Multi-Residential	1.998	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 34 Multi-Residential	1.244	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 35 Multi-Residential	1.021	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 36 Multi-Residential	0.809	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 37 Multi-Residential	0.651	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 38 Multi-Residential	0.328	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 39 Multi-Residential	3.859	Enhanced	SWMF1	OGS before Gallery	SWMF1	27mm	Block Level Gallery
Block 40 Multi-Residential	2.084	Enhanced	SWMF1	OGS before Gallery	SWMF1	27mm	Block Level Gallery
Block 41 Multi-Residential	4.122	Enhanced	SWMF1	OGS before Gallery	SWMF1	27mm	Block Level Gallery
Block 42 Multi-Residential	1.507	Enhanced	SWMF1	OGS before Gallery	SWMF1	27mm	Block Level Gallery
Block 43 Multi-Residential	2.208	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 44 Mixed Use	1.521	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Block 45 Mixed Use	3.069	Enhanced	SWMF1	OGS before Gallery	SWMF1	27mm	Block Level Gallery
Block 47 School / Mixed Use	2.067	Enhanced	SWMF1	n/a	SWMF1	27mm	SWMF1 Gallery
Catchment 202							
Block 23 Residential	0.367	Enhanced	SWMF1	n/a	SWMF1	27mm	Rear Yard Galleries / SWMF1 Gallery
Block 24 Residential	1.023	Enhanced	SWMF2	n/a	SWMF2	27mm	Rear Yard Galleries / SWMF1 Gallery
Block 25 Residential	1.237	Enhanced	SWMF2	n/a	SWMF2	27mm	Rear Yard Galleries / SWMF1 Gallery
Block 26 Residential	0.239	Enhanced	SWMF2	n/a	SWMF2	27mm	SWMF2 Gallery
Block 27 Residential	0.102	Enhanced	SWMF2	n/a	SWMF2	27mm	SWMF2 Gallery
Block 28 Residential	0.101	Enhanced	SWMF2	n/a	SWMF2	27mm	SWMF2 Gallery
Block 29 Residential	0.156	Enhanced	SWMF2	n/a	SWMF2	27mm	SWMF2 Gallery

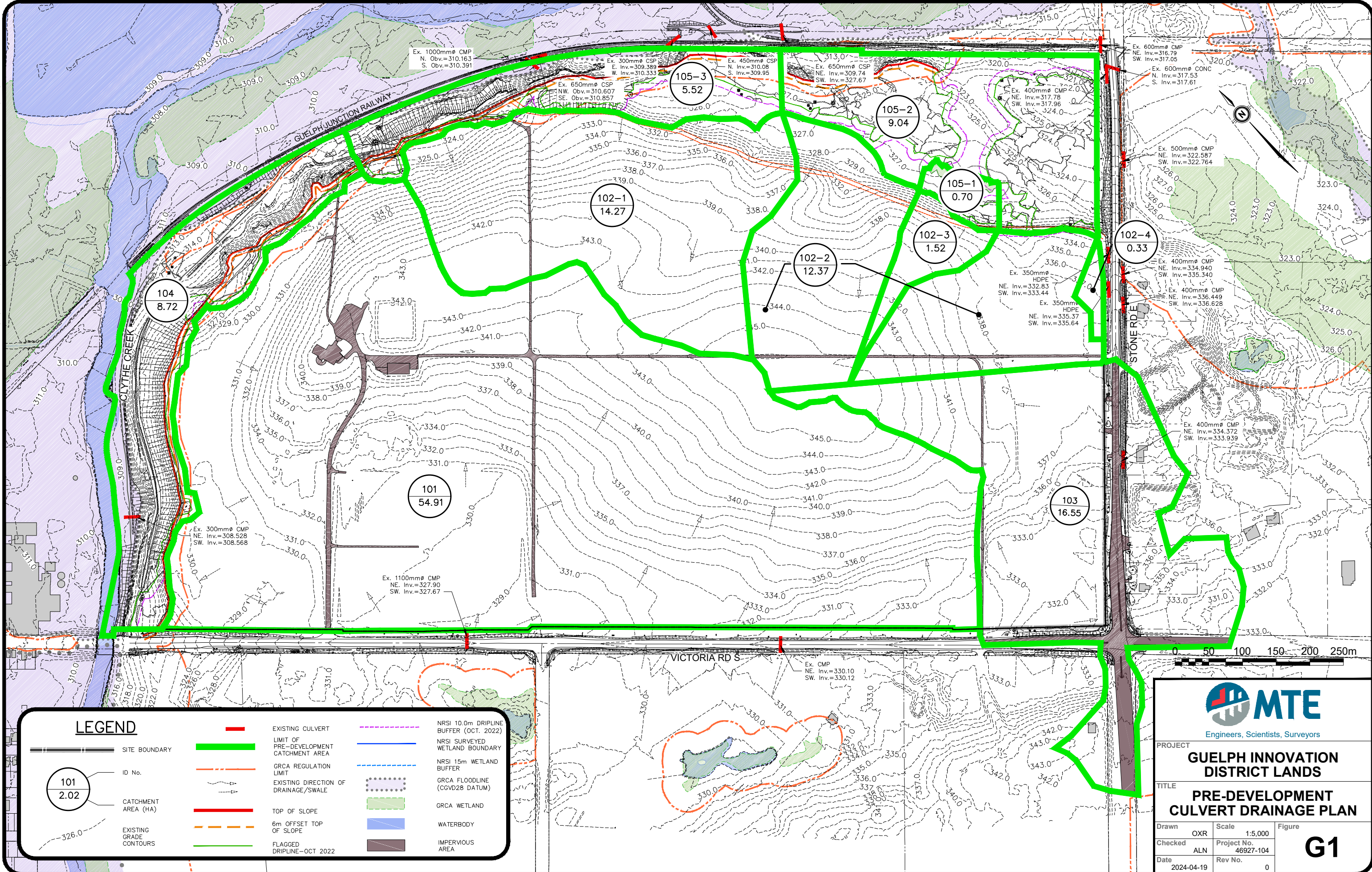
Lot / Block Level SWM Criteria

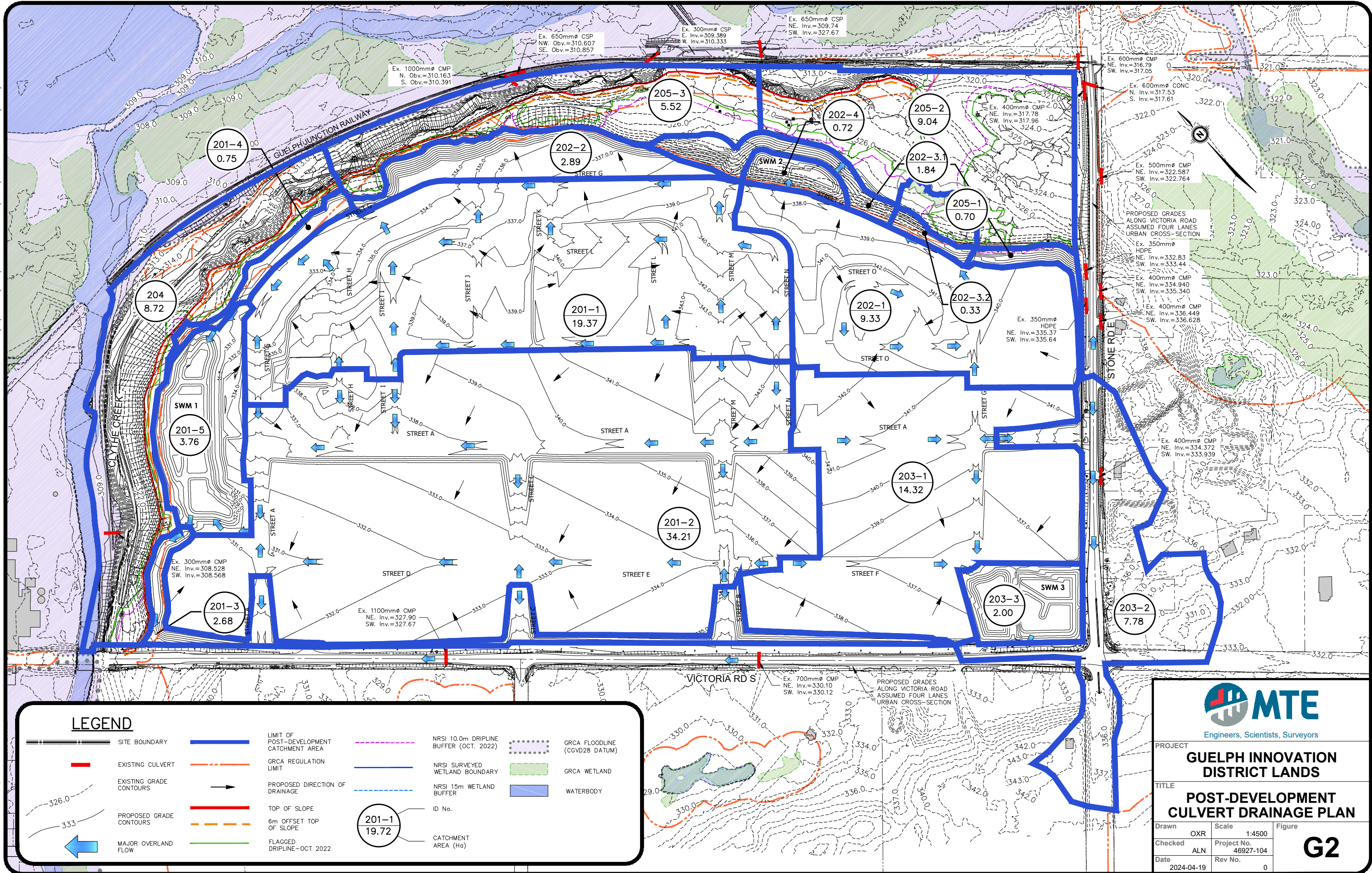
Location	Size (ha.)	Quality Control			Quantity Control	Infiltration	
		Criteria	Provided Via	Block Level Treatment	Provided Via	Infiltration Target	Provided Via
Block 30 Residential	0.781	Enhanced	SWMF2	n/a	SWMF2	27mm	SWMF2 Gallery
Block 46 Mixed Use	3.024	Enhanced	SWMF2	n/a	SWMF2 + ~0.227ha. of roof area to Wetland 6	27mm	SWMF2 Gallery
Catchment 203							
Block 31 Multi-Residential	1.903	Enhanced	SWMF3	n/a	SWMF3	27mm	SWMF3 Infiltration Cell
Block 48 Employment	1.415	Enhanced	SWMF3	OGS before Gallery	SWMF3	27mm	Block Level Gallery
Block 49 Employment	2.411	Enhanced	SWMF3	OGS before Gallery	SWMF3	27mm	Block Level Gallery
Block 50 Employment	2.561	Enhanced	SWMF3	OGS before Gallery	SWMF3	27mm	Block Level Gallery
Block 51 Employment	0.924	Enhanced	SWMF3	OGS before Gallery	SWMF3	27mm	Block Level Gallery

Appendix G

Existing Condition Analysis

EXISTING CULVERT DRAINAGE ANALYSIS





GID
EXISTING CULVERT ANALYSIS
Guelph, Ontario

Project Number: 46927-104
Date: June 11, 2026
Design By: MPW
File: Q:\46927\104\SWMI\Existing Culvert Analysis\Culvert Capacity Rough Sizing.xlsx

Existing Culvert:	Trail	Rail
Diameter (mm):	650	1800 (Box)
Length (m):	18	7
Trail/Rail Elevation (m):	311.40	313.00
Upstream Invert (m):	310.32	310.36
Slope (%):	3.4	0.5
Material:	CSP	Concrete
Design Criteria:	25 year	100 year
(per MTO B-100 Directive)		

Existing 650mm dia. CSP Culvert - Pre Development Conditions					
Design Storm	Flow (m3/s)	Culvert Flow (m3/s)	(m3/s)	HW Elevation (m)	
5	0.649	0.5142	0.1363	311.42	
25	1.680	0.5346	1.1490	311.46	Design Storm
100	2.768	0.5488	2.2246	311.5	

1. Design flows are modelled in PCSWMM using City of Guelph Design storms
2. Assumed flows from catchments 102-2 and 105-2 to culvert as per Figure E1

Existing 650mm dia. Culvert - Post Development Conditions					
Design Storm	Flow (m3/s)	Culvert Flow (m3/s)	(m3/s)	HW Elevation (m)	
5	0.428	0.4280	0.0000	311.23	
25	1.357	0.5295	0.8309	311.45	Design Storm
100	2.419	0.5446	1.8775	311.49	

1. Design flows are modelled in PCSWMM using City of Guelph Design storms
2. Assumed flows from catchments 202-1, 202-3.1, 202-4, and 205-2 as per Figure E2

Existing 1800m Concrete Box Culvert - Pre Development Conditions					
Design Storm	Flow (m3/s)	Culvert Flow (m3/s)	(m3/s)	HW Elevation (m)	
5	0.649	0.6490	0.0000	310.69	
25	1.680	1.6800	0.0000	311.02	
100	2.768	2.7680	0.0000	311.30	Design Storm

1. Design flows are modelled in PCSWMM using City of Guelph Design storms
2. Assumed flows from catchments 102-2 and 105-2 to culvert as per Figure E1

Existing 1800m Concrete Box Culvert - Post Development Conditions					
Design Storm	Flow (m3/s)	Culvert Flow (m3/s)	(m3/s)	HW Elevation (m)	
5	0.428	0.4280	0.0000	310.6	
25	1.357	1.3570	0.0000	310.93	
100	2.419	2.4190	0.0000	311.22	Design Storm

1. Design flows are modelled in PCSWMM using City of Guelph Design storms
2. Assumed flows from catchments 202-1, 202-3.1, 202-4, and 205-2 as per Figure E2



Ministry of
Transportation and
Communications

MINISTRY DIRECTIVE

Program: Provincial Roads

Directive: B-100

Issuing Authority: Executive Director, Highway Engineering Division

Date of Issue: 80 10 16 Effective Date: Immediate

TO: Assistant Deputy Ministers, Executive Directors, Regional Directors, Directors, District Engineers,
Regional Managers Drivers and Vehicles, Office Managers

SUBJECT: M.T.C. Design Flood Criteria

ALTERNATIVE INDEX LISTING(S): Design Floods, Design Storms, Flood Criteria,
Hydrologic Criteria for Bridges and Other
Drainage Facilities.

REFERENCE: - Ministry of Natural Resources "Provincial Flood Plain
Criteria" as approved by Cabinet, 1979 11 02.
- "Proposed Model Policies for Urban Drainage Management",
December 1978, produced by Urban Drainage Subcommittee of
the Canada-Ontario Agreement on Great Lakes Water Quality.
- Previous statements of M.T.C. flood criteria are hereby
cancelled and superseded.

PURPOSE

To state M.T.C. policy on flood criteria for the design of highway
structures and other drainage facilities.

BACKGROUND

A need was identified in 1971 for improved M.T.C. design flood criteria.
Later, R.E.C.A.P. 11:8 recommended that meetings be held with the Ministry
of Natural Resources (M.N.R.) to discuss the effects of its drainage policy
on the cost of road drainage facilities. This was done in July 1979.

In the interim, the Ministry had been using design flood criteria which were
agreed to by M.N.R. until such time as Cabinet had approved M.N.R.'s own
Provincial Flood Plain Criteria. The provincial criteria were approved in
November 1979, and the final M.T.C. criteria were subsequently agreed to by
M.N.R. in February 1980.

The M.T.C. criteria take account of M.T.C.'s own needs, those of the M.N.R.
and those expressed in the Proposed Model Policies for Urban Drainage
Management, which are supported by the Ministry of the Environment.

POLICY AND PROCEDURE

The attached M.T.C. Design Flood Criteria will be used for the hydraulic
design of M.T.C. water crossings, storm sewers and other drainage facilities.

In cases where a Regional Office is unable to agree with a Conservation
Authority or with M.N.R. on mutually acceptable design flood criteria, an
opinion and technical support will be obtained from the Drainage and
Hydrology Section. If agreement still cannot be reached, the problem will be
resolved by discussions between the M.T.C. Highway Engineering Division and
the M.N.R. Conservation Authorities Branch.

M.T.C. DESIGN FLOOD CRITERIA

ROAD CLASSIFICATION ¹	BRIDGES & CULVERTS		STORM DRAINAGE SYSTEM ²		STREAM CHANNELS
	Total span ⁶ up to 6.0 m	Total span ⁴ over 6.0 m	Minor System ⁸	Major System ⁸	
Freeway Urban Arterial	50 year	100 year	10 year	Regional Flood	10 year ⁹
Rural Arterial Collector Road	25 year	50 year	2 to 5 year	Regional Flood	2 to 5 year ⁹
Local Road	10 year	25 year	2 year	Regional Flood	2 year ⁹
Depressed roadways (subways etc)	-	-	10 to 25 year	-	-

NOTES

1. Drainage facilities for provincial highways shall be designed to the criteria shown, except as provided below.
2. Design floods for bridges and culverts shall be based on runoff conditions anticipated 20 years from the time of design, taking full account of present and probable future municipal controls over increases of runoff from new development.

Design floods for storm drainage systems shall normally be based on existing runoff conditions, but, at the request of the municipality concerned, and subject to the Ministry's cost sharing policies, may be based on the 20-year period as for bridges and culverts.

3. The criteria may be modified in exceptional cases, such as for unusually large structures, unusually low traffic volumes, or for vital routes which must remain useable during regional flood conditions. Use of regional flood criteria in the latter case shall be justified by a cost-benefit analysis.

4. REGIONAL FLOODS

If a drainage facility designed to the criteria specified in the table would increase flooding of buildings or developable land during a regional flood, the facility shall be designed to the regional flood criteria unless otherwise approved. The overall benefit (tangible and intangible) of designing to the regional flood shall be commensurate with the additional cost of the facility, and the proposal should be discussed with the municipality and with landowners adversely affected.

A regional flood is a design flood specified by the Ministry of Natural Resources for floodplain management purposes. Regional storms for specific regions are indicated on the attached map.

For the purposes of these criteria, buildings are defined as residential, commercial, institutional or industrial buildings or buildings of comparable value. Developable land is defined as land on which there is a high probability that buildings will be constructed within 20 years of design of the facility.

Relief flow over the roadway during regional floods shall be provided wherever feasible at bridge or culvert crossings required to accommodate such floods.

In a storm drainage system required to accommodate a regional flood, flows exceeding the capacity of the minor system shall be accommodated by the major system.

5. Road classifications are defined as follows.

Freeway a fully-controlled-access road exclusively for through traffic.

Arterial Road . . a road primarily for through traffic.

Collector Road . . a road on which traffic movement and access to property have similar importance.

Local Road . . . a road primarily for access to property.

If the road classification is likely to be upgraded or downgraded within 5 years of construction, the return period shall be that for the future classification.

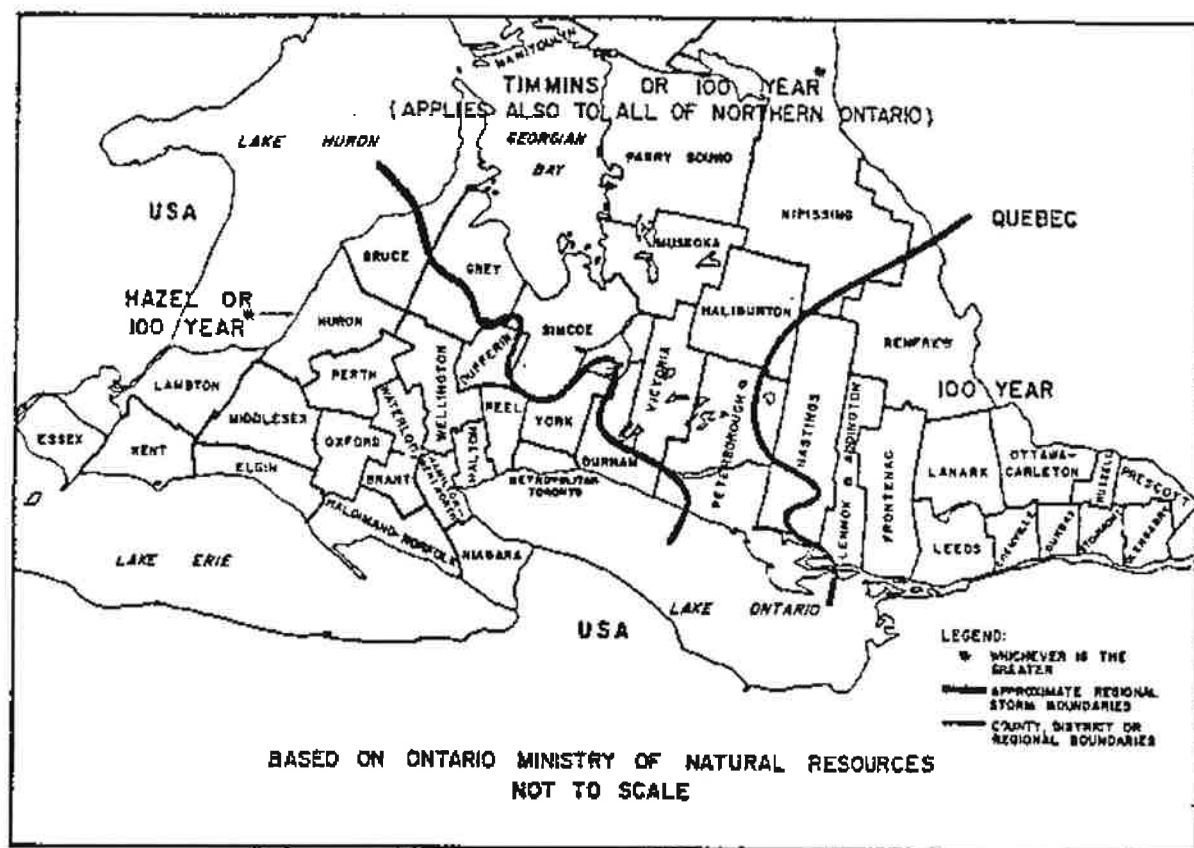
6. For the purpose of selecting design flood criteria, total span is defined as the sum of the individual clear spans or diameters, measured parallel to the centreline of roadway in the case of a bridge, and perpendicular to the longitudinal axis in the case of a culvert.

7. The flood (storm) frequencies for storm drainage systems may be modified to reflect local municipal requirements and adjacent land uses.

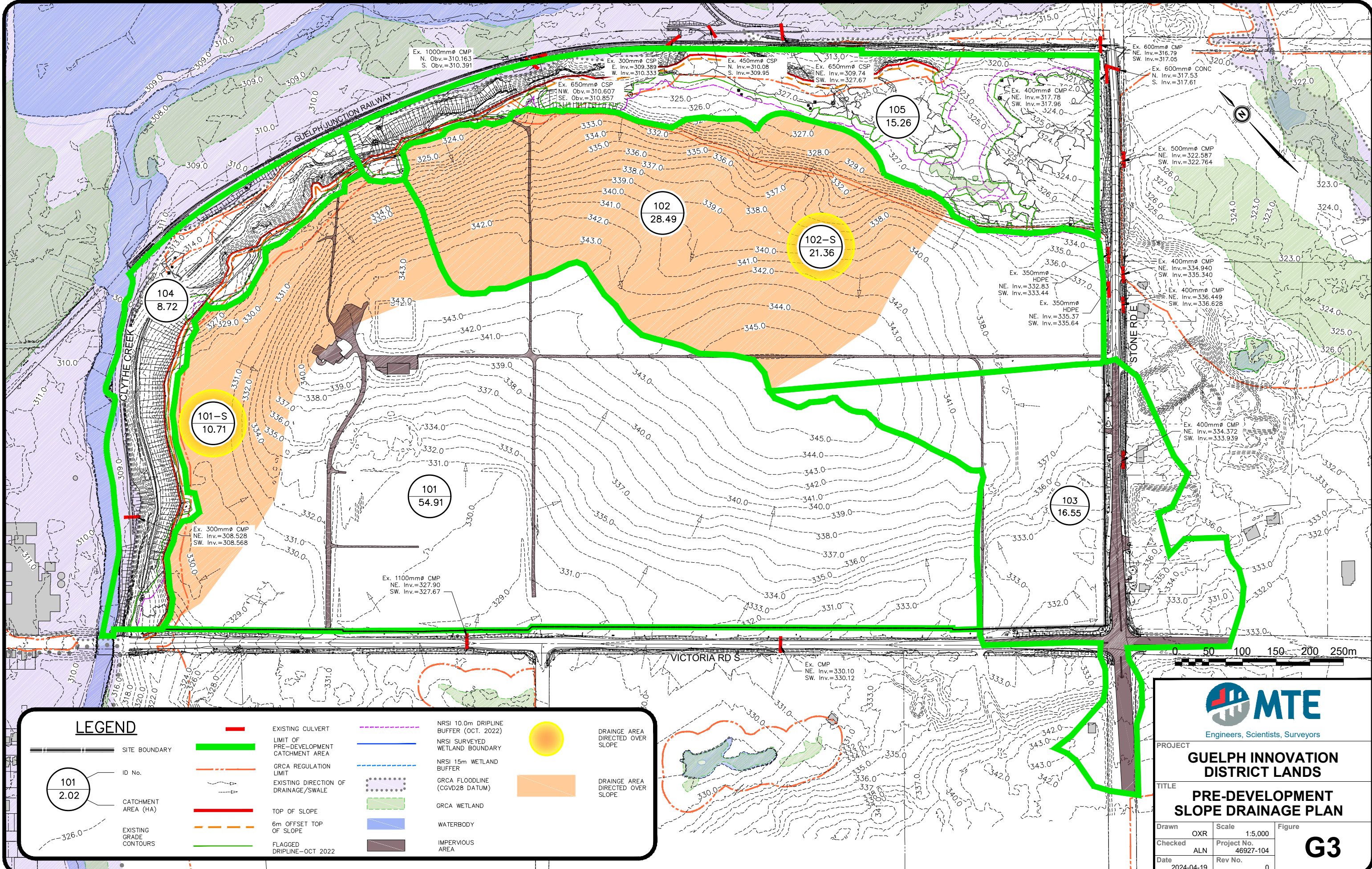
8. The minor system of a storm drainage system comprises the road gutters, inlets, storm sewers and minor ditches.

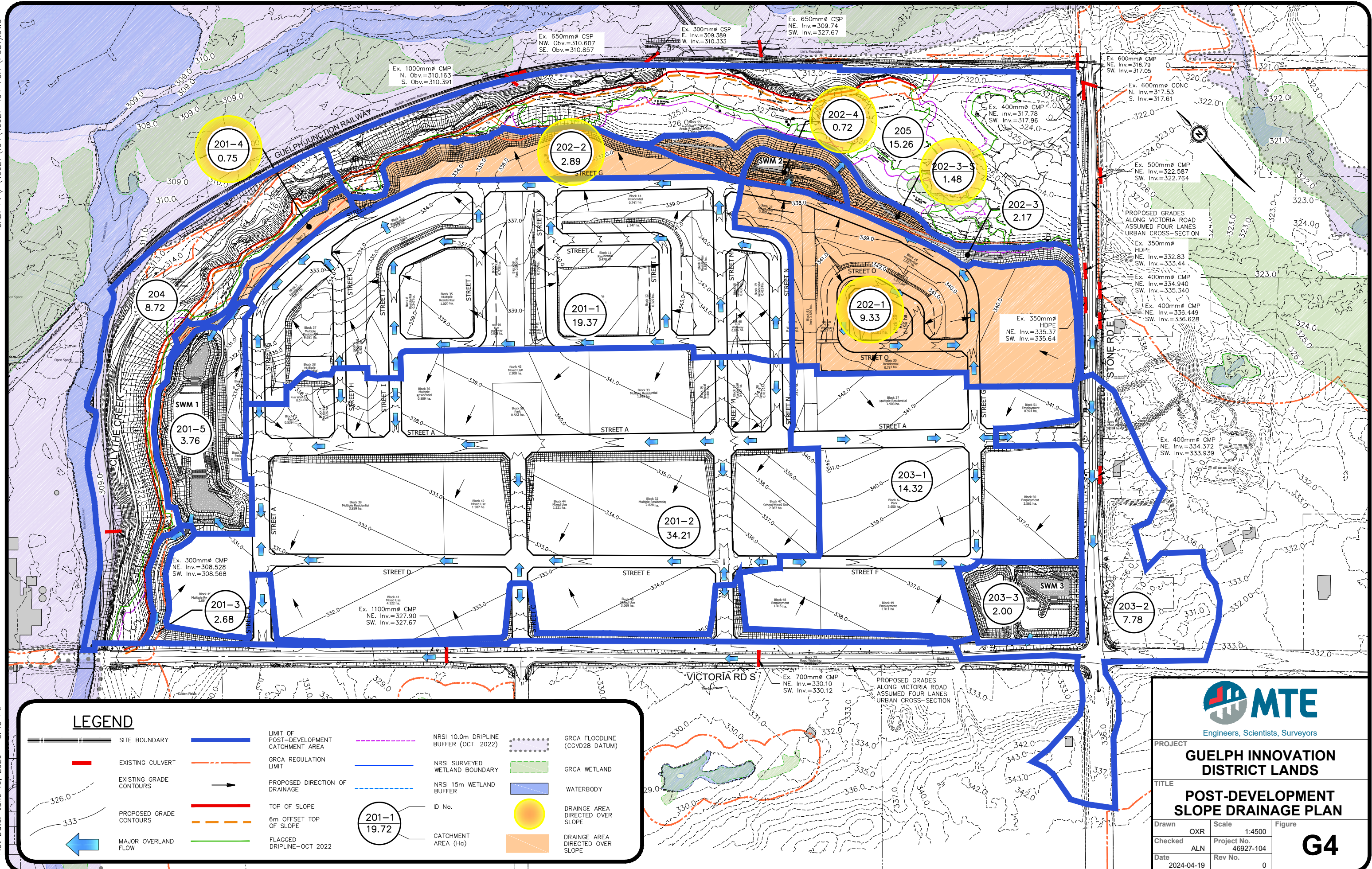
The major system is the route followed by runoff waters when the capacity of the minor system is exceeded, and generally includes the roadways and major channels.

9. If a stream diversion or stream channelization will alter the storage or discharge characteristics of a channel or floodplain, the channel may be designed for the return period given by the table, but the combined channel and floodplain shall accommodate a 25-year flood except as provided in note 4.



EXISTING SLOPE DRAINAGE ANALYSIS





Guelph Innovation District
Stormwater Mangement - Hazard Slope Flow Analysis
City of Guelph



Project Number: 46927-104
Date: June 11, 2026
Design By: MPW
File: Q:\46927\104\SWM\Hazard Slope Analysis\46927-104_Hazard Slope Flows.xlsx

PCSWMM OUTPUTS

Pre-Development Conditions

Storm Event	Peak Flow per Catchment	
	101-S	102-S
	(m ³ /s)	(m ³ /s)
5-year	0.530	0.420
25-year	1.260	1.040
100-year	2.000	1.720

Post-Development Conditions

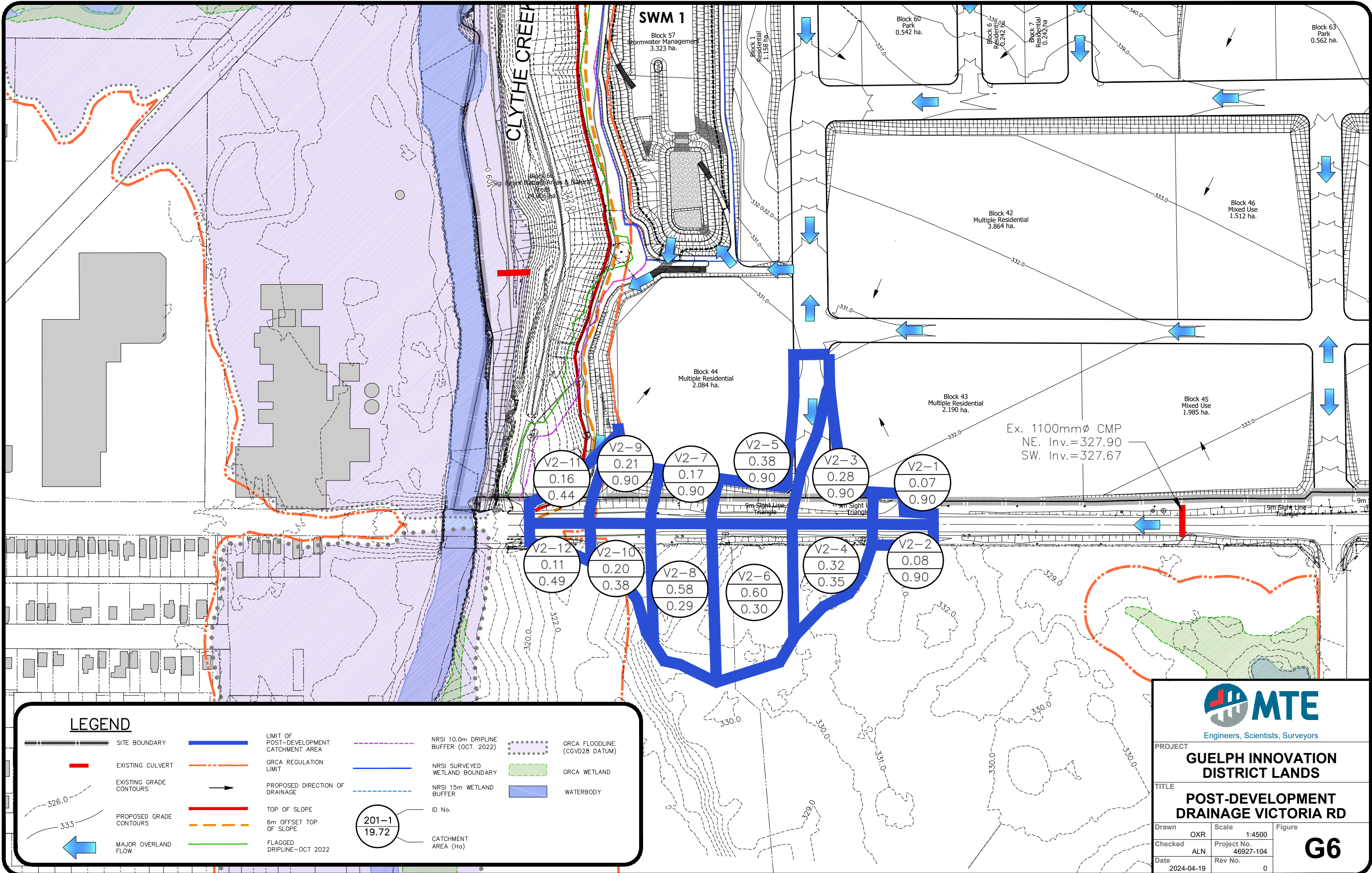
Storm Event	Peak Flow per Catchment	
	201-4	202-1, 202-2, 202-3S, 202-4
	(m ³ /s)	(m ³ /s)
5-year	0.300	0.239
25-year	0.470	0.876
100-year	0.580	1.598

Check Post < Pre Peak Flows

Storm Event	Peak Flow per Catchment	
	201-4	202-1, 202-2, 202-3S, 202-4
	(m ³ /s)	(m ³ /s)
5-year	-0.230	-0.181
25-year	-0.790	-0.164
100-year	-1.420	-0.122

EXISTING VICTORIA ROAD SEWER ANALYSIS





EXISTING VICTORIA ROAD CITY OF GUELPH				STORM SEWER DESIGN SHEET ENGINEERING AND PUBLIC WORKS		Design Parameters												
						5 YEAR STORM												
Project Number: 46927-104 Date: May 12, 2026 Design By: MPW Checked By: VAL File: Q:\46927\104\STM\46927-104_Storm Sewer Design Sheet (May 26) - 100 YR HGL MPW.xlsx				Drainage Area Plan No: 056480-STM1		Q=kAIC, k=0.00278 Manning's "n" 0.013 Intensity (I) = a(tc) ^b Min. Velocity 0.60 m/s a = 632.750 Max. Velocity 6.00 m/s b = -0.741 c = 0												
LOCATION						STORMWATER FLOW 5 YEAR STORM								DESIGN				
STREET	AREA NUMBER	MANHOLE LOCATION		AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME		RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY	PIPE FULL
		FROM MH	TO MH					TOTAL	IN PIPE									
Victoria Road	V1-2	CB 10	MH 14	0.080	0.90	0.0720	0.0720	2.8813	0.1633	288.85262	57.81674	300	14.0	1.00	96.70076	1.3680	1.4285	59.79
Victoria Road	V1-4	CB 9	MH 13	0.320	0.35	0.1120	0.1120	3.0446	0.1952	93.05148	28.97251	300	14.0	1.00	96.70076	1.3680	1.1954	29.96
Victoria Road	V1-6	CB 8	MH 12	0.600	0.30	0.1800	0.1800	13.2890	0.1858	69.55606	34.80585	300	14.0	1.00	96.70076	1.3680	1.2558	35.99
Victoria Road	V1-8	CB 7	MH 11	0.580	0.29	0.1682	0.1682	13.4842	0.1826	79.36517	37.11083	300	14.0	1.00	96.70076	1.3680	1.2776	38.38
Victoria Road	V1-10	CB 6	MH 10	0.200	0.38	0.0760	0.0760	19.6815	0.1986	128.84713	27.22282	300	14.0	1.00	96.70076	1.3680	1.1746	28.15
Victoria Road	V1-12	CB 5	MH 9	0.110	0.49	0.0539	0.0539	19.8673	0.1672	349.96080	52.43883	300	14.0	1.00	96.70076	1.3680	1.3957	54.23
Victoria Road		Ex. Tile MH15	MH15					16.6543			100.00000	300		0.50	68.37776	0.9673		146.25
Victoria Road			MH13						8.5652			100.00000	300		1.00	96.70076	1.3680	
Victoria Road	V1-1	MH14	MH13	0.260	0.38	0.0988	0.1708	2.2239	0.6339	50.83343	24.13693	300	60.0	2.50	152.89732	2.1631	1.5776	15.79
Victoria Road	V1-3	MH13	MH12	1.170	0.29	0.3393	0.6221	30.0500	0.4247	37.95066	65.63332	300	60.0	3.50	180.91055	2.5594	2.3544	36.28
Victoria Road	V1-5	MH12	MH11	2.430	0.27	0.6561	1.4582	44.5800	0.2254	37.68494	152.76705	375	45.0	5.00	392.05011	3.5497	3.3280	38.97
Victoria Road	V1-7	MH11	MH10	1.980	0.21	0.4158	2.0422	45.0047	0.2042	37.54571	213.15888	450	45.0	5.25	653.26024	4.1074	3.6723	32.63
Victoria Road	V1-9	MH10	MH9	0.510	0.25	0.1275	2.2457	45.2301	0.1959	37.42058	233.61840	450	45.0	5.50	668.63317	4.2041	3.8287	34.94
Victoria Road	V1-11	MH9	MH9.1	0.170	0.44	0.0748	2.3744	45.4343	0.0710	37.30147	246.22077	450	15.4	4.52	606.14397	3.8112	3.6127	40.62
Victoria Road	-	MH9.1	MH8				2.3744	45.6302	0.0386	37.25850	245.93708	450	8.2	4.27	589.14271	3.7043	3.5372	41.74
Victoria Road	-	MH8	HW				2.3744	45.7399	0.1699	37.23517	345.78312	675	14.4	0.30	460.40909	1.2866	1.4123	75.10
								45.9098										

1. The above design sheet is based on the drainage catchments denoted in the October 2006 Victoria Road Road Reconstruction drawings and design sheet provided by City of Guelph staff.
2. Time of concentration is calculated using both the Airport formula, and Bransby Williams formula.
3. An approximate flow of 100 L/s has been carried for the existing tile drain, as per the assumptions in the original 2006 design sheet.
4. IDF parameters have been updated from the original design sheet, to match the current City of Guelph parameters.

PROPOSED VICTORIA ROAD
CITY OF GUELPH

Project Number: 46927-104
Date: June 10, 2026
Design By: MPW
Checked By: VAL
File: Q:\46927\104\STM\46927-104_Storm Sewer Design Sheet (June 26).xlsx

STORM SEWER DESIGN SHEET
ENGINEERING AND PUBLIC WORKS

Drainage Area Plan No: 056480-STM1

Design Parameters

5 YEAR STORM

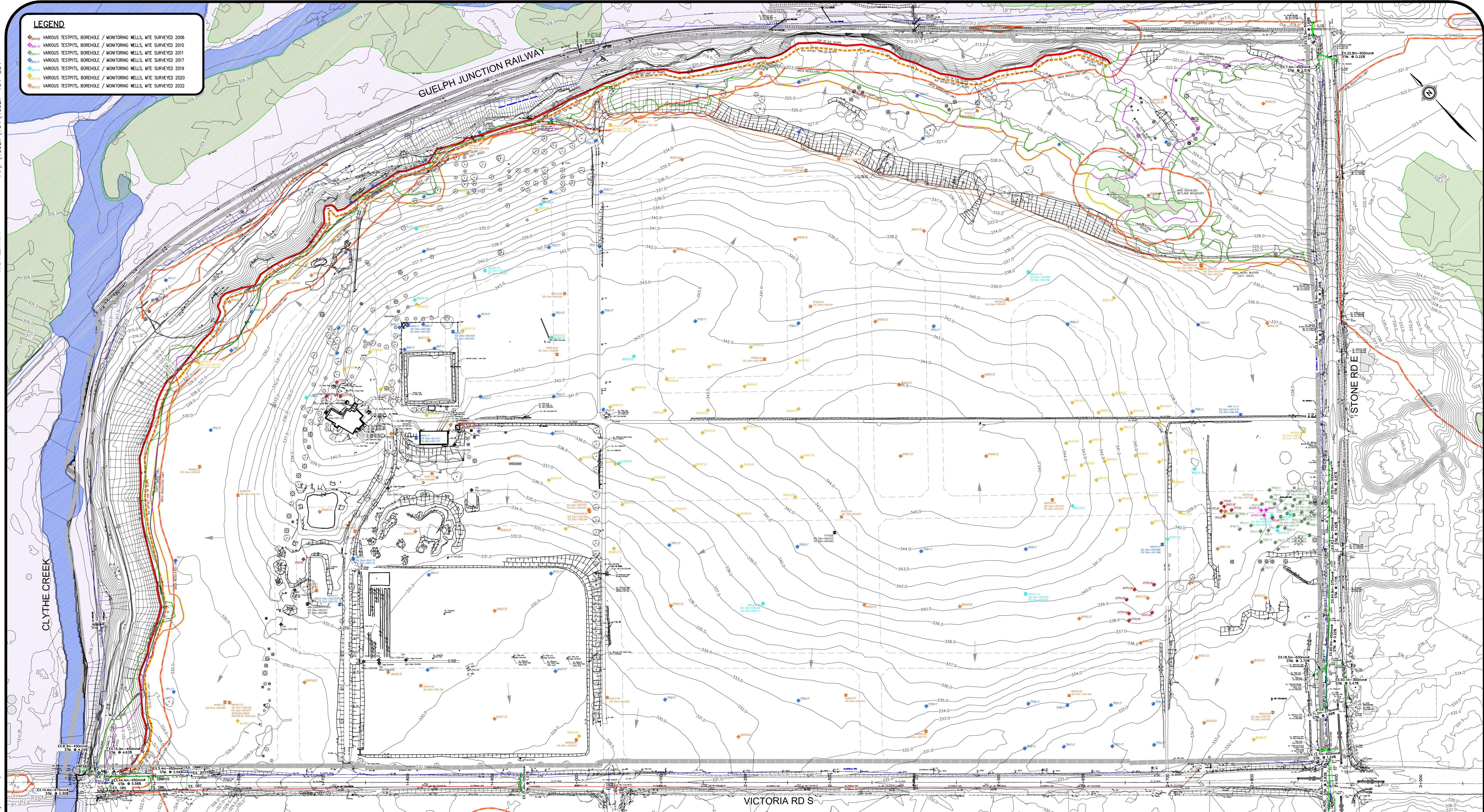
Q=kAIC, k=0.00278
Intensity (I) = a(tc)^b
a = 632.750
b = -0.741
c = 0

Manning's "n" 0.013
Min. Velocity 0.60 m/s
Max. Velocity 6.00 m/s



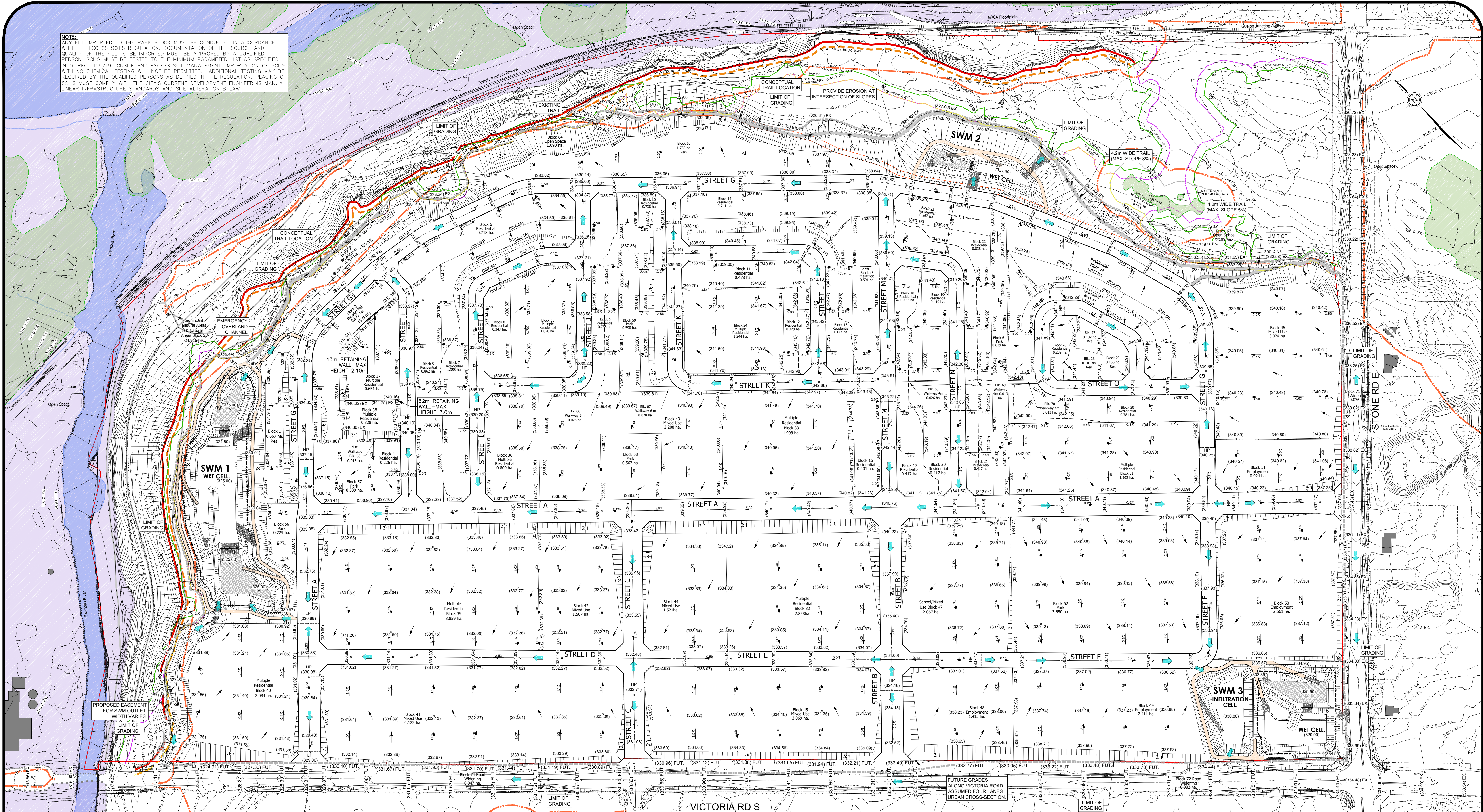
LOCATION				STORMWATER FLOW 5 YEAR STORM								DESIGN						
STREET	AREA NUMBER	MANHOLE LOCATION		AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME		RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY		PIPE FULL
		FROM MH	TO MH					TOTAL	IN PIPE							m/s	m/s	
Victoria Road	V2-2	CB 10	MH 14	0.080	0.90	0.0720	0.0720	2.8813 3.0446	0.1633	288.85262	57.81674	300	14.0	1.00	96.70076	1.3680	1.4285	59.79
Victoria Road	V2-4	CB 9	MH 13	0.320	0.35	0.1120	0.1120	13.2890 13.4842	0.1952	93.05148	28.97251	300	14.0	1.00	96.70076	1.3680	1.1954	29.96
Victoria Road	V2-6	CB 8	MH 12	0.600	0.30	0.1800	0.1800	19.6815 19.8673	0.1858	69.55606	34.80585	300	14.0	1.00	96.70076	1.3680	1.2558	35.99
Victoria Road	V2-8	CB 7	MH 11	0.580	0.29	0.1682	0.1682	16.4717 16.6543	0.1826	79.36517	37.11083	300	14.0	1.00	96.70076	1.3680	1.2776	38.38
Victoria Road	V2-10	CB 6	MH 10	0.200	0.38	0.0760	0.0760	8.5652 8.7638	0.1986	128.84713	27.22282	300	14.0	1.00	96.70076	1.3680	1.1746	28.15
Victoria Road	V2-12	CB 5	MH 9	0.110	0.49	0.0539	0.0539	2.2239 2.3911	0.1672	349.96080	52.43883	300	14.0	1.00	96.70076	1.3680	1.3957	54.23
Victoria Road		Ex. Tile	MH15								0.00000	300		0.50	68.37776	0.9673	0.0000	0.00
Victoria Road		MH15	MH13									*Existing tile drain within the GID lands will be removed. Flow set to 0 L/s.						
Victoria Road	V2-1	MH14	MH13	0.070	0.90	0.0630	0.1350	3.0446 3.4746	0.4299	277.28810	104.06623	300	60.0	2.50	152.89732	2.1631	2.3261	68.06
Victoria Road	V2-3	MH13	MH12	0.280	0.90	0.2520	0.4990	13.4842 13.8448	0.3605	92.05148	127.69566	300	60.0	3.50	180.91055	2.5594	2.7738	70.58
Victoria Road	V2-5	MH12	MH11	0.380	0.90	0.3420	1.0210	19.8673 20.0786	0.2113	69.07344	196.05668	375	45.0	5.00	392.05011	3.5497	3.5498	50.01
Victoria Road	V2-7	MH11	MH10	0.170	0.90	0.1530	1.3422	20.0786 20.2731	0.1945	68.53412	255.72247	450	45.0	5.25	653.26024	4.1074	3.8556	39.15
Victoria Road	V2-9	MH10	MH9	0.210	0.90	0.1890	1.6072	20.2731 20.4559	0.1828	68.04624	304.03167	450	45.0	5.50	668.63317	4.2041	4.1039	45.47
Victoria Road	V2-11	MH9	MH9.1	0.160	0.44	0.0704	1.7315	20.4559	0.0662	67.59524	325.37444	450	15.4	4.52	606.14397	3.8112	3.8783	53.68
Victoria Road	-	MH9.1	MH8	0.000	0.00	0.0000	1.7315	20.5220	0.0360	67.43365	324.59660	450	8.2	4.27	589.14271	3.7043	3.7935	55.10
Victoria Road	-	MH8	HW	0.000	0.00	0.0000	1.7315	20.5581 20.7303	0.1722	67.34607	324.17500	675	14.4	0.30	460.40909	1.2866	1.3936	70.41
ADD SWMF1 5 YEAR OUTFLOW											133.00	*(Modelled 5yr outflow of 133 L/s)						
TOTAL FLOW FROM MH8 TO HW											457.17	99% % Pipe Full < 460.41 L/s Pipe Capacity						

1. The above design sheet is based on the drainage catchments denoted in the October 2006 Victoria Road Road Reconstruction drawings and design sheet provided by City of Guelph staff.
2. Catchments V2-1, V2-3, V2-5, V2-7, V2-9, and V2-11 are modified based on the developed areas within GID, per the attached post development drainage area figure.



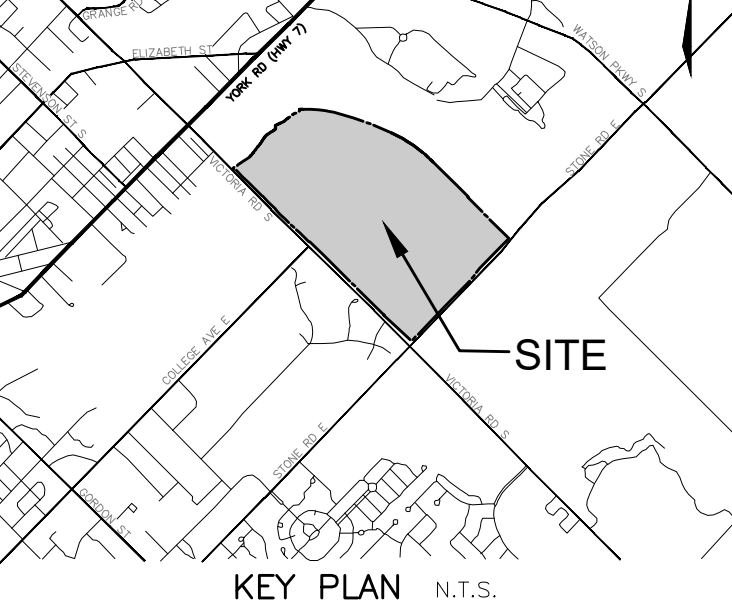
LEGEND

NOTE:
ANY FILL IMPORTED TO THE PARK BLOCK MUST BE CONDUCTED IN ACCORDANCE WITH THE EXCESS SOILS REGULATION. DOCUMENTATION OF THE SOURCE AND QUALITY OF THE FILL TO BE IMPORTED MUST BE APPROVED BY A QUALIFIED PERSON. SOILS MUST BE TESTED TO THE MINIMUM PARAMETER LIST AS SPECIFIED IN O. REG. 406/19: ON-SITE AND EXCESS SOIL MANAGEMENT. IMPORTATION OF SOILS WITH NO CHEMICAL TESTING WILL NOT BE PERMITTED. ADDITIONAL TESTING MAY BE REQUIRED BY THE QUALIFIED PERSONS AS DEFINED IN THE REGULATION. PLACING OF SOILS MUST COMPLY WITH THE CITY'S CURRENT DEVELOPMENT ENGINEERING MANUAL, LINEAR INFRASTRUCTURE STANDARDS AND SITE ALTERATION BYLAW.

**LEGEND**

	SITE BOUNDARY		GRCA REGULATION LIMIT
	LIMIT OF GRADING		TOP OF EXISTING SLOPE
	PROPOSED FINISHED GRADE		6m OFFSET TOP OF SLOPE
	FUTURE FINISHED GRADE		FLAGGED DRIPLINE - OCT 2022
	PROPOSED FINISHED GRADE (LOW/HIGH POINT)		NRSI 10.0m BUFFER (OCT. 2022)
	EXISTING EMBANKMENT (SLOPE AS NOTED)		NRSI SURVEYED WETLAND BOUNDARY
	PROPOSED EMBANKMENT		NRSI 30m WETLAND BUFFER
	EXISTING FENCE		BOREHOLE
	EXISTING DRIPLINE		EX WELL
			HANDHOLE
			MONITORING WELL
			GRCA FLOODLINE (COVID-28 DATUM)
			GRCA WETLAND
			WATERBODY
			EXISTING GRADE CONTOURS
			PROPOSED GRADE CONTOURS
			MAJOR OVERLAND FLOW
			EXISTING DIRECTION OF DRAINAGE/SWALE
			PROPOSED DIRECTION OF DRAINAGE/SWALE

CITY OF GUELPH



CITY OF GUELPH

GEODETIC BM

ELEV. = m

OWNER

FUSION HOMES

500 HANLON CREEK BOULEVARD GUELPH, ONTARIO

PROJECT
GUELPH INNOVATION DISTRICT LANDS

588 STONE ROAD EAST GUELPH, ONTARIO

DRAWING
PRELIMINARY GRADING CONTOUR PLAN

Engineers, Scientists, Surveyors

519-743-6500

Project Manager	D. HICKS	Project No.	46927-104
Design By	ALN	Checked By	VAL
Drawn By	ALN	Checked By	VAL
Surveyed By	MTE	Drawing No.	AG1.1
Date	20/05/2026	Scale	1:2000
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