Wilmot Woods Subdivision

Preliminary Stormwater Management Report

Project Location:
New Hamburg

Prepared for:
Wilmot Woods Developments Inc.
310 Fairway Road South
Kitchener, ON N2C 2R6

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Engineers, Scientists, Surveyors.

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MTE Drawing No. 35056-104-QU1.1 – Finished Grade Contour Plan.....Encl.

1.0 Introduction

1.1 Overview

MTE Consultants Inc. (MTE) was retained by Wilmot Woods Developments Inc. to prepare the following Preliminary Stormwater Management (SWM) Report in support of a Draft Plan of Subdivision application and zoning by-law amendment for a proposed residential subdivision in the Township of Wilmot.

Zoning by-law amendment and plan of subdivision applications were formally submitted to the Township of Wilmot and the Region of Waterloo in April 2022. The subdivision application has been assigned Subdivision File 30T-22601. This report considers comments received to date through the circulation of the plan of subdivision.

The Wilmot Woods subdivision, herein referred to as the 'subject lands', are located in the Town of New Hamburg. The lands are generally bounded by Waterloo Street to the north, the Ivan Gingrich Municipal Drain (IGMD) and agricultural lands to the east, the Canadian National (CN) railway corridor to the south, and the existing Forest Glen residential subdivision to the west. Refer to the Location Plan in **Figure 1.1**.

The subject lands comprise a total area of approximately 37.19ha. Development plans include the construction of street-oriented residential units, multiple residential blocks, a park block, open space block and stormwater management facilities with the required roads and municipal services (storm, sanitary, and water). Portions of the lands are undevelopable, as they are within the floodplain limits of the IGMD. A Draft Plan of Subdivision (dated February 3, 2023) for the proposed development has been prepared by MHBC Planning and forms the basis of this report. The reduced Draft Plan has been included in **Appendix A**.

This report presents the proposed plan detailing the stormwater quality and quantity measures that will be provided for the proposed development. This report should be read in conjunction with the following additional reports/information:

- *Wilmot Woods Subdivision - Functional Servicing Report* – MTE Consultants Inc. (March 8, 2023).
- *Wilmot Woods Subdivision - Hydrogeological Assessment Report* – MTE Consultants Inc. (March, 2023).
- *Wilmot Employment Lands Industrial Subdivision - Final Stormwater Management Report* - MTE (revised July 28, 2022).
- MTE's response letters to agency comments received to date. (GRCA comments and MTE's response letter have been included in **Appendix I**).

1.2 Background Information

An *Enhanced Master Drainage Plan* (EMDP) was undertaken for the Wilmot Employment Lands (WEL), located south of the CN railway corridor, by the Township in 2012. The EMDP was approved by the Township, the Region of Waterloo, the Grand River Conservation Authority (GRCA), and the Ministry of Transportation of Ontario (MTO). The purpose of the EMDP was to prepare a comprehensive SWM strategy for the contributing subwatershed (of which a portion of the Wilmot Woods subdivision is a part of). As part of the design considerations presented in MTE's Final SWM report for the WEL, storm servicing outlets were proposed for the subject lands through the WEL property. Furthermore, a communal quantity and quality control SWM

Facility (SWMF) adjacent to Highway 7/8 is proposed to provide quality control for the portion of the subject lands draining towards the south.

The WEL are located directly south of the subject lands, between the CN railway and Highway 7/8. MTE completed and submitted a Functional Servicing Study and a Preliminary SWM Report in support of two Draft Plan of Subdivision applications for the WEL in 2019. The Draft Plans were approved on March 17, 2021. A Final SWM Report, which details the design of the communal SWMF located immediately north of Highway 7/8, was submitted in the summer of 2022 (dated July 28, 2022).

The preliminary design strategies for stormwater management within the subject lands have been developed to be in accordance with the recommended solutions within the EMDP and MTE's design submissions for the WEL.

1.3 Purpose of Study

The purpose of this study is to develop a comprehensive stormwater management strategy for the proposed development, which implements the approved EMDP, incorporates findings of previous studies, and is acceptable to the Township, the Region, the GRCA, the Ministry of the Environment, Conservation and Parks (MECP, formerly referred to as the MOE).

1.4 Objectives

The objective of this stormwater management plan is to ensure that the proposed SWM strategy includes the necessary controls to protect the hydrology and water quality of the receiving water systems. Furthermore, this strategy also ensures that the proposed draft plan provides the necessary blocks and corridors for stormwater management measures. The primary objectives of this study are as follows:

- Document criteria for the management of stormwater runoff from the study area.
- Recommend a comprehensive plan for controlling the quality and quantity of stormwater runoff from the study area.
- Prepare preliminary designs for the recommended stormwater management infrastructure.

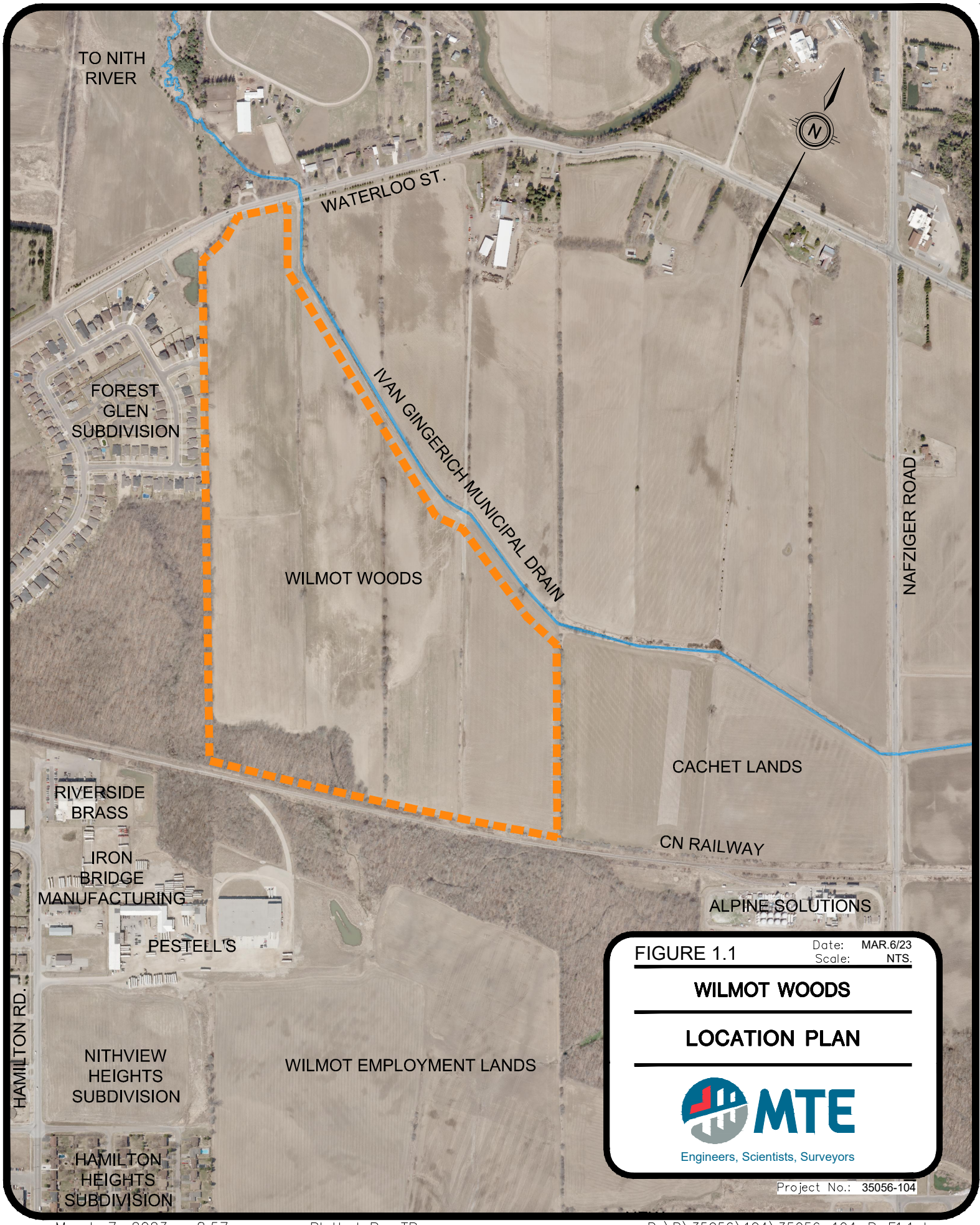

FIGURE 1.1

Date: MAR.6/23
Scale: NTS.

WILMOT WOODS

LOCATION PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

March 7, 2023 — 8:57 a.m. — Plotted By: TBerry

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2.0 Existing Conditions and Background Information

2.1 Topographical Information

As previously discussed, the subject lands consist of approximately 37.19ha, of which portions of the lands are undevelopable as they are within the IGMD floodplain. The subject lands are generally bounded by Waterloo Street to the north, the IGMD and agricultural lands to the east, the CN railway corridor to the south, and the Forest Glen residential subdivision to the west. The subject lands are currently used for interim agricultural purposes.

MTE conducted a detailed topographical survey of the subject lands in 2010. This information has been supplemented a few times since 2010 with additional surveys. Existing topographic conditions for the subject lands are illustrated in **MTE Drawing 35056-104-EC1.1**. Under existing conditions, the subject lands are moderately sloped throughout the majority of the site (generally between 1.0% and 6.0%). Existing elevations range between 339.0m near the IGMD floodplain in the north, 340.0m near the wetland feature located in the south, and 347.5m in the southeastern corner of the lands.

2.2 Pre-Development Conditions

There is a subwatershed divide in the central portion of the subject lands. The northern portion of the property drains to the IGMD as illustrated in **MTE Drawing 35056-104-EC1.1**. The IGMD flows northward, through a 1750mm diameter culvert beneath Waterloo Street, and ultimately to the Nith River, located approximately 700m downstream. A small area (sub-catchment 102) of this northern portion drains to an existing swale located in the northwest corner of the subject lands. The swale also conveys major storm flows from the existing Forest Glen subdivision SWM Facility, ultimately draining underneath Waterloo Street to the IGMD. A summary of pre-development conditions and catchment parameters are provided in **Appendix B.**

The southern portion of the subject lands primarily drains to an adjacent woodlot and wetland feature along the CN railway, and ultimately to the “Western Tributary” that conveys flows south of Highway 7/8 to the Nith River. This wetland feature has a positive draining surface outlet, through an existing 900mm diameter culvert under the CN railway, and flows south through the remainder of the wetland towards the WEL communal SWMF. Based on monitoring data and a hydrogeological study completed as part of the preliminary design of the WEL, it is understood that this wetland is maintained from surface water inputs along the CN railway corridor and from the agricultural tile drain system throughout the subject lands. The wetland is generally characterized as a surface water feature with minor groundwater inputs.

To determine pre-development flow rates to the existing 900mm culvert beneath the CN railway, the upstream drainage area was divided into 5 catchment areas. Design storm event modelling was completed to determine the existing flow rates to the culvert under various return period storms.

There is a small portion along the western limits of the subject lands that currently drain to the adjacent woodlot within the Forest Glen Subdivision.

A hydrologic model was created for the WEL as part of the EMDP using the SWMHYMO modelling platform. Storm runoff flows were simulated for the 25mm (4-hour) storm event, along with the 2 through 100-year return period design storms. The EMDP used the Region of Waterloo’s intensity-duration-frequency (IDF) parameters, however during final design of the WEL stormwater infrastructure, Township staff requested that the City of Kitchener’s IDF parameters be used. For consistency, this SWM report and analysis has also used the City of Kitchener’s IDF parameters. **Table 2.1** below provides the target discharge rates to various

features such as the IGMD, the existing 900mm diameter railway culvert, and the adjacent woodlot that will need to be met under post-development conditions.

Table 2.1 – Pre-Development Peak Runoff Rates (m^3/s)

Storm Event	IGMD			900mm Culvert (South)	Draining West to Forest Glen Woodlot
	Directly to Drain	Through Ex. SWMF Swale	Total		
25mm Storm	0.172	0.014	0.182	0.142	0.027
2-Year Storm	0.448	0.036	0.473	0.369	0.071
5-Year Storm	0.974	0.077	1.029	0.805	0.154
10-Year Storm	1.419	0.111	1.499	1.176	0.226
25-Year Storm	2.007	0.157	2.120	1.671	0.318
50-Year Storm	2.517	0.197	2.658	2.103	0.398
100-Year Storm	3.050	0.239	3.221	2.556	0.482

NAFZIGER ROAD

WATERLOO STREET

NITH RIVER

IVAN GINGERICH DRAIN

CN RAILWAY

EX. 900mm CULVERT

IVAN GINGERICH MUNICIPAL DRAIN SUBWATERSHED

'WEST TRIBUTARY' SUBWATERSHED

TO NITH RIVER

IVAN GINGERICH MUNICIPAL DRAIN SUBWATERSHED

TO FOREST GLEN SUBDIVISION

'WEST TRIBUTARY' SUBWATERSHED

EX. SWM FACILITY

CHARLES FOLINSBEE WAY

103
4.20

101
19.21

102
2.40

104
11.24

105
1.56

106
1.00

107
0.27

108
2.46

LEGEND

- SITE BOUNDARY
- 323 — EXISTING CONTOURS (GENERATED BY MTE)
- 323 — EXISTING CONTOURS (PROVIDED BY REGION OF WATERLOO GIS)
- EXISTING DIRECTION OF DRAINAGE/SWALE
- IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN
- EXISTING WETLAND
- WETLAND BUFFER
- PRE-DEVELOPMENT CATCHMENT AREA
- SUBWATERSHED DIVIDE
- EXISTING WATERCOURSE
- 112 / 7.31 — SUB-CATCHMENT NUMBER / AREA (ha.)

FIGURE 2.1

Date: MAR.6/23
Scale: 1:5000

PRE-DEVELOPMENT DRAINAGE AREA PLAN

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2.3 Geotechnical and Hydrogeological Information

In February 2022, Peto MacCallum Ltd. (Peto) prepared a geotechnical investigation for the subject lands. The fieldwork was carried out in 2018 included 22 boreholes, 10 of which included monitoring wells, to depths ranging between 6.5m to 12.6m.

In 2021/2022, MTE completed a Hydrogeological Assessment Report (April 2022) for the subject lands. This study summarizes the hydrogeological investigations performed to date for the development study area.

Based on the results of the detailed investigations, the subsurface stratigraphy is generally described as topsoil and localized fill underlain by extensive deposits of clayey silt, locally containing cohesionless silt, sandy silt, silty sand, and sand layers. Wet and saturated conditions are generally encountered throughout the site. Based on hydrostatic groundwater level readings recorded by Peto, groundwater levels generally rise and fall with the topography. Groundwater flow is interpreted to flow northward toward Waterloo Street and south towards the WEL from the topographic high in the central portion of the subject lands, which coincides with the subwatershed boundary. Sandy soils may act as an aquifer, but were only encountered within a few boreholes, which indicate that clayey soils dominate the subject lands. Infiltration is minor and the majority of the development portion of the subject lands are not a significant recharge area.

In March 2021, Peto provided MTE with updated water levels within monitoring wells MW101-MW110. Levels were measured from November 2020 to February 2021 and provided supplemental information to the groundwater contours established within the original 2019 hydrogeological report. More recently, MTE has been monitoring water levels within existing wells, as well as within the drilled wells installed in 2021 as part of MTE's *Hydrogeological Assessment Report*.

Refer to Peto's Geotechnical Investigation Report in **Appendix F** for more details.

2.4 GRCA Mapping

As illustrated in **Figure 2.2,** the northern portion of the subject lands is within a significant groundwater recharge area (SGRA) as defined by the Source Water Protection Plan Mapping. The SGRA limit corresponds with a surficial sand layer at the north portion of the subject lands. The SGRA has a vulnerability score of 2.0 generally representing a low score of surface-groundwater interaction and base flow to the IGMD and the Nith River.

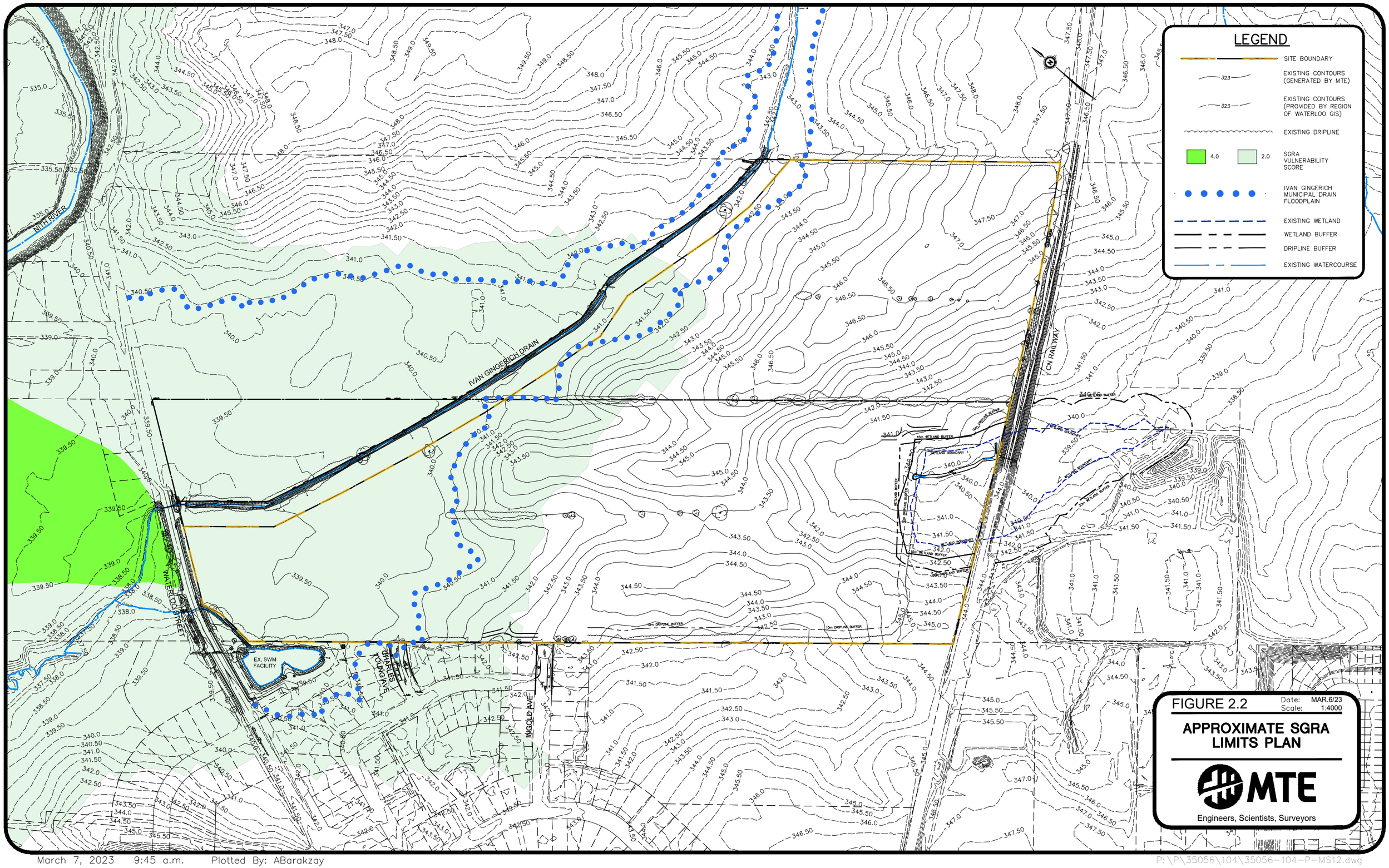

FIGURE 2.2 Date: MAR.6/23 Scale: 1:4000

APPROXIMATE SGRA LIMITS PLAN

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3.0 Stormwater Management Criteria

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

- Stormwater Management Planning and Design Manual (MOE, 2003).
- Enhanced Master Drainage Plan – Wilmot Employment Lands (MTE, May 2012).
- Wilmot Employment Lands Industrial Subdivision – Final Stormwater Management Report (MTE, July 28, 2022).
- City of Kitchener Stormwater Management Policies and Guidelines (2015).
- GRCA Policies for the Administration of Ontario Regulation 150/06 (GRCA, October 2015).

Some of the subject lands have been considered in the approved stormwater management strategy for the WEL to the south. The details have been well documented in the *Wilmot Employment Lands Industrial Subdivision - Final Stormwater Management Report* (MTE, revised July 28, 2022).

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

Ivan Gingerich Municipal Drain Subwatershed

- **Water Quality** – Provide an Enhanced (MOE, 2003) level of stormwater quality treatment prior to discharge to the IGMD and the Nith River to the north.
- **Water Quantity and Erosion Control** – Control peak flow rates to receiving surface water systems to existing levels up to and including the 100-year event. Provide erosion control by maintaining existing flow duration characteristics.

West Tributary Subwatershed

- **Water Quality** - Provide an Enhanced (MOE, 2003) level of stormwater quality treatment prior to discharging to surface water systems.
- **Water Quantity and Erosion Control** – Control peak flow rates to receiving surface water systems to existing levels up to and including the 100-year event.
- **Water Balance**
    - Infiltration – Based on existing soil conditions for the majority of the property, which are not conducive to infiltration, lot-level infiltration measures have not been considered for the proposed development.
    - Surface Water – Maintain existing surface water inputs into significant environmental features.

3.1 Ivan Gingerich Municipal Drain Subwatershed

An erosion threshold analysis was completed by Water's Edge for the Ivan Gingerich Drain downstream of the proposed SWMF outfall to determine the threshold flow rate. As such, the proposed design solution should provide adequate attenuation of flows towards the IGMD such that the exceedance hours for pre-development erosion threshold flow rate are not exceeded. The assessment is provided in **Appendix H**.

3.2 West Tributary Subwatershed

The southern portion of the subject lands drains to an existing 900mm diameter culvert under the CN railway, through the WEL to a communal SWMF adjacent to Highway 7&8, and ultimately to the West Tributary and the Nith River. The EMDP had recommended that the proposed WEL SWMF should provide an Enhanced level of water quality protection for the proposed industrial subdivision, as well as for approximately 98ha of upstream external lands. However, comments received from the GRCA as part of the April 2022 Plan of Subdivision submission, noted the need for water quality control within the subject lands prior to discharge to the CN railway culvert and adjacent wetland feature. As such, the southern SWMF would need to provide an Enhanced level of water quality.

4.0 Proposed Development and SWM Strategy

4.1 Proposed Area Grading

A preliminary finished grade contour plan illustrating road grades is enclosed (**MTE Drawing 35056-104-QU1.1**). The grading design of the site was controlled by many factors which include servicing constraints (both sanitary and storm) and matching existing boundary grades around the perimeter of the property while respecting existing natural features and buffers. Other factors include ensuring major storm event overland flows are directed towards the existing road rights-of-way where applicable, or towards the proposed SWM facilities, as well as maintaining a cut/fill balance for the overall development.

4.2 Post-Development Conditions

The proposed SWM plan, to be further discussed within this report, incorporates a variety of SWM infrastructure under a treatment train approach. The plan has been designed to meet the criteria presented in Section 3.0 of this report.

The proposed development is comprised of residential land use with two SWM blocks (SWMF1 and SWMF2), a park block, open space and walkway blocks, and related roads. The location of the proposed SWM facilities along with the contributing drainage areas is illustrated on **Figure 4.1**. Minor storm runoff from all contributing areas will be conveyed by the proposed storm sewer system to either SWMF1 or SWMF2. Excess runoff from major storms will flow overland to the respective SWMFs via the proposed right-of-ways and overland flow routes.

SWMF1 is located along the western property line between Charles Young Avenue and Ingold Avenue. It will discharge across Street Two, and through the open space block via a constructed swale to the existing IGMD to the east, which then drains under Waterloo Street.

Some of the catchment areas contributing flow to the IGMD will not be routed through the proposed SWMF1. The portion of the subject lands located within the IGMD floodplain will not be developed and will continue to contribute stormwater runoff to the municipal drain at existing rates. Drainage from a small portion of the northern end of Street Two that is unable to be directed towards SWMF1, will be directed towards an Oil-Grit Separator (OGS) and infiltration gallery treatment train prior to outletting to the IGMD. Additionally, portions of the rear yards adjacent to the floodplain limit will also contribute uncontrolled flow to the municipal drain.

SWMF2 is centrally located along the south property line, immediately east of the existing woodlot/wetland. This facility will discharge to an existing 900mm diameter culvert beneath the CN railway corridor and then to an existing watercourse immediately downstream of the railway crossing. A new conveyance channel constructed within the WEL development will pick up this watercourse and will convey storm drainage to the proposed SWMF located along the north side of Highway 7/8. The WEL SWMF discharges to the West Tributary which flows south, crosses Bleams Road and then through the Morningside Retirement Community and drains into the Nith River.

Some of the catchment areas contributing flow to the existing CN culvert will not be routed through the proposed SWMF2 during post-development conditions. The existing woodlot and wetland catchment areas will remain undeveloped and continue to contribute stormwater runoff to the culvert at existing rates.

SWMF1 and SWMF2 will utilize a wet pond design, providing quality and quantity control of runoff prior to discharge. The contributing area from the development portion of the subject lands draining to SWMF1 and SWMF2 are 9.15ha and 19.44ha, respectively.

The post-development catchment areas to each SWMF are illustrated in **Figure 4.1**, and the post-development modelling parameters and imperviousness calculations are included in **Appendix C**.

Descriptions of the drainage catchments and their respective drainage patterns are listed below:

4.2.1 Draining North to the IGMD

Catchment 201
Catchment 201 consists of the northern portion of the subject lands that is proposed to drain to SWMF1 via Ingold Avenue. The drainage area contains residential blocks and rights-of-way, for a total area of 7.04ha.

Catchment 202
Catchment 202 consists of a portion of Street Two that bypasses SWMF1 forebay and is directed through an OGS unit prior to draining to the wetpond cell. The drainage area is 0.64ha.

Catchment 203
Catchment 203 consists of SWMF1, and any adjacent rear yards and grassed areas directed overland towards the SWMF. The drainage area is 1.47ha.

Total Area to SWMF1 = 9.15ha

Catchment 204
Catchment 204 consists of the park block and adjacent rear yards directly draining to the IGMD. The drainage area is 1.44ha.

Catchment 205
Catchment 205 consists of the remaining portion of Street Two that cannot be managed and attenuated by SWMF1. This area will be directed through an OGS unit and infiltration gallery treatment train before outletting to the IGMD. The drainage area is 0.56ha.

Catchments 206
Catchment 206 consists of rear yards and open space blocks within the subject lands directly flowing overland to the IGMD. The drainage area is 1.89ha.

Catchment 207
Catchment 207 consists of the open space block west of Street Two that drains directly into the existing swale acting as the major flow outlet for the adjacent Forest Glen subdivision SWM Facility. The drainage area is 0.85ha.

Catchment 208
Catchment 208 consists of the open space block east of Street Two that flows directly overland to the IGMD. The drainage area is 3.33ha.

Total Area to IGMD = 17.22ha

4.2.2 Draining South to the CN Culvert

Catchment 209
Catchment 209 consists of the southern portion of the subject lands that is proposed to drain to SWMF2. The drainage area contains residential blocks, trail blocks and rights-of-way, for a total area of 13.27ha.

Catchment 210
Catchment 210 consists of the adjacent lands to the east (Cachet lands) proposed to drain through the subject lands to SWMF2. The drainage area is 4.17ha.

Catchment 211
Catchment 211 consists of SWMF2 and any adjacent rear yards and grassed areas directed towards it. The drainage area is 2.00ha.

Total Area to SWMF2 = 19.44ha

Catchment 212 to 215
Catchments 212 to 215 consists of the existing woodlot and wetland within the southern portion of the subject lands, as well as the remaining existing portion of the CN corridor, and drains directly to the existing culvert. The drainage areas total 3.99ha.

Total Area to CN Culvert = 23.43ha

NAFZIGER ROAD

WATERLOO STREET

NITH RIVER

IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN

IVAN GINGERICH MUNICIPAL DRAIN SUBWATERSHED

'WEST TRIBUTARY' SUBWATERSHED

IVAN GINGERICH DRAIN

WATERLOO STREET

CN RAILWAY

EX. 900mm CULVERT

ROOF AREA ADJACENT TO WOODLAND TO BE CONNECTED TO STORM SYSTEM

TO NITH RIVER

IVAN GINGERICH MUNICIPAL DRAIN SUBWATERSHED

TO FOREST GLEN SUBDIVISION

'WEST TRIBUTARY' SUBWATERSHED

EX. SWM FACILITY

SHARER YOUNG AVE

INGOLD AVE

210 / 4.17

206 / 1.89

204 / 1.44

209 / 13.27

211 / 2.00

215 / 1.16

201 / 7.04

213 / 1.00

202 / 0.64

208 / 3.33

203 / 1.47

212 / 1.56

216 / 1.69

214 / 0.27

207 / 0.85

205 / 0.56

LEGEND

- SITE BOUNDARY
- PROPOSED CONTOURS (323)
- EXISTING CONTOURS (323)
- PROPOSED DIRECTION OF DRAINAGE/SWALE
- IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN
- EXISTING WETLAND
- WETLAND BUFFER
- PROPOSED DEVELOPMENT CATCHMENT AREA
- SUBWATERSHED DIVIDE
- EXISTING WATERCOURSE
- 210 / 7.31 — SUB-CATCHMENT NUMBER / AREA (ha.)

FIGURE 4.1

Date: MAR.6/23
Scale: 1:5000

POST DEVELOPMENT DRAINAGE AREA PLAN

MTE
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Project No.: 35056-104

March 7, 2023 9:43 a.m. Plotted By: ABarakzay

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5.0 Stormwater Management Design

5.1 Hydrologic Modelling

As previously noted, as part of the EMDP study, a hydrologic model was prepared using the SWMHYMO modelling platform. This model was then updated and refined as part of the final stormwater management design of the WEL to reflect the proposed conditions and stormwater management strategies approved for the surrounding lands. Separate hydrologic models for both existing and proposed conditions were prepared as part of this study, again using the SWMHYMO platform. The existing and proposed development conditions were modelled for the:

- Quality storm event (25mm depth, 4-hour Chicago distribution).
- 2, 5, 10, 25, 50, and 100-year return period rainfall events (3-hour SCS Type II Storm).

As stated above, the City of Kitchener IDF parameters were used as part of this analysis. The IDF parameters and the hydrologic parameters for the pre- and post-development conditions are included in **Appendices B and C**, respectively.

In order to determine appropriate CN values within the model, existing and proposed land uses and soil types were analyzed. The CN values used are generally representative of the largely clayey and silty deposits underneath agricultural and urban lawn land uses.

5.2 Water Quality

Stormwater Management Facilities 1 and 2 have been designed as a wet ponds with a permanent pool depth of 1.5m. The facilities incorporate a sediment forebay with a depth of 1.5m, which offers 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[1]. Therefore, the sediment forebays are designed targeting the smaller flows. Furthermore, since larger storm events will have greater peak flows, there is potential for re-suspension of accumulated sediment. Thus, the smaller flows into the forebays should be separated from the larger flows which should enter the main pond directly. To achieve this objective, appropriately sized splitter structures upstream of the forebays are proposed where possible.

Sizing of a splitter structure by simply sizing the outlet pipes based on their free flowing (Manning's) capacities often results in 'washout' of the forebay (and costly remediation) due to larger flows that result from surcharging of the splitter structure. The design of the splitter structure for this project incorporates both free flowing pipe capacities (i.e., assuming no surcharge and using Manning's equation) as well as the effects of head buildup within the splitter structure and associated discharge pipes.

The forebay design is based on classic particle settling and flow dispersion equations, as presented in the MOE 2003 *Stormwater Management Planning and Design Manual*. The methodology presented in that document suggests that the design flow for the forebay should

[1] From MOE-1994, Figure C.1: 62% less than 5mm, 78% < 10mm, 90% < 15mm and 97% < 25mm

be taken as the peak outflow from the facility. A forebay is typically designed to treat minor storm flows. The main pond will essentially be empty (or at its permanent pool level) during minor storm events. As such, there will be no mass of water at the outlet of the forebay that would control the flow through the forebay to that of 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 MOE 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 using the main pond peak discharge rate for the 25mm storm event (as per MOE 2003);
- Settling length based on a settling velocity of 0.0055m/s using the forebay inflow/outflow for the 5-year storm event;
- Dispersion length such that, based on the flow and depth of water, the velocity through the forebay is less than 0.5m/s; and
- Velocity based on flow divided by the cross-sectional area is less than 0.15m/s to prevent scouring.

The 2003 MOE document suggests that the cleanout frequency for a SWMF be based on the sediment loading within the entire pond, however, it is recommended that the cleanout frequency be based on the loadings within the forebay only. While this typically results in more frequent cleanout, it is restricted to the forebay area only and avoids disturbance of the main pond. The cleanout frequency for the proposed SWMF can be found in the forebay design calculations in **Appendix D**.

5.2.1 Stormwater Management Facility 1

As described in Section 4.2, this facility will provide quality control for the majority of the northern portion of the subject lands. The total drainage area to this facility is 9.15ha at 66.8% imperviousness. According to Table 3.2 from the MOE's 2003 Stormwater Management Guidelines, an *Enhanced* level of protection requires 217.5m^3/ha of storage, 40m^3/ha of which is extended detention, and the remainder of which is the permanent pool. The required permanent pool and extended detention volumes for SWMF1 are therefore 1,624m^3 and 366m^3 respectively.

The forebay and main pond have permanent pool volumes of 1,008m^3 and 2,602m^3 respectively, for a total permanent pool volume of 3,610m^3. Providing a minimum 24-hour extended detention drawdown for the 366m^3 of storage requires a 75mm diameter orifice to be implemented. The proposed SWMF1 design characteristics are summarized in **Table 5.1** below. Refer to **Appendix D** for the relevant design sheets and calculations (catchment parameters, imperviousness calculations, stage-storage discharge relationships, drawdown calculations, forebay sizing calculations, control manhole sizing, etc.). Refer to **Figures 5.1 to 5.4** for details of the proposed SWMF1.

Drainage Area 202 represents a portion of Street Two and grassed areas that are unable to drain to the SWMF1 forebay. This area is directed through an OGS unit prior to being released into the wetcell within SWMF1.

The OGS unit is designed to treat runoff from minor events (i.e., events ≤ 25mm) before releasing flows to the SWMF wetcell. Flows from events greater than the 25mm storm may by-pass the OGS unit. The proposed OGS (model EF4) unit has been verified by the Canadian

Environmental Technology Verification Program and has been sized to provide at least 54% TSS removal. It should be noted that the GRCA will credit a maximum of 50% TSS removal, and the implementation of a treatment train will provide additional TSS removal. A detailed sizing report for the OGS unit is included in **Appendix D.**

Table 5.1 – SWMF1 Design Characteristics

General	Facility Characteristics
Stormwater Management Facility Type	Wet Pond
Required MECP Water Quality Protection	Level 1 (Enhanced)
Total Contributing Area	9.15ha
Imperviousness	66.8%
Bottom Elevation (of main facility)	338.00m
Storage	
Unit Area Storage Volume Requirements as per SWMMP (MOE, 2003)	217.5m^3/ha
Required Total Volume	1,990m^3
Permanent Pool	
Required Permanent Pool Volume	1,624m^3
Permanent Pool Volume Provided	3,610m^3
Permanent Pool Elevation	339.50m
Extended Detention	
Minimum Required Volume (40m^3/ha)	366m^3
Approximate Drawdown Time (40m^3/ha)	42.9hr
Extended Detention Elevation (40m^3/ha)	339.61m
Peak Release Rate for Extended Detention (40m^3/ha)	0.0033m^3/s
Forebay	
Required Forebay Length	16.7m
Actual Forebay Length	40.0m
Permanent Pool Elevation	339.50m
Bottom Elevation	338.00m
Outlet Controls	
Orifice 1 Diameter (Extended Detention)	75mm
Orifice 1 Elevation (Extended Detention)	339.50m
Orifice 2 Diameter (25mm-4hr)	150mm
Orifice 2 Elevation (25mm-4hr)	339.80m
Cutout Weir Width (5yr to 100-year)	0.7m
Cutout Weir Elevation (5yr to 100-year)	340.30m

5.2.2 Stormwater Management Facility 2

As described in Section 4.2, this facility will provide quality control for the majority of the southern portion of the subject lands. The total drainage area to this facility is 19.44ha at 52.9% imperviousness. According to Table 3.2 from the MEO's 2003 Stormwater Management Guidelines, an *Enhanced* level of protection requires 184.8m^3/ha of storage, 40m^3/ha of which is extended detention, and the remainder of which is the permanent pool. The required permanent pool and extended detention volumes for SWMF1 are therefore 2,816m^3 and 778m^3, respectively.

The proposed SWMF2 design characteristics are summarized in **Table 5.2** below. Refer to **Appendix D** for the relevant design sheets and calculations (catchment parameters, imperviousness calculations, stage-storage discharge relationships, drawdown calculations, forebay sizing calculations, control manhole sizing, etc.). Refer to **Figures 5.5 to 5.7** for details of the proposed SWMF.

Table 5.2 – SWMF2 Design Characteristics

General	Facility Characteristics
Stormwater Management Facility Type	Wet Pond
Required MECP Water Quality Protection	Level 1 (Enhanced)
Total Contributing Area	19.44ha
Imperviousness	52.9%
Bottom Elevation	339.20m
Storage	
Unit Area Storage Volume Requirements as per SWMMP (MOE, 2003)	184.8m^3/ha
Required Total Volume	3,594m^3
Permanent Pool	
Required Permanent Pool Volume	2,816m^3
Permanent Pool Volume Provided	6,994m^3
Permanent Pool Elevation	340.70m
Extended Detention	
Minimum Required Volume (40m^3/ha)	778m^3
Approximate Drawdown Time (40m^3/ha)	26.0hr
Extended Detention Elevation (40m^3/ha)	340.84m
Peak Release Rate for Extended Detention (40m^3/ha)	0.0095m^3/s
Forebay	
Required Forebay Length	26.8m
Actual Forebay Length	75.0m
Permanent Pool Elevation	340.70m
Bottom Elevation	339.20m
Outlet Controls	
Orifice 1 Diameter (Extended Detention)	130mm
Orifice 1 Elevation (Extended Detention)	340.70m
Notch Weir Width (25mm-4hr)	400mm
Notch Weir Elevation (25mm-4hr)	340.90m
1.4m Internal Weir Elevation	341.80m

5.3 Water Quantity and Erosion Control

5.3.1 Stormwater Management Facility 1

As previously discussed, flows for all storm events will be conveyed to the proposed SWMF by a combination of storm sewers and overland flow routes (road rights-of-way). The post-development SWMHYMO design storm event modelling output is included in **Appendix C**.

Discharge from the facility will be controlled via a 2400mm multi-stage control manhole outlet, which includes: a 75mm orifice plate at permanent pool elevation of 339.50m, a 150mm orifice plate at 339.80m, a 0.7m cutout weir at 340.30m and a 1.7m overflow weir at 341.00m. This structure will control peak design flows for all storm durations to suit the targets set by the pre-development conditions. The facility has a total active storage capacity of 12,643m^3 up to an elevation of 342.00m. A summary of the preliminary stage-storage-discharge relationship for the proposed SWMF is listed in **Table 5.3** below.

The SWMF outlets east of Street Two into an engineered grassed swale within the open space block adjacent to Street Two. This swale conveys the flows downstream towards the existing IGMD, and ultimately to the existing culvert underneath Waterloo Street.

Table 5.3 – SWMF1 Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m^3/s)	Volume (m^3)	Remarks
339.50	0.000	0	Permanent Pool Elevation, 75mm Orifice
339.80	0.006	1,110	200mm Orifice
340.30	0.043	3,282	0.7m Weir
340.50	0.144	4,229	Contour
340.60	0.225	4,716	Contour
341.00	0.673	6,756	1.7m Weir
341.70	3.267	10,705	Emergency Overflow
342.00	7.269	12,643	Top of Berm

A summary of the peak flows and the associated maximum water levels from the SWMF under post-development conditions are summarized in **Table 5.4** below. Enough volume has been provided to store the 100-year storm event to a maximum elevation of 340.72m, or 1.22m above the permanent pool level. Refer to **Appendix C** for detailed SWMHYMO output of the post-development model.

Table 5.4 – SWMF1 Proposed Ponding Elevations

Storm Event	Peak Inflow (m^3/s)	Peak Outflow (m^3/s)	Maximum Ponding Volume (m^3)	Maximum Ponding Elevation (m)
25mm 4hr Storm	1.038	0.014	1,449	339.89
2-Year Storm	1.603	0.019	2,092	340.04
5-Year Storm	2.196	0.029	3,021	340.25
10-Year Storm	2.735	0.070	3,588	340.37
25-Year Storm	3.163	0.148	4,203	340.50
50-Year Storm	3.633	0.189	4,805	340.63
100-Year Storm	4.099	0.291	5,284	340.72

The pre- and post-development peak flows, which outlet into the IGMD, are summarized in **Table 5.5**.

Table 5.5 – SWMF1 Pre- and Post-Development Peak Runoff Rates

Storm Event	Pre-Development (m^3/s)	Post-Development (m^3/s)	
		Pond Outflow	Total to IGMD
25mm 4hr Storm	0.194	0.014	0.056
2-Year Storm	0.804	0.019	0.131
5-Year Storm	1.471	0.029	0.287
10-Year Storm	1.962	0.070	0.428
25-Year Storm	2.594	0.148	0.630
50-Year Storm	3.108	0.189	0.831
100-Year Storm	3.599	0.291	1.065

As stated above, the SWMF outlets east of Street Two into an engineered grassed swale within the open space block adjacent to Street Two, which conveys the flows downstream towards the IGMD. In order to confirm that no impacts to the SWM performance occur a result of backwater effects from the IGMD, additional calculations were completed. A supplemental SWMHYMO model utilizing the model within the Floodplain Analysis Brief was created to determine the ponding elevations within the floodplain under the 25mm-4hr to 100-year events. The floodplain and existing culvert under Waterloo Street were modelled with storage volumes and flow controls to determine the ponding elevations within the floodplain. The corresponding stage-storage-discharge relationships for the IGMD and floodplain storage are provided in **Appendix D**.

Through these additional calculations, it was determined that the orifice controls within the outlet control manhole are partially submerged under various events as a result of the flood elevations within the IGMD. These controls were considered as submerged (i.e., set to zero [0] flow when flooded) within the post-development SWMHYMO modelling. Calculations confirming capacity of the swale and culvert when free-flowing using CulvertMaster software are provided in **Appendix D**.

5.3.2 Erosion Threshold Analysis

An erosion threshold analysis was completed by Water's Edge for the Ivan Gingerich Drain downstream of the proposed SWMF outfall to determine the threshold flow rate. Based on field investigations and assessments, a critical cross section was identified for the reach between Waterloo Street and the Nith River. An erosion threshold flow of $0.36m^3/s$ was established for this critical section based on shear stresses acting on the bed. A continuous hydrologic model was developed under pre- and post-development conditions to analyze erosion exceedance hours. Water's Edge concluded that adequate attenuation of flows towards the IGMD is provided such that there will be an approximate 10% reduction in erosion hours under proposed conditions. The Erosion Threshold Assessment is included in **Appendix H**.

LEGEND

- PROPERTY BOUNDARY
- 338.5 — EXISTING CONTOURS
- 339.5 — FINISHED GRADE CONTOURS
- (336.00)EX × — EXISTING SPOT ELEVATIONS
- (336.00) × — PROPOSED SPOT ELEVATIONS
- GABION MAT
- MAJOR OVERLAND FLOW ROUTE
- MAINTENANCE ACCESS
- DIRECTION OF DRAINAGE

STREET TWO

STREET THREE

STREET ONE

INGOLD AVENUE

CHARLES YOUNG AVE

PROPOSED SEDIMENT DRYING AREA

4.5m MAINTENANCE TRAIL

OUTLET SWALE TO IVAN GINGERICH DRAIN (SEE FIGURE 5.4)

STORM SEWER SYSTEM TO INFILTRATION GALLERY (SEE FIGURE 5.8)

EMERGENCY OVERFLOW WEIR

MAJOR OVERLAND FLOW ROUTE (SEE FIGURE 5.3)

SWMF 1
PERM. POOL=339.50

WET CELL

10m FOREBAY WEIR

WETPOND ACCESS

FOREBAY

CONTROL MH206

OGS207

HW208
INV.=339.60

HW205
INV.=339.76

HW203
INV.=339.65

HW301

MH61

MH57

MH58

MH46

MH48

MH45

MH50

MH44

MH40

MH204

SPMH202

MH201

CB302.1

CBMH302

CBMH56

(342.30)LP

(342.40)LP

(342.45)HP

(342.49)

(342.10)

(342.00)

(341.50)

(340.10)

(339.50)

(338.90)

(338.00)

(342.96)

(344.04)

(343.10)

(344.14)

(342.68)

(342.80)

(342.62)

(342.28)

(341.43)

(341.20)

(341.70)

(341.60)

(340.25)EX

(341.99)EX

(340.42)

18.6m–600mmø STM. @ 0.40%

42.5m–600mmø STM. @ 0.40%

22.5m–600mmø STM. @ 0.40%

40.0m–375mmø STM. @ 1.00%

32.4m–450mmø STM. @ 1.00%

9.6m–450mmø STM. @ 1.00%

11.0m–450mmø STM. @ 1.00%

15.0m–750mmø STM. @ 0.40%

90.0m–525mmø STM. @ 1.10%

19.0m–600mmø STM. @ 0.50%

65.0m–975mmø STM. @ 0.40%

19.0m–975mmø STM. @ 0.40%

60.5m–450mmø STM. @ 1.70%

19.0m–525mmø STM. @ 0.50%

51.0m–1200mmø STM. @ 0.25%

14.0m–900mmø STM. @ 0.40%

20.0m–1200mmø STM. @ 0.25%

30.0m–975mmø STM. @ 0.40%

11.0m–975mmø STM. @ 0.40%

25.0m–1200mmø STM. @ 0.25%

N39°04'07"E 291.951m

N39°24'40"E

FIGURE 5.1

SWM FACILITY 1 LOCATION PLAN

Date: MAR.6/23
Scale: 1:750

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

March 7, 2023 9:34 a.m. Plotted By: ABarakzay

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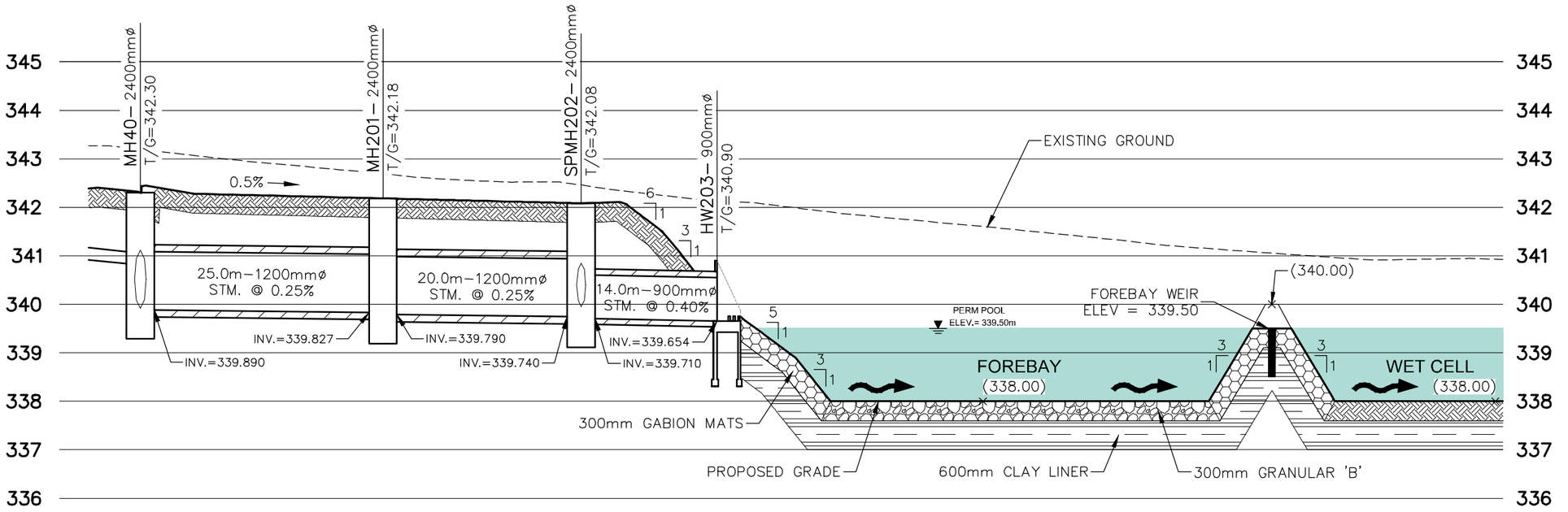

MAXIMUM PONDING LEVELS	
PERMANENT POOL	339.50
MOE EXT DET	339.61
25mm STORM	339.89
2YR STORM	340.04
5YR STORM	340.25
10YR STORM	340.37
25YR STORM	340.50
50YR STORM	340.63
100YR STORM	340.72

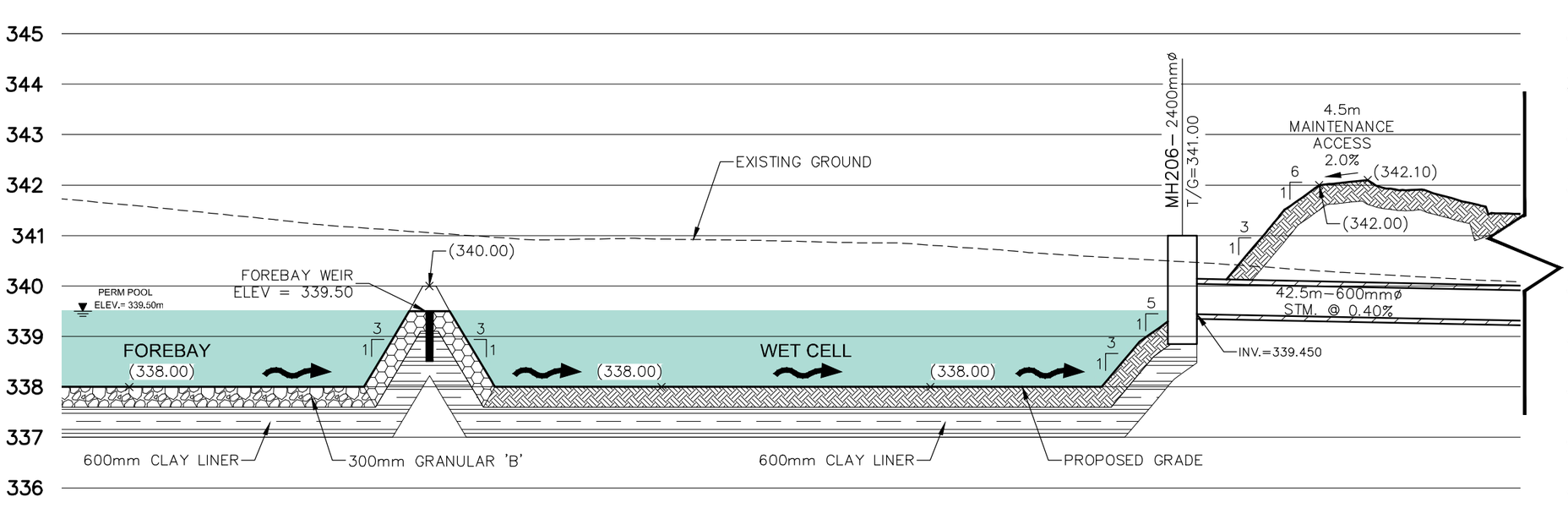

FIGURE 5.2 Date: MAR.6/23
Scale: H-1:500 V-1:100

SWM FACILITY 1
PROFILE SECTION A-A

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

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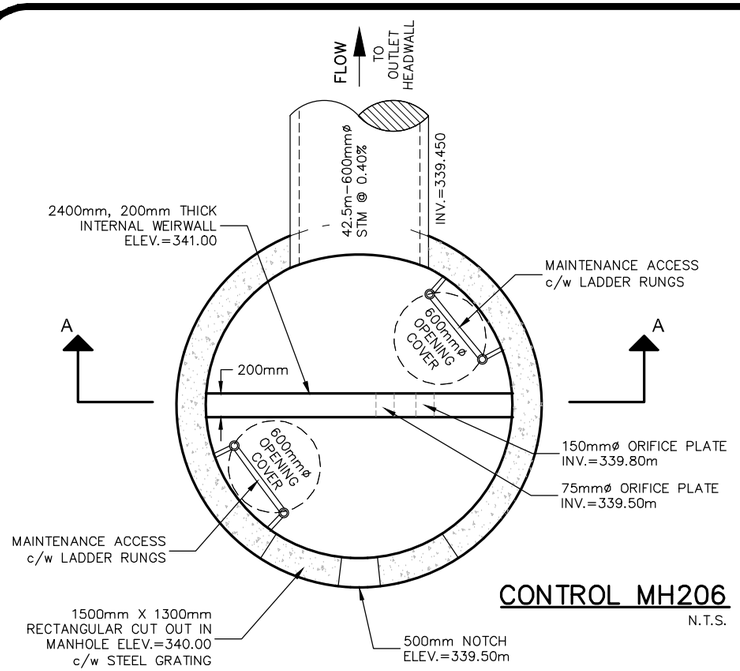
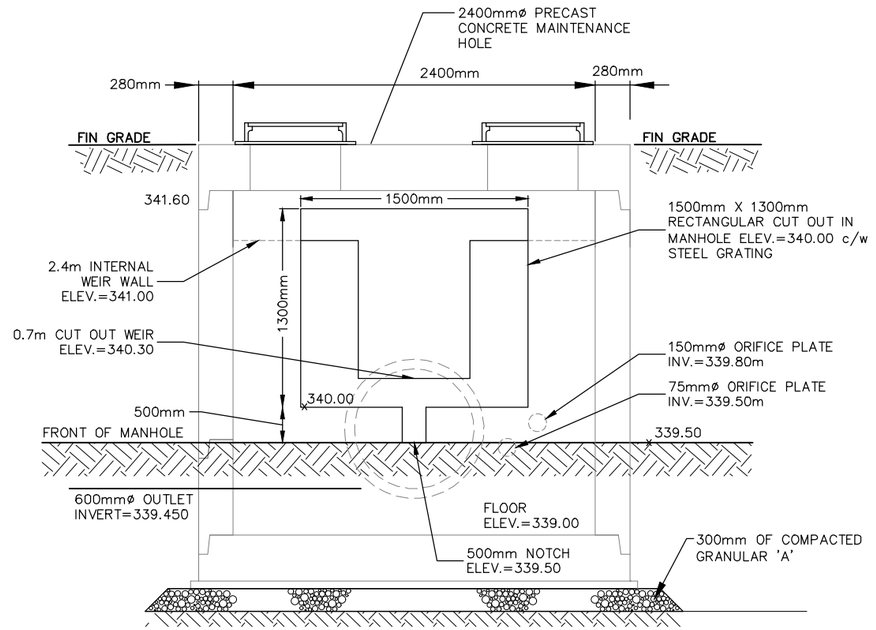


CONTROL MH206

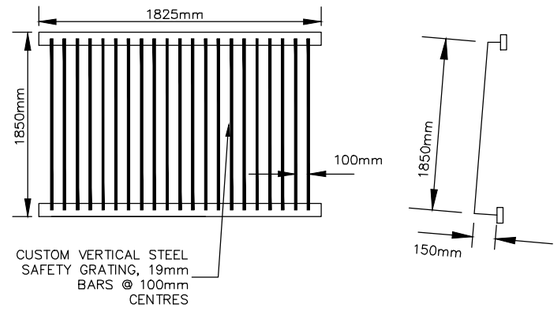
N.T.S.



SECTION A–A

N.T.S.

GRATING TO COVER CUTOUT WEIR AND NOTCH



SAFETY GRATE DETAIL

N.T.S.

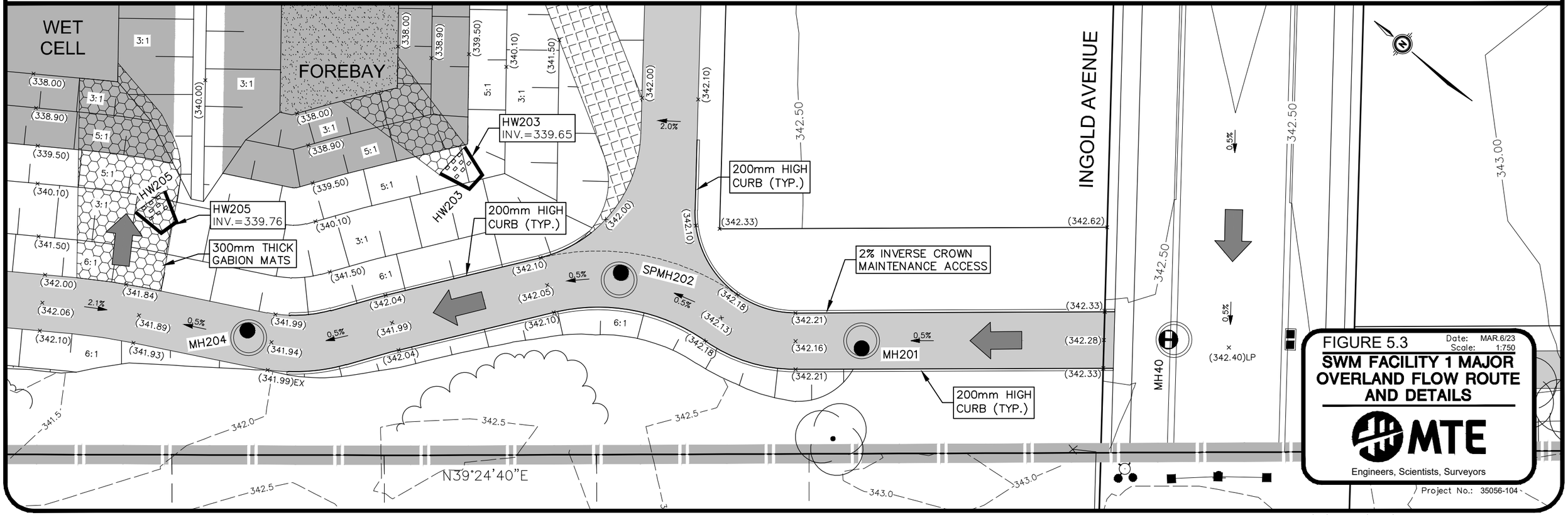


FIGURE 5.3

SWM FACILITY 1 MAJOR OVERLAND FLOW ROUTE AND DETAILS

Date: MAR.6/23
Scale: 1:750

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

March 7, 2023 9:28 a.m. Plotted By: ABarakzay

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IVAN GINGERICH DRAIN

WATERLOO STREET

STREET TWO

CHARLES YOUNG

PROPOSED TWO
14.0m–375mmØ
CULVERTS @ 1.00%

600X1200mm
FLOODPLAIN
EQUALIZATION
CULVERT
INV.=339.40+/–

HW301
INV.=339.03

HW401

DCB308.1
DCBMH308
CB307.1
CBMH307
CB306.1
MH306
CB306.2
CB305.1
CBMH305
CB304.1
CBMH304
CB303.1
CBMH303
CB302.1
MH58
CBMH302
MH57
MH206
DCB56.1

33.0m–300mmØ STM. @ 0.50%
34.0m–375mmØ STM. @ 0.45%
2.1m–375mmØ STM. @ 1.00%
2.0m–375mmØ STM. @ 1.00%
9.0m–375mmØ STM. @ 1.80%
23.0m–375mmØ STM. @ 0.45%
20.8m–375mmØ STM. @ 0.45%
50.2m–375mmØ STM. @ 0.45%
41.8m–375mmØ STM. @ 0.75%
18.6m–600mmØ STM. @ 0.40%
22.5m–600mmØ STM. @ 0.40%
42.5m–600mmØ STM. @ 0.40%
11.7m–250mmØ STM. @ 2.00%
32.4m–450mmØ STM.
9.6m STM.

(2.00%)EX.
0.40%
0.35%
0.50%
0.45%

(338.27)EX
(338.32)
(338.46)
(338.48)
(338.67)
(338.87)
(339.00)

94.405m
108.766m
N65°56'10"W
N39°12'02"W
N39°04'07"E 291.951m

SECTION A–A
NTS

MATCH TO EXISTING
1.5m
3.0m
1.5m
MATCH TO EXISTING
FLAT

LEGEND

- PROPERTY BOUNDARY
- 338.5 EXISTING CONTOURS
- 339.5 FINISHED GRADE CONTOURS
- (336.00)EX EXISTING SPOT ELEVATIONS
- (336.00) PROPOSED SPOT ELEVATIONS
- 3.0m MULTI–USE TRAIL
- 0.35% PROPOSED OUTLET SWALE GRADE
- (TOP) / (BOTTOM) PROPOSED EMBANKMENT

FIGURE 5.4
Date: MAR.6/23
Scale: 1:750

OUTLET SWALE TO
IVAN GINGERICH DRAIN

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

March 7, 2023 11:17 a.m. Plotted By: ACressman

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5.3.3 Stormwater Management Facility 2

As described in Section 4.2, the facility will provide quantity controls for the majority of the southern portion of the subject lands. The total drainage area to the proposed facility is 19.44ha at 52.9% imperviousness.

The proposed facility will accept all storm event flows and provide enough volume to detain and attenuate the Regional storm event. These flows will be conveyed to the proposed SWMF by a combination of storm sewers and overland flow routes (road rights-of-way). The post-development SWMHYMO design storm event modelling output is included in **Appendix D**.

The proposed forebay will accept minor storm event flows via a splitter structure designed to split off flows in excess of the 25mm quality event. The large flows will be directed into the main pond, avoiding potential resuspension or washout of the forebay.

Discharge from the facility will be controlled via a 2400mm multi-stage control manhole outlet, which includes: a 130m orifice plate at the permanent pool elevation of 340.70m, a 400mm notch weir at 340.90m, and a 1.4m internal weir at 341.80m. This structure will control peak design flows for all storm durations up to and including the 100-year storm. The facility has a total active storage capacity of 21,857m^3 up to an elevation of 343.30m. A summary of the preliminary stage-storage-discharge relationship for the proposed SWMF is listed in **Table 5.6** below.

Refer to **Appendix D** for the relevant design sheets and calculations (catchment parameters, imperviousness calculations, stage-storage discharge relationships, drawdown calculations, etc.). Refer to **Figures 5.5 to 5.7** for details of the proposed SWMF.

Table 5.6 – SWMF2 Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m^3/s)	Volume (m^3)	Remarks
340.70	0.000	0	Permanent Pool, 130mm Orifice
340.90	0.014	1,172	0.4m Notch Weir
341.20	0.122	3,284	Contour
341.80	0.542	8,024	1.4m Internal Weir
342.00	0.907	9,696	Contour
342.50	2.455	14,078	Contour
343.00	4.570	18,776	Emergency Overflow Weir
343.30	8.371	21,857	Top of Pond

As summary of the peak flows and the associated maximum water levels from the SWMF under post-development conditions are summarized in **Table 5.7** below. Enough volume has been provided to store the 100-year storm event to a maximum elevation of 341.94m, or to a depth of 1.24m. Refer to **Appendix C** for detailed SWMHYMO output of the post-development model.

Table 5.7 – SWMF2 Proposed Event Modelling Output

Storm Event	Peak Inflow (m^3/s)	Peak Outflow (m^3/s)	Maximum Ponding Volume (m^3)	Maximum Ponding Elevation (m)
25mm Storm	1.711	0.067	2,209	341.05
2-Year Storm	2.637	0.121	3,273	341.26
5-Year Storm	3.632	0.233	4,701	341.39
10-Year Storm	4.525	0.324	5,749	341.52
25-Year Storm	5.245	0.456	7,162	341.70
50-Year Storm	6.028	0.600	8,262	341.83
100-Year Storm	6.813	0.833	9,215	341.94

The pre- and post-development peak flows, which outlet to the existing 900mm diameter culvert beneath the CN railway, are summarized in **Table 5.8**.

Table 5.8 – SWMF2 Pre- and Post-Development Peak Runoff Rates

Storm Event	Pre-Development (m^3/s)	Post-Development (m^3/s)	
		Pond Outflow	Total to Culvert
25mm Storm	0.142	0.067	0.074
2-Year Storm	0.369	0.121	0.141
5-Year Storm	0.805	0.233	0.285
10-Year Storm	1.176	0.324	0.410
25-Year Storm	1.671	0.456	0.587
50-Year Storm	2.103	0.600	0.754
100-Year Storm	2.556	0.833	1.047

As previously discussed, SWMF2 discharges to the existing 900mm culvert crossing of the CN corridor. CulvertMaster software was used to analyze the culvert crossing under various design storm events to determine the headwater elevations upstream of the existing culvert. These elevations were then compared to the discharge controls of SWMF2 to ensure that backwater effects of the crossing will not impact the stage-discharge relationship. These calculations are provided in **Appendix D**.

LEGEND

- PROPERTY BOUNDARY
- 338.5 — EXISTING CONTOURS
- 339.5 — FINISHED GRADE CONTOURS
- (336.00)EX × — EXISTING SPOT ELEVATIONS
- (336.00) × — PROPOSED SPOT ELEVATIONS
- GABION MAT
- MAJOR OVERLAND FLOW ROUTE
- MAINTENANCE ACCESS
- DIRECTION OF DRAINAGE

STREET NINE

STREET EIGHT

STREET TWO

12.5m–600mmø STM. @ 0.50%

(344.80)

20.0m–750mmø STM. @ 0.35%

MH74

0.5%

20.0m–525mmø STM. @ 0.50%

22.0m–600mmø STM. @ 0.40%

MH77

0.7%

56.5m–600mmø STM. @ 0.40%

(345.54)

SEE INSERT C–C

16.3m–450mmø STM. @ 0.60%

MH78

57.0m–750mmø STM. @ 0.35%

MH75

MH72

74.0m–900mmø STM. @ 0.35%

MH71

MH37

3.0m MULTI-USE TRAIL

81.0m–450mmø STM. @ 1.40%

12.5m–450mmø STM. @ 1.40%

HW103 (INLET FOR DRAINAGE AREA 210) INV.=341.75

HW103

5m FOREBAY WEIR

2.5m HIGH RAILWAY CRASH BERM

SWMF 2 PERM. POOL=340.70

FOREBAY

WETLAND ACCESS

1.0m

CONTROL MH102 (SEE FIGURE 5.7)

HW101.2 INV.=340.90

HW101.1 INV.=341.00

MH102

EMERGENCY OVERFLOW WEIR

29.0m–600mmø STM. @ 0.50%

4.5m MAINTENANCE TRAIL

MH34

SPMH29

45.0m–1050mmø STM. @ 0.35%

8.0m–1050mmø STM. @ 0.35%

30.0m–450mmø SAN. @ 0.35%

31.6m–1200mmø STM. @ 0.55%

28.1m–450mmø SAN. @ 0.35%

21.0m–675mmø STM. @ 0.40%

54.5m–675mmø STM. @ 0.40%

33.0m–975mmø STM. @ 0.40%

62.0m–975mmø STM. @ 0.40%

77.4m–300mmø SAN. @ 0.35%

18.5m–300mmø SAN. @ 0.35%

63.8m–300mmø SAN. @ 0.35%

15.0m–900mmø STM. @ 0.40%

18.0m–975mmø STM. @ 0.35%

MH15A

MH70

MH28

MH16A

MH14.1A

MH66

MH68

A

B

OUTLET TO SURFACE TOWARDS CULVERT INV.=340.200

EX. 900mm CULVERT INV.=339.503

FOR SANITARY CORSSING AT CN RAIL, SEE MTE DRAWING 35056–104–MS5

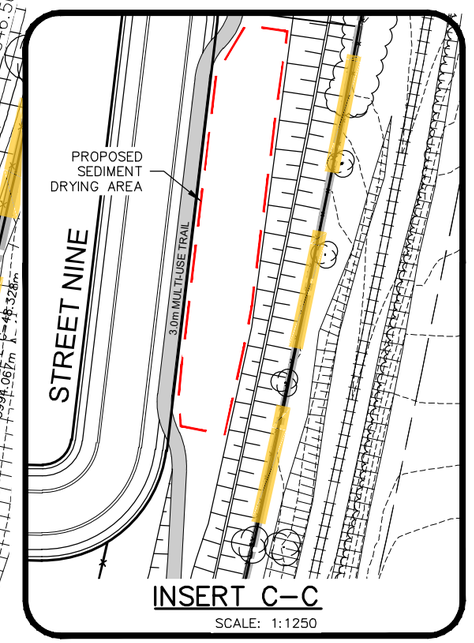
WETLAND BOUNDARY

15m WETLAND BUFFER

CN RAILWAY

SWMF 2

SCALE: 1:750



INSERT C–C

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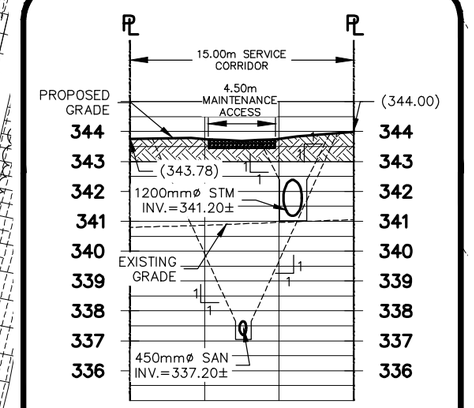

SECTION B–B

SCALE: H–1: 400 V–1: 200

FIGURE 5.5

Date: MAR.6/23
Scale: AS NOTED

SWM FACILITY 2 LOCATION PLAN

MTE

Engineers, Scientists, Surveyors

Project No.: 35056-104

March 7, 2023 11:13 a.m. Plotted By: TBerry

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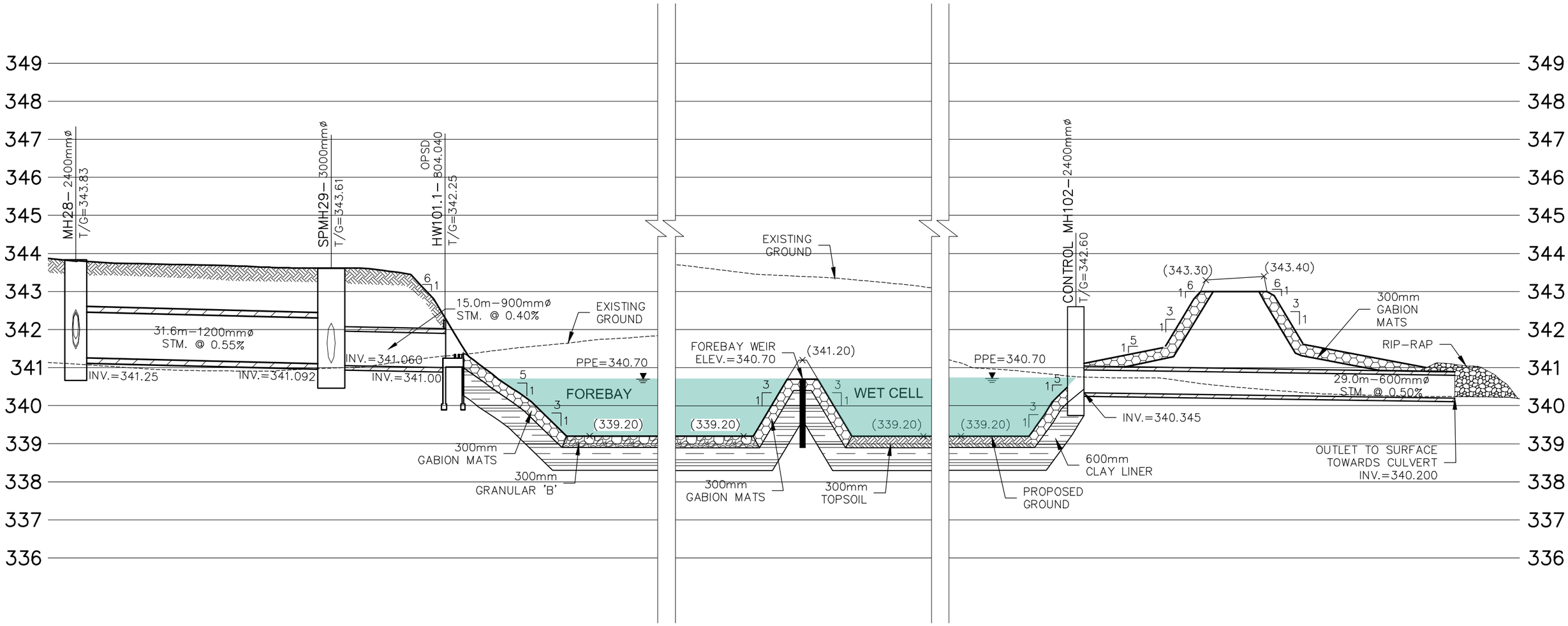

MAXIMUM PONDING LEVELS	
PERMANENT POOL	340.70
MOE EXT DET	340.84
25mm STORM	341.05
2YR STORM	341.26
5YR STORM	341.39
10YR STORM	341.52
25YR STORM	341.70
50YR STORM	341.83
100YR STORM	341.94

FIGURE 5.6 Date: MAR.6/23 Scale: H-1:500 V-1:100

SWM FACILITY 2 PLAN & PROFILE SECTION A-A

MTE

Engineers, Scientists, Surveyors

Project No.: 35056-104

March 7, 2023 8:50 a.m. Plotted By: ABarakzay

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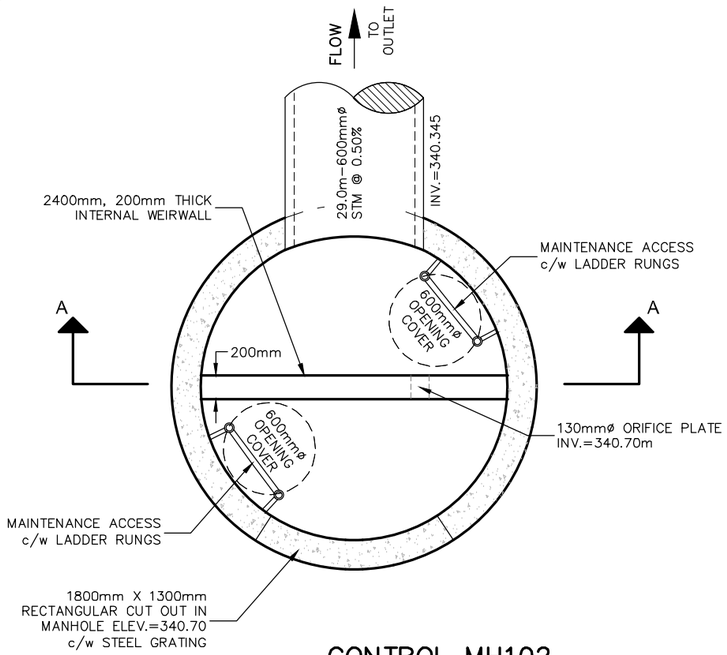
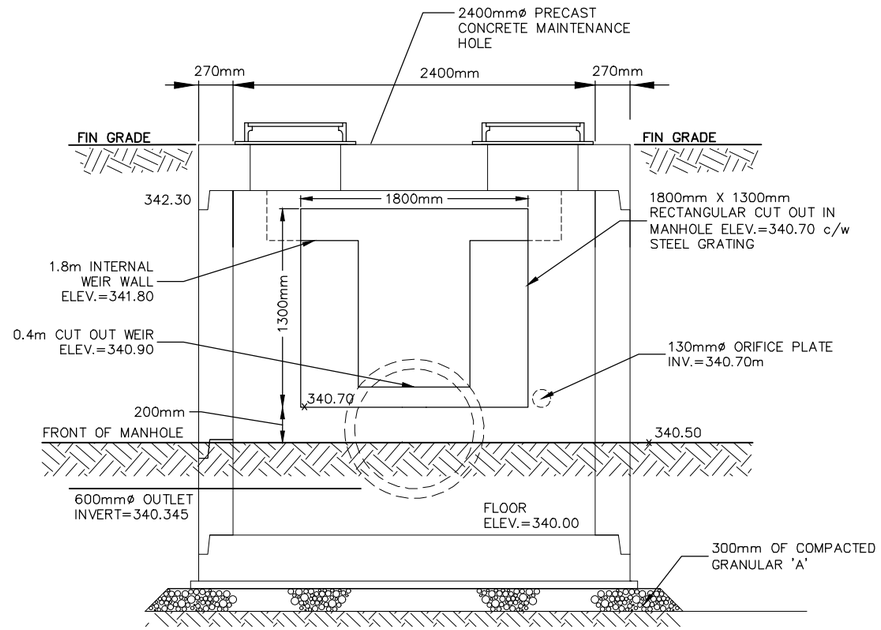


CONTROL MH102

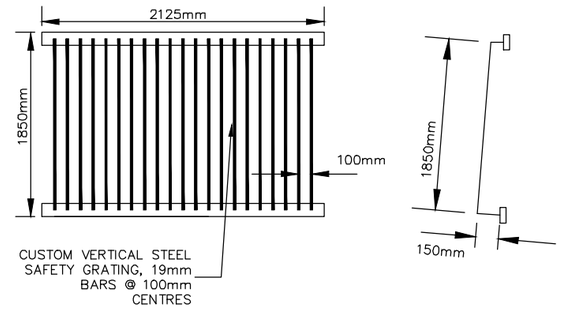
N.T.S.



SECTION A–A

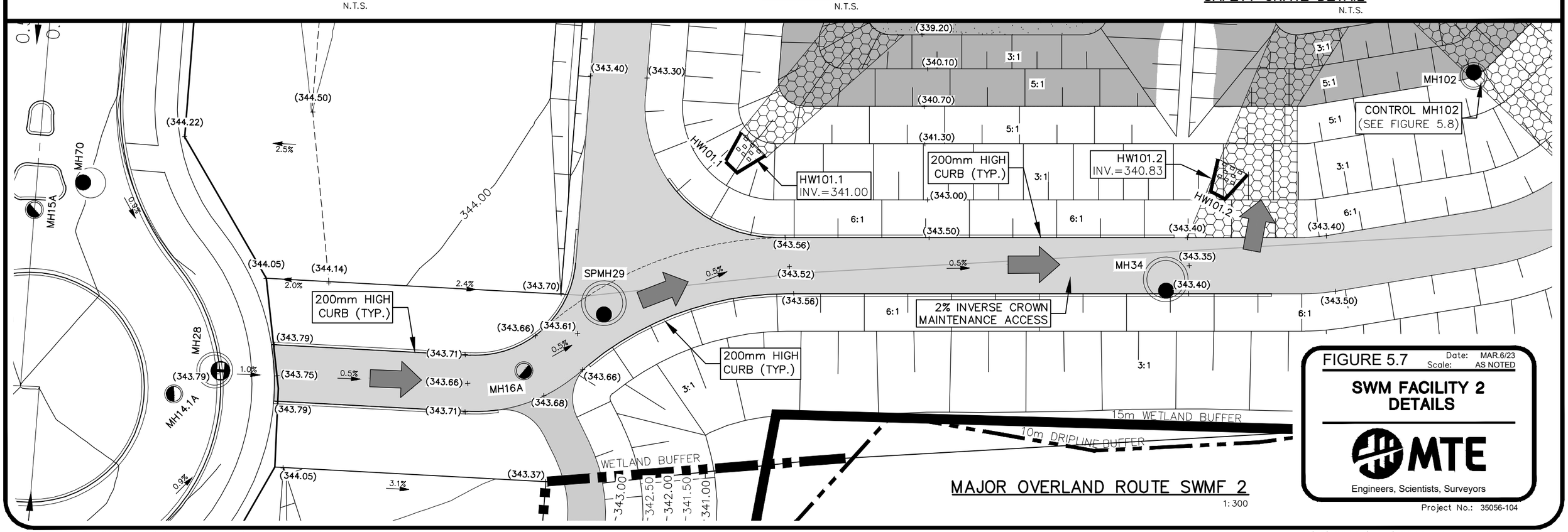
N.T.S.

GRATING TO COVER CUTOUT WEIR AND NOTCH



SAFETY GRATE DETAIL

N.T.S.



MAJOR OVERLAND ROUTE SWMF 2

1:300

FIGURE 5.7 Date: MAR.6/23 Scale: AS NOTED

SWM FACILITY 2 DETAILS

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

March 7, 2023 9:03 a.m. Plotted By: ABarakzay

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5.4 Additional Drainage Areas to the IGMD

5.4.1 Drainage Area 205

Drainage Area 205 represents a portion of Street Two that is unable to drain towards SWMF1. This 0.56ha of right-of-way is proposed to be directed towards an OGS unit and infiltration gallery treatment train prior to be released into the IGMD. The infiltration gallery is sized to infiltrate the 25mm event. An infiltration rate of 40mm/hr (representing the sand layers encountered on-site) is assumed at the location of the gallery. The infiltration rate will be confirmed at the location of the gallery during final design.

A MIDUSS model for Catchment Area 205 was prepared in order to determine flow rates and storage volumes required for the gallery. The MIDUSS model to size the infiltration gallery is provided in **Appendix D**. Refer to **Figure 5.8** for a layout of the proposed system. The proposed infiltration gallery will be a manufactured chamber (such as an Advanced Drainage Solutions StormTech chamber) system. For the purpose of the overall post-development modelling, the quantities within the infiltration gallery are considered negligible, and the gallery is not included within the SWMHYMO modelling.

The OGS unit is designed to treat runoff from minor events (i.e., events ≤ 25mm) before releasing flows to the IGMD. Flows from events greater than the 25mm storm may by-pass the OGS unit. The proposed OGS (model EF4) unit has been verified by the Canadian Environmental Technology Verification Program and has been sized to provide at least 56% TSS removal. It should be noted that the GRCA will credit a maximum of 50% TSS removal, and the implementation of a treatment train will provide additional TSS removal. A detailed sizing report for the OGS unit is included in **Appendix D.**

5.4.2 Drainage Areas 204, 206 to 208

The remaining uncontrolled drainage areas to the IGMD are open space blocks (Drainage Areas 204, 206 to 208). Street Two bisects open space Drainage Areas 207 and 208. Drainage Area 207 drains towards the existing swale for the Forest Glen subdivision SWMF. A culvert will be introduced underneath Street Two to connect Drainage Areas 207 and 208 such that the emergency overland flows can drain directly to the IGMD if required. This culvert will also serve to provide floodplain equalization storage across the open space blocks under the large storm events, as further discussed in the Floodplain Analysis Brief in **Appendix E**.

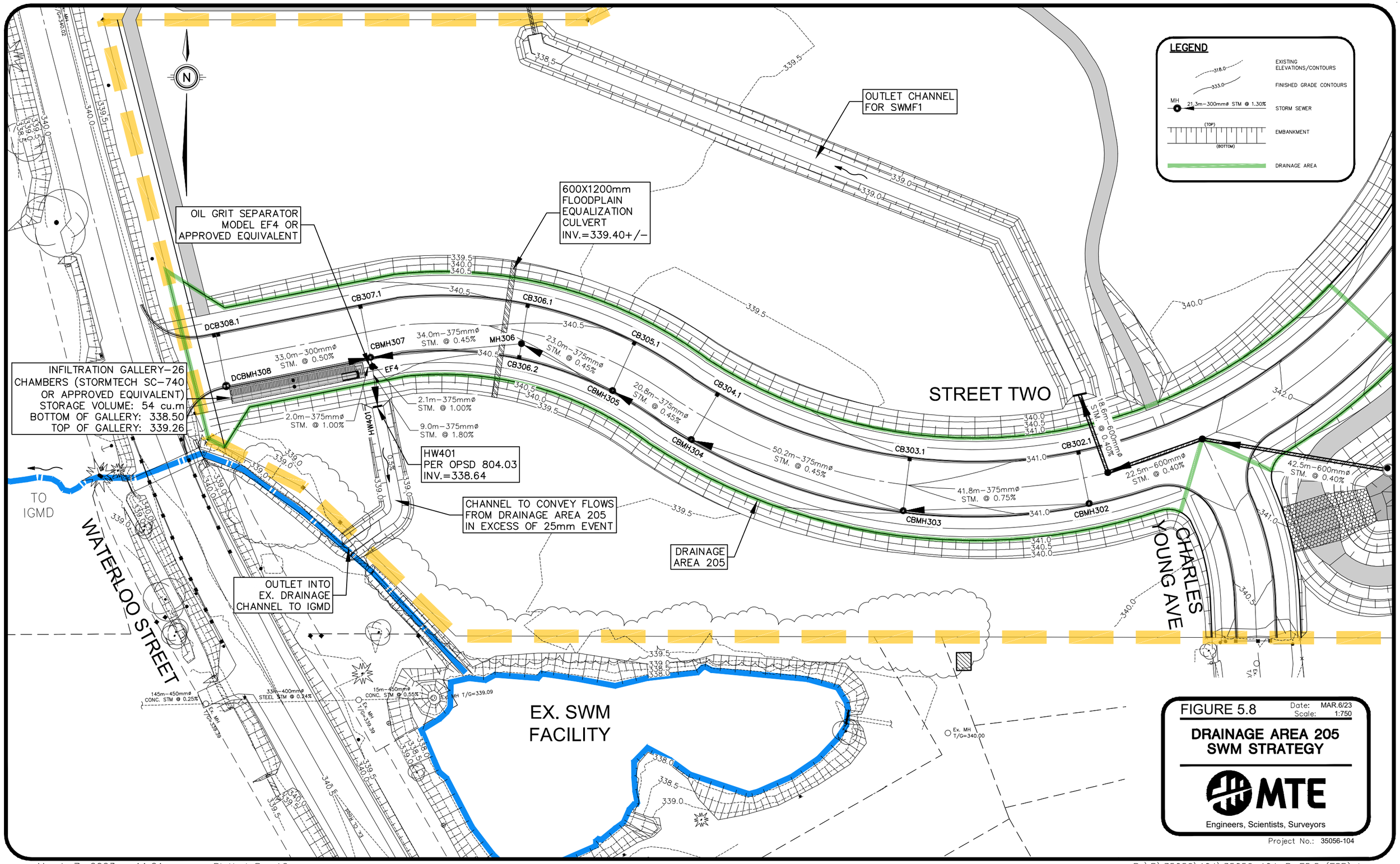
5.5 Water Balance Analysis

5.5.1 Infiltration

The EMDP established that due to the fine grained nature of the subsurface material within the study area, infiltration will not be feasible for the majority of the study area, however there may be silty sand lenses which may be accessible on some sites for rooftop infiltration.

The fine-grained soil characteristics have been confirmed through the majority of the subject lands based on the information gathered from the geotechnical and hydrogeological investigations completed to date. These investigations have concluded that the majority of the underlying soils within the subject lands include extensive deposits of clayey silt. The prevalence of low-permeability clayey silt deposits limits on-site infiltration.

Although the soils in the northern portion of the site are conducive to infiltration (sand and silty sand material), the presence of high groundwater eliminates the widespread potential to provide infiltration in these areas. Infiltration will be utilized to provide stormwater attenuation for Drainage Area 205, as described within **Section 5.4.1.**



March 7, 2023 — 11:21 a.m. — Plotted By: ACressman

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5.5.2 Surface Water

R.J. Burnside & Associates Limited was retained to prepare an Environmental Impact Study (EIS) of the subject lands. Within this report, a summary was created to assess the potential impacts of the development on the wetland/woodland feature, and outlines mitigation measures to resolve any potential impacts. To address alterations to hydrological regimes through creation of impervious surfaces, it was stated:

> "The grading plan should ensure that existing grades are not significantly altered and that surface water continues to flow through the buffer area towards the woodland and/or wetland."

A surface water balance is provided in **Appendix J** to analyze pre- and post-development surface water contributions to the woodland and wetland features. For the purposes of this assessment, drainage areas east and north of the wetland ditch largely drain directly into the ditch and were not considered within the surface water balance.

The majority of the pre-development surface drainage into the wetland is unchanged under the post-development condition. A small additional area (Area 201) of backyards backing onto the wetland will be directed overland as surface drainage to the wetland. The net 8.3% surplus (additional 324m^3) of surface water inputs into the wetland is considered minor and mitigated.

5.6 Sediment Drying Areas

Per Township standards, SWM facilities being transferred to the Township shall incorporate land area within the SWM block to facilitate sediment removal and maintenance of the facilities. The sediment drying area shall be sized to fit a full cleanout of 100% sediment capacity of the forebay, equivalent to a 33% volume of the forebay's permanent pool depth.

The sediment drying area for SWMF1 is located along the eastern limits of the block, with space to accommodate approximately 375m^3 of sediment. The sediment drying area for SWMF2 is located between Street Nine and the CN crash berm, with space to accommodate approximately 805m^3 of sediment. Please note the revised draft plan provides sufficient decanting area within the stormwater management blocks. Refer to **Figures 5.1 and 5.5** for the locations of the sediment drying areas.

5.7 Landscape Design

A landscape design for the proposed SWMFs will be completed during the final design stage of the development. The reasons for landscaping these facilities are aesthetics, erosion protection and long-term bank stability, and to limit pedestrian access. The SWMFs have been designed in accordance with the City of Kitchener's Stormwater Management Policies and Guidelines for aesthetics, landscape, and safety of stormwater management facilities as required by the Township of Wilmot.

6.0 Ivan Gingerich Municipal Drain Floodplain Mapping

The Ivan Gingerich Municipal Drain (IGMD) is a municipal drainage channel located within the Township of Wilmot. The drain begins east of Nafziger Road and flows west through agricultural lands (including the subject lands), crosses Waterloo Street and Christner Road and ultimately confluences with the Nith River just downstream of the Christner Road crossing. Several stormwater drainage catchments within the proposed Wilmot Woods subdivision ultimately discharge to the IGMD. No engineered floodplain mapping has been previously completed for the IGMD. Hydrologic and hydraulic analyses were carried out in this study to better determine the floodplain within the subject lands, following the *Technical Guide – River and Stream Systems: Flooding Hazard Limit* (MNR, 2002).

A Floodplain Analysis Brief has been prepared as a condition of approval from the Grand River Conservation Authority and to support the delineation of the floodplain. This brief discusses the delineation of the floodplain in proximity to the subject lands, outlines constraints and boundary conditions, and summarizes impacts of the proposed development and Street Two on the floodplain. A response to the GRCA comments including the Brief was submitted to the GRCA (dated November 4, 2022) and approval and acceptance of the Brief was given on December 5, 2022. The Brief is provided in **Appendix E**.

7.0 Monitoring Program

A monitoring program will be implemented and will serve to ensure that the stormwater management plan proposed within this report is implemented and performing at an acceptable level. Refer to **Figures 7.1 and 7.2** for an illustration of the Pre-Construction, and the During and Post-Construction monitoring programs. A summary table outlining the monitoring program in provided in **Table G1**.

7.1 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. Groundwater monitoring has been on-going since March 2021.
- **Surface water** – continuous surface water monitoring including levels and temperature have been completed utilizing a pressure transducer in the IGMD since February 2021. Grab samples will be taken 4 times a year on a seasonal basis, analysed for dissolved chlorides, nitrates, and total phosphorus.
- **Wetland** – monitoring includes water level and temperature (continuous via datalogger). Grab samples will be taken 4 times a year on a seasonal basis, analysed for dissolved chlorides, nitrates, and total phosphorus.

7.2 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** – Total suspended solids samples captured seasonally following events >15mm at the outlet of SWMF1 and SWMF2. Standard inspection of vegetation, structures, and general operation of hydraulic controls (observations of drawdown) within the SWMFs. These inspections are to occur seasonally and typically after a significant rainfall event.
- Erosion and Sediment Control – per ESC plans.

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

7.3 Post-Development Monitoring Program

This period of the monitoring will begin following 90% buildout of the subdivision (buildings are constructed, lots are sodded/landscaped, and open spaces are stabilized). 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 SWMF by the Township, the Township continues with a post-development inspection and maintenance program to ensure the long-term effectiveness of the proposed SWMFs.

LEGEND

- SITE BOUNDARY
- EXISTING CONTOURS (GENERATED BY MTE) — 323
- EXISTING CONTOURS (PROVIDED BY REGION OF WATERLOO GIS) — 323
- EXISTING DRIPLINE
- IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN
- EXISTING WETLAND
- 30m WETLAND BUFFER
- PROPOSED RIGHT OF WAY
- EXISTING WATERCOURSE
- EXISTING RAILWAY
- Ex. BH10 Elev=311.64 — EXISTING BOREHOLE
- BH/MW302-D Ground Elev=313.50 Top of Casing=314.45 — EXISTING MONITORING WELL
- SWL/C — SURFACE WATER LEVELS AND CHEMISTRY
- W — WETLAND WATER LEVEL/TEMP/QUALITY
- GWL — GROUNDWATER LEVELS/TEMPERATURE
- GWC — GROUNDWATER CHEMISTRY

IVAN GINGERICH DRAIN

CN RAILWAY

WATERLOO STREET

CHARLES YOUNG AVE

INGOLD AVE

EX. SWM FACILITY

SWL/C (27OP)

MW101 ELEV.=339.20 PZ.=340.12 — GWL/C

MW102 ELEV.=340.15 PZ.=341.11 — GWL/C

MW103 ELEV.=341.08 PZ.=342.16 — GWL

MW104 ELEV.=344.95 PZ.=345.88 — GWL

MW105 ELEV.=345.30 PZ.=346.42 — GWL

MW106 ELEV.=342.96 PZ.=344.13 — GWL

MW107 ELEV.=347.01 PZ.=348.06 — GWL/C

MW108 ELEV.=340.06 PZ.=340.92 — GWL

MW109 ELEV.=340.08 PZ.=340.92 — GWL

MW110 ELEV.=340.04 PZ.=340.75 — GWL/C

MP01-22 ELEV.=340.97 PZ.=342.22 — GWL

MW201-21 ELEV.=343.52 PZ.=344.38 — GWL

MW202-21 ELEV.=342.08 PZ.=343.13 — GWL/C

MW203A-21 ELEV.=344.73 PZ.=345.70 — GWL

MW203B-21 ELEV.=344.77 PZ.=345.72 — GWL/C

BH 1 ELEV.=339.37

BH 2 ELEV.=341.42

BH 3 ELEV.=344.50

BH 4 ELEV.=342.61

BH 5 ELEV.=341.78

BH 6 ELEV.=343.61

BH 7 ELEV.=341.57

BH 8 ELEV.=343.37

BH 9 ELEV.=343.24

BH 10 ELEV.=342.20

BH 11 ELEV.=346.37

BH 12 ELEV.=346.22

10m DRIPLINE BUFFER

15m WETLAND BUFFER

WETLAND BOUNDARY

W

340.50 BUFFER

FIGURE 7.1 — PRE-CONSTRUCTION MONITORING PROGRAM

Date: MAR.6/23
Scale: 1:3000

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

March 7, 2023 9:18 a.m. Plotted By: ABarakzay

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LEGEND

- SITE BOUNDARY
- EXISTING CONTOURS (GENERATED BY MTE)
- EXISTING CONTOURS (PROVIDED BY REGION OF WATERLOO GIS)
- EXISTING DRIPLINE
- IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN
- EXISTING WETLAND
- 30m WETLAND BUFFER
- PROPOSED RIGHT OF WAY
- EXISTING WATERCOURSE
- EXISTING RAILWAY
- EXISTING BOREHOLE
- EXISTING MONITORING WELL
- SWL/C — SURFACE WATER LEVELS AND CHEMISTRY
- W — WETLAND WATER LEVEL/TEMP/QUALITY
- GWL — GROUNDWATER LEVELS/TEMPERATURE
- GWC — GROUNDWATER CHEMISTRY
- SW — STORMWATER MANAGEMENT MONITORING

IVAN GINGERICH DRAIN

CN RAILWAY

WATERLOO STREET

CHARLES YOUNG AVE

INGOLD AVE

EX. SWM FACILITY

SWL/C(27OP)

GWL/C

SW1

SW2

SW3

SW4

GWL/C

W

GWL

MW101 ELEV.=339.20 PZ.=340.12

MW102 ELEV.=340.15 PZ.=341.11

MW103 ELEV.=341.08 PZ.=342.16

MW104 ELEV.=344.95 PZ.=345.88

MW105 ELEV.=345.30 PZ.=346.42

MW106 ELEV.=342.96 PZ.=344.13

MW107 ELEV.=347.01 PZ.=348.06

MW109 ELEV.=340.06 PZ.=340.92

MW110 ELEV.=340.04 PZ.=340.75

MP01-22 ELEV.=340.97 PZ.=342.22

MW201-21 ELEV.=343.52 PZ.=344.38

MW202-21 ELEV.=342.08 PZ.=343.13

MW203A-21 ELEV.=344.73 PZ.=345.70

MW203B-21 ELEV.=344.77 PZ.=345.72

BH 1 ELEV.=339.37

BH 2 ELEV.=341.42

BH 3 ELEV.=344.50

BH 4 ELEV.=342.61

BH 5 ELEV.=341.78

BH 6 ELEV.=343.61

BH 7 ELEV.=341.57

BH 8 ELEV.=343.37

BH 9 ELEV.=343.24

BH 10 ELEV.=342.20

BH 11 ELEV.=346.37

BH 12 ELEV.=346.22

15m WETLAND BUFFER

10m DRIPLINE BUFFER

WETLAND BOUNDARY

FIGURE 7.2

Date: MAR.6/23

Scale: 1:3000

DURING AND POST-CONSTRUCTION MONITORING PROGRAM

MTE

Engineers, Scientists, Surveyors

Project No.: 35056-104

March 7, 2023 9:21 a.m. Plotted By: ABarakzay

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8.0 Erosion and Sediment Control Measures

Precautions shall be taken during all stages of construction to limit erosion and sedimentation. The final details of the erosion and sediment control plan will follow the *Erosion & Sediment Control Guideline for Urban Construction* document and will be provided during final design. The plan will illustrate the erosion and sediment control measures to be implemented during construction, which will limit impacts associated with site development.

The recommended construction sequence for erosion and sediment control measures shall be as follows:

- Placement of all sediment control fencing where required.
- Stripping and strategic placement of topsoil stockpiles. Placement of sediment control fencing around all stockpile areas.
- Construction of temporary sediment control ponds, which will serve as sedimentation basins for the site during construction.
- Construction of temporary swales to direct runoff to sedimentation basins, with rock check dams as required to control velocities.
- Re-vegetation of completed areas as soon as possible after construction, including those areas not slated for construction within 60 days.

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 will 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.

Storage consistent with the GRCA's requirement of 125m^3/ha of live and dead storage respectively (total 250m^3/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 basin 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.

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. Furthermore, 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 Township and the 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 Township and the GRCA, based on field decisions.

9.0 Conclusions and Recommendations

Based on the foregoing analysis, it is concluded that:

1. The stormwater management strategy outlined herein will provide the subject lands with appropriate levels of quality, quantity, and erosion controls to meet the criteria set out for the subject lands.
2. 'Enhanced' quality control of stormwater runoff can be provided by SWMF1 and SWMF2 prior to releasing flows to the IGMD and adjacent wetland, respectively.
3. Quantity control of stormwater runoff can also be achieved by SWMF1 and SWMF2 within the subject lands.
4. Erosion hours within the IGMD will be reduced under proposed conditions by approximately 10%.
5. Surface water inputs to the existing wetland will be maintained in the post-development condition.

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

1. Upon completion of detailed design, SWMFs be constructed to provide control of stormwater as described in Sections 4.0 and 5.0 of this report.
2. The preliminary design and modelling of the proposed stormwater management measures for the development be reviewed and re-confirmed at the time of final design.
3. Erosion and sediment controls be implemented during construction as described in Section 8.0 of this report.
4. A monitoring program be updated for the Final SWM report at final design.

All of which is respectfully submitted,

MTE Consultants Inc.

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acressman@mte85.com

Garett Korber, P.Eng.
Design Engineer
519-743-6500 ext. 1292
gkorber@mte85.com

AJC:GMK:sgd

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Appendix A

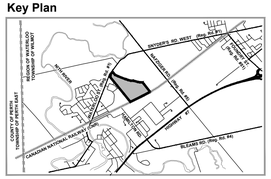
Draft Plan of Subdivision (Reduced)

DRAFT PLAN OF SUBDIVISION

Legal Description

PART OF LOT 20, CONCESSION SOUTH OF SNYDER'S ROAD
TOWNSHIP OF WILMOT
REGIONAL MUNICIPALITY OF WATERLOO

Key Plan



Subject Lands

SCALE: NTS

Source: SLRN, Region of Waterloo

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

A. AS SHOWN	B. AS SHOWN	C. AS SHOWN
D. RESIDENTIAL, MULTIPLE RESIDENTIAL, STORMWATER MANAGEMENT, PARK, OPEN SPACE		
E. AS SHOWN	F. AS SHOWN	G. AS SHOWN
H. MUNICIPAL WATER SUPPLY	I. SANDY LOAM/CLAY LOAM	J. AS SHOWN
K. ALL SERVICES AS REQUIRED	L. AS SHOWN	

Notes

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. BOUNDARY INFORMATION AND TOPOGRAPHICAL BASE INFORMATION PROVIDED BY MTE, MAY 31, 2021
3. ADJACENT PARCEL FABRIC IS APPROXIMATE.
4. LOTS/BLOCKS ON THE PLAN ARE RESIDENTIAL UNLESS OTHERWISE LISTED

■ ■ ■ DENOTES STAGE LIMITS

19/25 MINIMUM/MAXIMUM LOT YIELD PER BLOCK

Rev. No.	Date	Issued / Revision	By
2.	Feb.3, 2023	For Resubmission to Township/Region;	DGS
1.	Sept. 30, 2021	For pre-consultation meeting submission;	DGS

Owner's Certificate

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

DATE: January 12, 2022 — Adam Belsky, Adam Belsky, Wilmot Woods Developments Inc.

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: JAN. 14, 2022 — Trevor D.A. McNeil, OLS (MTE OLS LTD.)

Area Schedule 30T-_____

	Stage 1		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
Residential*	1-18	135/196	4.81
Multiple Residential	19-21	186/246	2.83
Park	22		1.00
Open Space	23-26		5.30
Stormwater Management	27,28		2.99
Service Corridor	29		0.22
Walkway	30		0.02
0.3m Reserve	31-36		0.01
Road Widening	37		0.03
Roads			4.27
Total	37	321/442	21.48

*Blks. 2,3,4,5,12,16 [street towns (5.5-7m)]
Blks. 6-11,17 [street towns (6m) and small single detached lots (9m)]
Blk. 1,13,14 [small single detached lots (9-12m)]
Blk. 15,18 [large single detached lots (9-13.76m)]
Blks. 19,20,21 [from Concept Plans (Stacked Towns)]

	Stage 2		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
*Residential	1-5	66/96	2.73
Trail	6		0.05
0.3m Reserve	7		0.001
Roads			1.00
Total	7	66/96	3.78

*Blk. 1 [street towns (6m) and small single detached lots (9m)]
Blks. 2,3,4,5 [small single detached lots (9m-12m)]

	Stage 3		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
*Residential	1-7	56/81	2.48
Open Space	8		2.86
Walkway	9		0.02
Trail			
0.3m Reserve			
Roads			0.84
Total	9	56/81	6.20

*Part of Blk. 6 [street towns (6m) and small single detached lots (9m)]
Blks. 1,2,3,4,5 [small single detached lots (9m-12m)]
Blk. 6,7 [large single detached lots (9-13.76m)]

Stage 4		
Lots/Blocks	Units (min/max)*	Area (ha)
1-11	80/134	3.49
12-14		0.42
15		0.001
		1.82
15	80/134	5.73

*Part of Blk. 1, Blks. 3,4,5,6,7,8 [street towns (6m) and small single detached lots (9m)]
Blks. 2,9,10,11 [small single detached lots (9m-12m)]
Blk. 1 [large single detached lots (9-13.76m)]

Total			
Description	Lots/Blocks	Units (min/max)	Area (ha)
Residential	41	337/507	13.51
Multiple Residential	3	186/246	2.83
Park	1		1.00
Open Space	5		8.16
Stormwater Management	2		2.99
Trail	4		0.47
Walkway	2		0.04
Service Corridor	1		0.22
0.3m Reserve	8		0.01
Road Widening	1		0.03
Roads			7.93
Total	68	523/753	37.19

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

Approval Stamp

Date	February 3, 2023
File No.	2123A
Plan Scale	1:2,000 (24x36)
Drawn By	D.G.S.
Checked By	P.B.

Project Wilmot Woods

Applicant

Wilmot Woods Developments Inc.
310 Fairway Rd. S
P.O. Box 45016
Kitchener, ON. N2C 2R6
P: 519.570.2137

File Name DRAFT PLAN

Dwg No. 1 of 1

Scale Bar 0 10 25 50 100m

K:\2123A-NH Properties-New Hamburg\DP\Draft Plan February3 2023.dwg

Appendix B

Existing Conditions Hydrologic Modelling

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number: 35056-104
Date: January 26, 2023
Design By: AJC
File: Q:\35056\104\STM\35056-104-Storm Sewer Design Sheet Revised Submission.xlsx

HYDROLOGIC PARAMETERS
Pre-Development Conditions

Sub-Catchment Number	Area (ha)	Pervious CN (AMC II)	Percent Impervious (TIMP) (%)	Directly Connected (XIMP) (%)	Overland Slope (%)	Overland Length (m)	Pervious IA (mm)	Impervious IA (mm)	Pervious Slope (%)	Impervious Slope (%)	Pervious Length (m)	Impervious Length (m)	Pervious Manning's n	Impervious Manning's n	Tp (hrs)	SWMHHYMO catchment command (HYD)	Land Use	Comment
Catchments Draining to Ivan Gingerich Municipal Drain																		
101	19.21	82	1		3.9	200	8.4								0.26	NASH	Agricultural	Northern Draining Agricultural Fields to IGMD
102	2.40	82	1		1.0	320	8.4								0.52	NASH	Agricultural	Northern Draining Agricultural Field to ex. Forest Glen Swale to IGMD
Total to IGMD	**21.61**		**1.0**															
Catchments Draining to Southern Culvert																		
103	4.20	82	4		0.5	80	8.4								0.33	NASH	Agricultural	Southern Portion of Cachet Lands Draining to CN Ditch
104	11.24	82	1		2.5	180	8.4								0.29	NASH	Agricultural	Southern Draining Agricultural Fields
105	1.56	70	1		2.5	85	8.2								0.20	NASH	Woodlot	Woodlot North of CN Culvert
106	1.00	70	1		1.5	110	8.2								0.27	NASH	Woodlot	Wetland within Woodlot North of CN Culvert
107	0.27	70	1		2.0	45	8.2								0.16	NASH	Agricultural	Southeastern Corner of Forest Glen Subdivision Woodlot
Total to South Culvert	**18.27**		**1.7**															
Catchments Draining to Forest Glen Woodlot																		
108	2.46	82	1		3.0	80	8.4								0.18	NASH	Agricultural	Western Portion Draining Externally to Forest Glen Woodlot
Total to Forest Glen Woodlot	**2.46**		**1.0**															
Grand Total	**42.34**		**1.3**															

Time of concentration calculated using the Airport Method

tc = [3.26 * (1.1 - C) * L0.5] / Sw0.33, where
tc = time of concentration (min)
C = Runoff coefficient (assumed to be 0.2 for rural areas)
L = Overland Flow Length (m)
Sw = Catchment Slope

Tp = 0.6 * tc

IA = kS = k*((1000/CN)-10)*25.4

where k=0.075 for CN <=70
k=0.10 for 70<CN<=80
k=0.15 for 80<CN<=90
k=0.20 for CN >90

```
================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                        9   9  9   9   # 3053466
        StormWater Management HYdrologic Model           999    999    =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ********************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                  OTTHYMO-83 and OTTHYMO-89.                  *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.           *********
 *********                   Ottawa,  Ontario: (613) 836-3884           *********
 *********                   Gatineau, Quebec: (819) 243-6858           *********
 *********                   E-Mail: swmhymo@jfsa.Com                   *********
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: MTE Consultants Inc.                          +++++++++
 +++++++++                Burlington           SERIAL#:3053466        +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ********************************************************************************


 **********************   D E T A I L E D   O U T P U T   **********************
 ********************************************************************************
 *         DATE: 2023-02-03     TIME: 15:15:58     RUN COUNTER: 000009         *
 ********************************************************************************
 * Input   filename: Q:\35056\104\SWM\SWMHYMO\PRE\ex3hr.dat                      *
 * Output  filename: Q:\35056\104\SWM\SWMHYMO\PRE\ex3hr.out                      *
 * Summary filename: Q:\35056\104\SWM\SWMHYMO\PRE\ex3hr.sum                      *
 * User comments:                                                               *
 * 1:_____________________________________________________________________________*
 * 2:_____________________________________________________________________________*
 * 3:_____________________________________________________________________________*
 ********************************************************************************

--------------------------------------------------------------------------------
-
001:0001-------------------------------------------------------------------------
```

```
-
*#*************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=25mm.4hr
-------------------------------------------------------------------------------
-
001:0002---------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 25-mm, 4 hour Chicago Storm, (a=508.5, b
| Ptotal=  25.00 mm|    Comments: 25-mm, 4 hour Chicago Storm, (a=508.5, b
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   1.410 |   1.08   3.570 |   2.08   6.620 |   3.08   2.160
               .17   1.480 |   1.17   4.160 |   2.17   5.580 |   3.17   2.050
               .25   1.560 |   1.25   5.010 |   2.25   4.840 |   3.25   1.960
               .33   1.640 |   1.33   6.350 |   2.33   4.270 |   3.33   1.870
               .42   1.740 |   1.42   8.730 |   2.42   3.830 |   3.42   1.790
               .50   1.850 |   1.50  14.060 |   2.50   3.480 |   3.50   1.720
               .58   1.980 |   1.58  35.190 |   2.58   3.190 |   3.58   1.660
               .67   2.130 |   1.67  71.896 |   2.67   2.950 |   3.67   1.600
               .75   2.310 |   1.75  26.870 |   2.75   2.740 |   3.75   1.540
               .83   2.530 |   1.83  15.350 |   2.83   2.570 |   3.83   1.490
               .92   2.790 |   1.92  10.660 |   2.92   2.410 |   3.92   1.440
              1.00   3.130 |   2.00   8.160 |   3.00   2.280 |   4.00   1.400

-------------------------------------------------------------------------------
-
001:0003---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   19.21   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    2.822
```

```
     PEAK FLOW       (cms)=     .172 (i)
     TIME TO PEAK    (hrs)=    2.067
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
001:0004---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.40   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .520

     Unit Hyd Qpeak  (cms)=     .176

     PEAK FLOW       (cms)=     .014 (i)
     TIME TO PEAK    (hrs)=    2.467
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
001:0005---------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:101          19.21     .172    2.07   3.81    .000

                     +ID2 02:102           2.40     .014    2.47   3.81    .000

                      ============================================================
                      SUM 03:IGMD         21.61     .182    2.08   3.81    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
-
001:0006---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
```

```
| 01:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .033 (i)
     TIME TO PEAK    (hrs)=    2.167
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0007---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 02:104    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=     .095 (i)
     TIME TO PEAK    (hrs)=    2.117
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0008---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .009 (i)
     TIME TO PEAK    (hrs)=    1.967
     RUNOFF VOLUME    (mm)=    2.246
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
-
001:0009--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .005 (i)
     TIME TO PEAK    (hrs)=    2.083
     RUNOFF VOLUME    (mm)=    2.246
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0010--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:107    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .002 (i)
     TIME TO PEAK    (hrs)=    1.917
     RUNOFF VOLUME    (mm)=    2.245
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0011--------------------------------------------------------------------------
-
------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:103            4.20     .033    2.17   3.81    .000

                    +ID2 02:104           11.24     .095    2.12   3.81    .000

                    +ID3 04:105            1.56     .009    1.97   2.25    .000
```

```
                  +ID4 05:106            1.00     .005    2.08   2.25    .000

                  +ID5 06:107             .27     .002    1.92   2.24    .000

                   ============================================================
                   SUM 07:CULVRT        18.27     .142    2.12   3.57    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
-
001:0012---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:108    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .027 (i)
     TIME TO PEAK    (hrs)=    1.933
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0013---------------------------------------------------------------------
-
  ** END OF RUN :   1

********************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=kitSCS2.3h
```

```
--------------------------------------------------------------------------------
-
002:0002--------------------------------------------------------------------------
-
*#**************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#**************************************************************************
--------------------------------------------------------------------------------
-
002:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 2-year, 3 hour SCS Type II Storm, City o
| Ptotal=  34.28 mm|    Comments: 2-year, 3 hour SCS Type II Storm, City o
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.680 |    .83   7.040 |   1.58  12.520 |   2.33   4.070
               .17   2.860 |    .92   8.810 |   1.67  10.060 |   2.42   3.800
               .25   3.070 |   1.00  11.860 |   1.75   8.430 |   2.50   3.570
               .33   3.330 |   1.08  18.310 |   1.83   7.270 |   2.58   3.370
               .42   3.630 |   1.17  39.760 |   1.92   6.400 |   2.67   3.190
               .50   4.000 |   1.25 109.401 |   2.00   5.720 |   2.75   3.030
               .58   4.470 |   1.33  45.910 |   2.08   5.180 |   2.83   2.890
               .67   5.070 |   1.42  24.590 |   2.17   4.750 |   2.92   2.760
               .75   5.880 |   1.50  16.600 |   2.25   4.380 |   3.00   2.650

--------------------------------------------------------------------------------
-
002:0003--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   19.21   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    2.822

     PEAK FLOW       (cms)=     .448 (i)
     TIME TO PEAK    (hrs)=    1.618
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
-
002:0004-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.40   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .520

     Unit Hyd Qpeak  (cms)=     .176

     PEAK FLOW       (cms)=     .036 (i)
     TIME TO PEAK    (hrs)=    1.984
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0005-------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:101          19.21     .448    1.62   8.20    .000

                      +ID2 02:102           2.40     .036    1.98   8.20    .000

                       ============================================================
                       SUM 03:IGMD         21.61     .473    1.63   8.20    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
-
002:0006-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 01:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .085 (i)
     TIME TO PEAK    (hrs)=    1.718
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239
```

```
     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0007---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 02:104    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=     .245 (i)
     TIME TO PEAK    (hrs)=    1.668
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0008---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .025 (i)
     TIME TO PEAK    (hrs)=    1.534
     RUNOFF VOLUME    (mm)=    5.039
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .147

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0009---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141
```

```
     PEAK FLOW       (cms)=     .014 (i)
     TIME TO PEAK    (hrs)=    1.634
     RUNOFF VOLUME    (mm)=    5.039
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .147

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0010---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:107    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .005 (i)
     TIME TO PEAK    (hrs)=    1.484
     RUNOFF VOLUME    (mm)=    5.038
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .147

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0011---------------------------------------------------------------------
-
------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                        ID1 01:103          4.20     .085    1.72   8.20    .000

                       +ID2 02:104         11.24     .245    1.67   8.20    .000

                       +ID3 04:105          1.56     .025    1.53   5.04    .000

                       +ID4 05:106          1.00     .014    1.63   5.04    .000

                       +ID5 06:107           .27     .005    1.48   5.04    .000

                        ============================================================
                        SUM 07:CULVRT       18.27     .369    1.67   7.71    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------------------------------------------------------------------
-
002:0012--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:108    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .071 (i)
     TIME TO PEAK    (hrs)=    1.501
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
002:0013--------------------------------------------------------------------------
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002:0002--------------------------------------------------------------------------
-
  ** END OF RUN :   2

********************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 003
    NSTORM=   1
           #  1=kitSCS5.3h
--------------------------------------------------------------------------------
-
003:0002--------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
```

```
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#**************************************************************************
-------------------------------------------------------------------------------
-
003:0002-------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 5-year, 3 hour SCS Type II Storm, City o
| Ptotal=  47.26 mm|    Comments: 5-year, 3 hour SCS Type II Storm, City o
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.810 |    .83   9.480 |   1.58  18.860 |   2.33   4.770
               .17   3.060 |    .92  12.460 |   1.67  14.610 |   2.42   4.380
               .25   3.350 |   1.00  17.720 |   1.75  11.810 |   2.50   4.050
               .33   3.700 |   1.08  28.800 |   1.83   9.860 |   2.58   3.770
               .42   4.130 |   1.17  61.690 |   1.92   8.420 |   2.67   3.520
               .50   4.670 |   1.25 139.288 |   2.00   7.330 |   2.75   3.300
               .58   5.370 |   1.33  70.600 |   2.08   6.480 |   2.83   3.100
               .67   6.300 |   1.42  39.220 |   2.17   5.800 |   2.92   2.930
               .75   7.590 |   1.50  25.910 |   2.25   5.240 |   3.00   2.780

-------------------------------------------------------------------------------
-
003:0003-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   19.21   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    2.822

     PEAK FLOW       (cms)=     .974 (i)
     TIME TO PEAK    (hrs)=    1.601
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
003:0004-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.40   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
```

```
----------------------   U.H. Tp(hrs)=    .520

     Unit Hyd Qpeak  (cms)=     .176

     PEAK FLOW       (cms)=     .077 (i)
     TIME TO PEAK    (hrs)=    1.951
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
003:0005---------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:101          19.21     .974    1.60  15.96    .000

                     +ID2 02:102           2.40     .077    1.95  15.96    .000

                      ============================================================
                      SUM 03:IGMD         21.61    1.029    1.62  15.96    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
-
003:0006---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 01:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .183 (i)
     TIME TO PEAK    (hrs)=    1.701
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
003:0007---------------------------------------------------------------------
```

```
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 02:104    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=     .533 (i)
     TIME TO PEAK    (hrs)=    1.651
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
003:0008--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .058 (i)
     TIME TO PEAK    (hrs)=    1.534
     RUNOFF VOLUME    (mm)=   10.316
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .218

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
003:0009--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .031 (i)
     TIME TO PEAK    (hrs)=    1.634
     RUNOFF VOLUME    (mm)=   10.316
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .218
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

003:0010---

| CALIB NASHYD | Area (ha)= .27 Curve Number (CN)=70.00
| 06:107 DT= 1.00 | Ia (mm)= 8.200 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= .160

Unit Hyd Qpeak (cms)= .064

PEAK FLOW (cms)= .011 (i)
TIME TO PEAK (hrs)= 1.468
RUNOFF VOLUME (mm)= 10.315
TOTAL RAINFALL (mm)= 47.263
RUNOFF COEFFICIENT = .218

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

003:0011---

ADD HYD (CULVRT)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1	01:103	4.20	.183	1.70	15.96	.000
+ID2	02:104	11.24	.533	1.65	15.96	.000
+ID3	04:105	1.56	.058	1.53	10.32	.000
+ID4	05:106	1.00	.031	1.63	10.32	.000
+ID5	06:107	.27	.011	1.47	10.31	.000
SUM	07:CULVRT	18.27	.805	1.65	15.09	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

003:0012---

| CALIB NASHYD | Area (ha)= 2.46 Curve Number (CN)=82.00

```
| 08:108    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .154 (i)
     TIME TO PEAK    (hrs)=    1.501
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0013---------------------------------------------------------------------------
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003:0002---------------------------------------------------------------------------
-
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-
003:0002---------------------------------------------------------------------------
-
  ** END OF RUN :   3

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 004
    NSTORM=   1
           #  1=kitSCS10.3h
--------------------------------------------------------------------------------
-
004:0002---------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
```

```
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#**************************************************************************
--------------------------------------------------------------------------------
-
004:0002----------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 10-year, 3 hour SCS Type II Storm, City
| Ptotal=  56.29 mm|    Comments: 10-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.910 |    .83  10.890 |   1.58  22.590 |   2.33   5.190
               .17   3.190 |    .92  14.590 |   1.67  17.260 |   2.42   4.730
               .25   3.530 |   1.00  21.160 |   1.75  13.770 |   2.50   4.340
               .33   3.930 |   1.08  35.090 |   1.83  11.350 |   2.58   4.000
               .42   4.430 |   1.17  76.090 |   1.92   9.590 |   2.67   3.720
               .50   5.070 |   1.25 169.551 |   2.00   8.260 |   2.75   3.460
               .58   5.900 |   1.33  87.120 |   2.08   7.230 |   2.83   3.240
               .67   7.010 |   1.42  48.190 |   2.17   6.400 |   2.92   3.050
               .75   8.580 |   1.50  31.460 |   2.25   5.740 |   3.00   2.870

--------------------------------------------------------------------------------
-
004:0003----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   19.21   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    2.822

     PEAK FLOW       (cms)=    1.419 (i)
     TIME TO PEAK    (hrs)=    1.601
     RUNOFF VOLUME    (mm)=   22.128
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
004:0004----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.40   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .520
```

```
     Unit Hyd Qpeak  (cms)=     .176

     PEAK FLOW       (cms)=     .111 (i)
     TIME TO PEAK    (hrs)=    1.918
     RUNOFF VOLUME    (mm)=   22.128
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
004:0005--------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:101          19.21    1.419    1.60  22.13    .000

                     +ID2 02:102           2.40     .111    1.92  22.13    .000

                      ============================================================
                      SUM 03:IGMD         21.61    1.499    1.60  22.13    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
-
004:0006--------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 01:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .266 (i)
     TIME TO PEAK    (hrs)=    1.684
     RUNOFF VOLUME    (mm)=   22.128
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
004:0007--------------------------------------------------------------------
-
----------------------
```

```
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 02:104    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=     .775 (i)
     TIME TO PEAK    (hrs)=    1.634
     RUNOFF VOLUME    (mm)=   22.128
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
004:0008--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .087 (i)
     TIME TO PEAK    (hrs)=    1.518
     RUNOFF VOLUME    (mm)=   14.735
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .262

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
004:0009--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .047 (i)
     TIME TO PEAK    (hrs)=    1.618
     RUNOFF VOLUME    (mm)=   14.735
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .262

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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--------------------------------------------------------------------------------
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004:0010--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:107    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .017 (i)
     TIME TO PEAK    (hrs)=    1.468
     RUNOFF VOLUME    (mm)=   14.734
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .262

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
004:0011--------------------------------------------------------------------------
-
------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:103            4.20     .266    1.68  22.13    .000

                     +ID2 02:104           11.24     .775    1.63  22.13    .000

                     +ID3 04:105            1.56     .087    1.52  14.74    .000

                     +ID4 05:106            1.00     .047    1.62  14.73    .000

                     +ID5 06:107             .27     .017    1.47  14.73    .000

                      ============================================================
                      SUM 07:CULVRT        18.27    1.176    1.63  20.98    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
-
004:0012--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:108    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180
```

```
     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .226 (i)
     TIME TO PEAK    (hrs)=    1.484
     RUNOFF VOLUME    (mm)=   22.128
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0013--------------------------------------------------------------------------
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004:0002--------------------------------------------------------------------------
-
--------------------------------------------------------------------------------
-
004:0002--------------------------------------------------------------------------
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--------------------------------------------------------------------------------
-
004:0002--------------------------------------------------------------------------
-
  ** END OF RUN :   4

********************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

-------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=kitSCS25.3h
--------------------------------------------------------------------------------
-
005:0002--------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
```

```
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
--------------------------------------------------------------------------------
-
005:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 25-year, 3 hour SCS Type II Storm, City
| Ptotal=  68.27 mm|    Comments: 25-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.260 |    .83  13.680 |   1.58  29.070 |   2.33   6.170
               .17   3.610 |    .92  18.580 |   1.67  22.100 |   2.42   5.570
               .25   4.030 |   1.00  27.210 |   1.75  17.500 |   2.50   5.070
               .33   4.540 |   1.08  45.020 |   1.83  14.300 |   2.58   4.640
               .42   5.190 |   1.17  93.660 |   1.92  11.960 |   2.67   4.270
               .50   6.010 |   1.25 191.557 |   2.00  10.200 |   2.75   3.950
               .58   7.090 |   1.33 106.330 |   2.08   8.840 |   2.83   3.670
               .67   8.560 |   1.42  61.230 |   2.17   7.760 |   2.92   3.420
               .75  10.620 |   1.50  40.460 |   2.25   6.880 |   3.00   3.210

--------------------------------------------------------------------------------
-
005:0003--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   19.21   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    2.822

     PEAK FLOW       (cms)=    2.007 (i)
     TIME TO PEAK    (hrs)=    1.584
     RUNOFF VOLUME    (mm)=   30.999
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
005:0004--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.40   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
```

```
----------------------   U.H. Tp(hrs)=    .520

     Unit Hyd Qpeak  (cms)=     .176

     PEAK FLOW       (cms)=     .157 (i)
     TIME TO PEAK    (hrs)=    1.918
     RUNOFF VOLUME    (mm)=   30.999
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
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005:0005---------------------------------------------------------------------
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------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:101          19.21    2.007    1.58  31.00    .000

                     +ID2 02:102           2.40     .157    1.92  31.00    .000

                      ============================================================
                      SUM 03:IGMD         21.61    2.120    1.60  31.00    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
-
005:0006---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 01:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .377 (i)
     TIME TO PEAK    (hrs)=    1.684
     RUNOFF VOLUME    (mm)=   30.999
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0007---------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 02:104    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=    1.097 (i)
     TIME TO PEAK    (hrs)=    1.634
     RUNOFF VOLUME    (mm)=   30.999
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0008----------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .126 (i)
     TIME TO PEAK    (hrs)=    1.518
     RUNOFF VOLUME    (mm)=   21.360
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .313

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
005:0009----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .068 (i)
     TIME TO PEAK    (hrs)=    1.618
     RUNOFF VOLUME    (mm)=   21.359
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .313
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

005:0010---

| CALIB NASHYD | Area (ha)= .27 Curve Number (CN)=70.00
| 06:107 DT= 1.00 | Ia (mm)= 8.200 # of Linear Res.(N)= 3.00
| | U.H. Tp(hrs)= .160

Unit Hyd Qpeak (cms)= .064

PEAK FLOW (cms)= .025 (i)
TIME TO PEAK (hrs)= 1.468
RUNOFF VOLUME (mm)= 21.359
TOTAL RAINFALL (mm)= 68.268
RUNOFF COEFFICIENT = .313

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

005:0011---

ADD HYD (CULVRT)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:103	4.20	.377	1.68	31.00	.000
	+ID2 02:104	11.24	1.097	1.63	31.00	.000
	+ID3 04:105	1.56	.126	1.52	21.36	.000
	+ID4 05:106	1.00	.068	1.62	21.36	.000
	+ID5 06:107	.27	.025	1.47	21.36	.000
	SUM 07:CULVRT	18.27	1.671	1.63	29.51	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

005:0012---

| CALIB NASHYD | Area (ha)= 2.46 Curve Number (CN)=82.00

```
| 08:108    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .318 (i)
     TIME TO PEAK    (hrs)=    1.484
     RUNOFF VOLUME    (mm)=   30.999
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0013--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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  ** END OF RUN :   5

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 006
    NSTORM=   1
           #  1=kitSCS50.3h
```

```
--------------------------------------------------------------------------------
-
006:0002--------------------------------------------------------------------------
-
*#*************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
--------------------------------------------------------------------------------
-
006:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 50-year, 3 hour SCS Type II Storm, City
| Ptotal=  77.65 mm|    Comments: 50-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.490 |    .83  15.570 |   1.58  33.550 |   2.33   6.820
               .17   3.880 |    .92  21.290 |   1.67  25.420 |   2.42   6.130
               .25   4.360 |   1.00  31.380 |   1.75  20.040 |   2.50   5.550
               .33   4.950 |   1.08  52.080 |   1.83  16.280 |   2.58   5.060
               .42   5.690 |   1.17 107.590 |   1.92  13.550 |   2.67   4.640
               .50   6.640 |   1.25 215.802 |   2.00  11.500 |   2.75   4.270
               .58   7.890 |   1.33 121.920 |   2.08   9.910 |   2.83   3.950
               .67   9.590 |   1.42  70.790 |   2.17   8.660 |   2.92   3.670
               .75  11.990 |   1.50  46.810 |   2.25   7.640 |   3.00   3.430

--------------------------------------------------------------------------------
-
006:0003--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   19.21   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    2.822

     PEAK FLOW       (cms)=    2.517 (i)
     TIME TO PEAK    (hrs)=    1.584
     RUNOFF VOLUME    (mm)=   38.361
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .494

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0004-------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    2.40   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .520

     Unit Hyd Qpeak  (cms)=     .176

     PEAK FLOW       (cms)=     .197 (i)
     TIME TO PEAK    (hrs)=    1.901
     RUNOFF VOLUME    (mm)=   38.361
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .494

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
006:0005-------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:101          19.21    2.517    1.58  38.36    .000

                      +ID2 02:102           2.40     .197    1.90  38.36    .000

                       ============================================================
                       SUM 03:IGMD         21.61    2.658    1.60  38.36    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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006:0006-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 01:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .473 (i)
     TIME TO PEAK    (hrs)=    1.668
     RUNOFF VOLUME    (mm)=   38.361
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .494
```

```
     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
006:0007--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 02:104    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=    1.376 (i)
     TIME TO PEAK    (hrs)=    1.618
     RUNOFF VOLUME    (mm)=   38.361
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .494

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
006:0008--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .162 (i)
     TIME TO PEAK    (hrs)=    1.518
     RUNOFF VOLUME    (mm)=   27.050
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .348

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
006:0009--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141
```

```
     PEAK FLOW       (cms)=     .088 (i)
     TIME TO PEAK    (hrs)=    1.618
     RUNOFF VOLUME    (mm)=   27.049
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .348

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
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006:0010---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:107    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .032 (i)
     TIME TO PEAK    (hrs)=    1.468
     RUNOFF VOLUME    (mm)=   27.049
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .348

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
006:0011---------------------------------------------------------------------
-
------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:103            4.20     .473    1.67  38.36    .000

                      +ID2 02:104           11.24    1.376    1.62  38.36    .000

                      +ID3 04:105            1.56     .162    1.52  27.05    .000

                      +ID4 05:106            1.00     .088    1.62  27.05    .000

                      +ID5 06:107             .27     .032    1.47  27.05    .000

                       ============================================================
                       SUM 07:CULVRT        18.27    2.103    1.62  36.61    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

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006:0012--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:108    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .398 (i)
     TIME TO PEAK    (hrs)=    1.484
     RUNOFF VOLUME    (mm)=   38.361
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .494

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0013--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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  ** END OF RUN :   6

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```

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 007
    NSTORM=   1
           #  1=kitSC100.3h
-------------------------------------------------------------------------------
-
007:0002----------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
-------------------------------------------------------------------------------
-
007:0002----------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 100-year, 3 hour SCS Type II Storm, City
| Ptotal=  87.08 mm|    Comments: 100-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.700 |    .83  17.510 |   1.58  38.190 |   2.33   7.460
               .17   4.140 |    .92  24.100 |   1.67  28.840 |   2.42   6.680
               .25   4.680 |   1.00  35.700 |   1.75  22.650 |   2.50   6.020
               .33   5.340 |   1.08  59.350 |   1.83  18.330 |   2.58   5.470
               .42   6.180 |   1.17 121.590 |   1.92  15.190 |   2.67   4.990
               .50   7.260 |   1.25 239.354 |   2.00  12.830 |   2.75   4.580
               .58   8.690 |   1.33 137.520 |   2.08  11.000 |   2.83   4.220
               .67  10.630 |   1.42  80.540 |   2.17   9.560 |   2.92   3.910
               .75  13.390 |   1.50  53.350 |   2.25   8.410 |   3.00   3.630

-------------------------------------------------------------------------------
-
007:0003----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   19.21   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    2.822
```

```
     PEAK FLOW       (cms)=    3.050 (i)
     TIME TO PEAK    (hrs)=    1.584
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
007:0004---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.40   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .520

     Unit Hyd Qpeak  (cms)=     .176

     PEAK FLOW       (cms)=     .239 (i)
     TIME TO PEAK    (hrs)=    1.901
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
007:0005---------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:101          19.21    3.050    1.58  46.05    .000

                     +ID2 02:102           2.40     .239    1.90  46.05    .000

                      ============================================================
                      SUM 03:IGMD         21.61    3.221    1.58  46.05    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
-
007:0006---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
```

```
| 01:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .573 (i)
     TIME TO PEAK    (hrs)=    1.668
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
007:0007----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 02:104    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=    1.667 (i)
     TIME TO PEAK    (hrs)=    1.618
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
007:0008----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .201 (i)
     TIME TO PEAK    (hrs)=    1.518
     RUNOFF VOLUME    (mm)=   33.144
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .381

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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007:0009--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .108 (i)
     TIME TO PEAK    (hrs)=    1.601
     RUNOFF VOLUME    (mm)=   33.143
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .381

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
007:0010--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:107    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .039 (i)
     TIME TO PEAK    (hrs)=    1.468
     RUNOFF VOLUME    (mm)=   33.143
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .381

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
007:0011--------------------------------------------------------------------------
-
------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:103            4.20      .573    1.67  46.05    .000

                    +ID2 02:104           11.24    1.667    1.62  46.05    .000

                    +ID3 04:105            1.56     .201    1.52  33.14    .000
```

```
                    +ID4 05:106            1.00     .108    1.60  33.14    .000

                    +ID5 06:107             .27     .039    1.47  33.14    .000

                     ============================================================
                     SUM 07:CULVRT        18.27    2.556    1.62  44.05    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
-
007:0012---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:108    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .482 (i)
     TIME TO PEAK    (hrs)=    1.468
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0013---------------------------------------------------------------------
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007:0002---------------------------------------------------------------------
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007:0002---------------------------------------------------------------------
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007:0002---------------------------------------------------------------------
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007:0002---------------------------------------------------------------------
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007:0002--------------------------------------------------------------------------------
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007:0002--------------------------------------------------------------------------------
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*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2023-02-03     at 15:16:01
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```

Appendix C

Proposed Conditions Hydrologic Modelling

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number: 35056-104
Date: February 7, 2023
Design By: AJC
File: Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_Revised Submission.xlsx

HYDROLOGIC PARAMETERS
Post Development Conditions

Sub-Catchment Number	Area (ha)	Pervious CN (AMC II)	Percent Impervious (TIMP) (%)	Directly Connected (XIMP) (%)	Overland Slope (%)	Overland Length (m)	Pervious IA (mm)	Impervious IA (mm)	Pervious Slope (%)	Impervious Slope (%)	Pervious Length (m)	Impervious Length (m)	Pervious Manning's n	Impervious Manning's n	Tp (hrs)	SWMHYMO COMMAND	Land Use	Comment
Catchments Draining to Ivan Gingerich Drain																		
Catchments Draining to North SWM Facility																		
201	7.04	76	70	70	0.5	80	8.0	1.0	2.0	0.5	80	80	0.25	0.013		STAND	Residential	Proposed Subdivision to Forebay
202	0.64	76	70	70	1.0	90	8.0	1.0	2.0	1.0	90	90	0.25	0.013		STAND	Road Allowance	Right-of-way and Street Two to SWMF
203	1.47	76	50	50	5.0	20	8.0	1.0	5.0	2.0	20	20	0.25	0.013		STAND	SWMF	Rear Yards/Roofs + Proposed SWMF
	9.15		**66.8**															
Catchments Bypassing North SWM Facility																		
204	1.44	76	12	12	5.0	120	8.0	1.0	5.0	0.5	120	15	0.25	0.013		STAND	Industrial	Park and rear yard/roofs Directly to Ivan Gingerich Drain
205	0.56	76	70	70	1.0	90	8.0	1.0	2.0	1.0	90	90	0.25	0.013		STAND	Road Allowance	Right-of-way and Street Two to IGMD
206	1.89	82	10		5.0	30	8.4								0.09	NASH	Open Space	Open Space/, rear yards and roofs to IGMD
207	0.85	82	8		0.5	180	8.4								0.49	NASH	Open Space	Open Space to IGMD, Charles Young Avenue
208	3.33	82	0		0.5	110	8.4								0.39	NASH	Open Space	Open Space to IGMD
	8.07		**10.2**															
	17.22		**40.3**															
Catchments Draining to Culvert																		
Catchments Draining to South SWM Facility																		
209	13.27	76	68	68	0.5	80	8.0	1.0	2.0	0.5	80	80	0.25	0.013		STAND	Residential	Proposed Subdivision to Forebay
210	4.17	82	4		0.5	80	8.4								0.33	NASH	Agricultural	Southern Portion of Cachet Lands Draining to Proposed SWMF
211	2.00	76	55	55	5	35	8.0	1.0	5.0	2.0	20	20	0.25	0.013		STAND	SWMF	Rear Yards/Roofs + Proposed SWMF
	19.44		**52.9**															
Catchments Draining Directly to Culvert																		
212	1.56	70	1		2.5	85	8.2								0.20	NASH	Woodlot	Woodlot North of CN Culvert
213	1.00	70	1		0.5	110	8.2								0.39	NASH	Woodlot	Wetland within Woodlot North of CN Culvert
214	0.27	70	1		2.0	45	8.2								0.16	NASH	Agricultural	Southeastern Corner of Forest Glen Subdivision Woodlot
215	1.16	70	5		0.5	340	8.2								0.68	NASH	Residential	Rear Yards/roofs, railway corridor to CN Culvert
	3.99		**0.7**															
	23.43		**44.0**															
Catchments Draining to Forest Glen Woodlot																		
216	1.69	82	5		3.0	80	8.4								0.18	NASH	Agricultural	Western Portion Draining Externally to Forest Glen Woodlot
	42.34		**40.9**															

Time of concentration calculated using the Airport Method
tc = [3.26 * (1.1 - C) * L0.5] / Sw0.33, where
tc = time of concentration (min)
C = Runoff coefficient (assumed to be 0.2 for rural areas)
L = Overland Flow Length (m)
Sw = Catchment Slope

Tp = 0.6 * tc

IA = kS = k*((1000/CN)-10)*25.4
where k=0.075 for CN <=70
k=0.10 for 70<CN<=80
k=0.15 for 80<CN<=90
k=0.20 for CN >90

SWMF1 / IGMD

```
================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                         9   9  9   9   # 3053466
        StormWater Management HYdrologic Model           999    999    =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ********************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                  OTTHYMO-83 and OTTHYMO-89.                  *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                   Ottawa,  Ontario: (613) 836-3884          *********
 *********                   Gatineau, Quebec: (819) 243-6858          *********
 *********                   E-Mail: swmhymo@jfsa.Com                  *********
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: MTE Consultants Inc.                          +++++++++
 +++++++++                Burlington           SERIAL#:3053466        +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ********************************************************************************


 ***********************   D E T A I L E D   O U T P U T   **********************
 ********************************************************************************
 *         DATE: 2023-03-03     TIME: 10:58:43     RUN COUNTER: 000029         *
 ********************************************************************************
 * Input   filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr2253h.dat         *
 * Output  filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr2253h.out         *
 * Summary filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr2253h.sum         *
 * User comments:                                                              *
 * 1:_____________________________________________________________________     *
 * 2:_____________________________________________________________________     *
 * 3:_____________________________________________________________________     *
 ********************************************************************************

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001:0001--------------------------------------------------------------------------
-
*#*************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=kitSCS2.3h
-----------------------------------------------------------------------------------
-
001:0002--------------------------------------------------------------------------
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--------------------
| READ STORM       |    Filename: 2-year, 3 hour SCS Type II Storm, City o
| Ptotal=  34.28 mm|    Comments: 2-year, 3 hour SCS Type II Storm, City o
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.680 |    .83   7.040 |   1.58  12.520 |   2.33   4.070
               .17   2.860 |    .92   8.810 |   1.67  10.060 |   2.42   3.800
               .25   3.070 |   1.00  11.860 |   1.75   8.430 |   2.50   3.570
               .33   3.330 |   1.08  18.310 |   1.83   7.270 |   2.58   3.370
               .42   3.630 |   1.17  39.760 |   1.92   6.400 |   2.67   3.190
               .50   4.000 |   1.25 109.401 |   2.00   5.720 |   2.75   3.030
               .58   4.470 |   1.33  45.910 |   2.08   5.180 |   2.83   2.890
               .67   5.070 |   1.42  24.590 |   2.17   4.750 |   2.92   2.760
               .75   5.880 |   1.50  16.600 |   2.25   4.380 |   3.00   2.650

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001:0003--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.93         2.11
     Dep. Storage     (mm)=       1.00         8.00
```

```
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40         7.80
               over (min)        3.00        32.00
     Storage Coeff.  (min)=       2.65 (ii)   32.34 (ii)
     Unit Hyd. Tpeak (min)=       3.00        32.00
     Unit Hyd. peak  (cms)=        .41          .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.26          .02          1.261 (iii)
     TIME TO PEAK    (hrs)=       1.27         1.90          1.267
     RUNOFF VOLUME    (mm)=      33.28         6.48         25.238
     TOTAL RAINFALL   (mm)=      34.28        34.28         34.276
     RUNOFF COEFFICIENT   =        .97          .19           .736

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0004--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .45          .19
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40         7.40
               over (min)        2.00        35.00
     Storage Coeff.  (min)=       2.31 (ii)   34.85 (ii)
     Unit Hyd. Tpeak (min)=       2.00        35.00
     Unit Hyd. peak  (cms)=        .51          .03
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .12          .00           .123 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.95          1.250
     RUNOFF VOLUME    (mm)=      33.28         6.48         25.238
     TOTAL RAINFALL   (mm)=      34.28        34.28         34.276
     RUNOFF COEFFICIENT   =        .97          .19           .736

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
           CN* =  76.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0005--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40        14.89
               over (min)        1.00         8.00
     Storage Coeff.  (min)=        .76 (ii)    8.34 (ii)
     Unit Hyd. Tpeak (min)=       1.00         8.00
     Unit Hyd. peak  (cms)=       1.24          .14
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .22          .02          .228 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.42         1.250
     RUNOFF VOLUME    (mm)=      33.28         6.48        19.880
     TOTAL RAINFALL   (mm)=      34.28        34.28        34.276
     RUNOFF COEFFICIENT   =        .97          .19          .580

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0006--------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:201            7.04    1.261    1.27  25.24    .000

                    +ID2 02:202             .64     .123    1.25  25.24    .000

                    +ID3 03:203            1.47     .228    1.25  19.88    .000
```

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                    ============================================================
                    SUM 04:IGD            9.15    1.603    1.25  24.38    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0007--------------------------------------------------------------------------
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---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .658  .6756E+00
                            .006  .1110E+00   |    1.505  .8381E+00
                            .017  .1933E+00   |    3.249  .1071E+01
                            .032  .3282E+00   |    7.250  .1264E+01
                            .212  .4716E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.15     1.603     1.250     24.377
     OUTFLOW<05: (SWMF  )       9.15      .019     3.117     24.375
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.193
                    TIME SHIFT OF PEAK FLOW         (min)=   112.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.2092E+00

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001:0008--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.44
| 01:204    DT= 1.00 |   Total Imp(%)=   12.00   Dir. Conn.(%)=   12.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17         1.27
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         5.00
```

```
     Length            (m)=      15.00       120.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40         8.27
               over (min)         1.00        29.00
     Storage Coeff.  (min)=        .97 (ii)   29.07 (ii)
     Unit Hyd. Tpeak (min)=       1.00        29.00
     Unit Hyd. peak  (cms)=       1.09          .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .05          .02          .053 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.83         1.250
     RUNOFF VOLUME    (mm)=      33.28         6.48         9.699
     TOTAL RAINFALL   (mm)=      34.28        34.28        34.276
     RUNOFF COEFFICIENT   =        .97          .19          .283
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0009--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39          .17
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40         7.40
               over (min)         2.00        35.00
     Storage Coeff.  (min)=       2.31 (ii)   34.85 (ii)
     Unit Hyd. Tpeak (min)=       2.00        35.00
     Unit Hyd. peak  (cms)=        .51          .03
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .11          .00          .107 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.95         1.250
     RUNOFF VOLUME    (mm)=      33.28         6.48        25.238
     TOTAL RAINFALL   (mm)=      34.28        34.28        34.276
     RUNOFF COEFFICIENT   =        .97          .19          .736
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0010--------------------------------------------------------------------------
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--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
         .067       .133       .200
         .067       .161       .229
         .067       .189       .256

             NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                        (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .107  No_date    1:15     25.238    1     8.
   ==========================================================================
   IDout= 04:INF         .52     .067  No_date    1:15     25.238    1     8.
   IDout= 07:IGD         .04     .040  No_date    1:15     25.238    1     0.
--------------------------------------------------------------------------------
-
001:0011--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .077 (i)
     TIME TO PEAK    (hrs)=    1.367
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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001:0012--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .013 (i)
     TIME TO PEAK    (hrs)=    1.950
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0013--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .060 (i)
     TIME TO PEAK    (hrs)=    1.800
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0014--------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:204           1.44     .053    1.25   9.70    .000

                    +ID2 02:206           1.89     .077    1.37   8.20    .000
```

```
                  +ID3 05:SWMF          9.15     .019    3.12  24.37    .000

                  +ID4 07:IGD            .04     .040    1.25  25.24    .000

                  +ID5 08:207            .85     .013    1.95   8.20    .000

                  +ID6 09:208           3.33     .060    1.80   8.20    .000

                   ============================================================
                   SUM 03:IGMD         16.70     .131    1.25  17.23    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
-
001:0015--------------------------------------------------------------------------
-
  ** END OF RUN :   1

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=kitSCS5.3h
--------------------------------------------------------------------------------
-
002:0002--------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
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002:0002--------------------------------------------------------------------------
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--------------------
| READ STORM       |    Filename: 5-year, 3 hour SCS Type II Storm, City o
| Ptotal=  47.26 mm|    Comments: 5-year, 3 hour SCS Type II Storm, City o
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	2.810	.83	9.480	1.58	18.860	2.33	4.770
.17	3.060	.92	12.460	1.67	14.610	2.42	4.380
.25	3.350	1.00	17.720	1.75	11.810	2.50	4.050
.33	3.700	1.08	28.800	1.83	9.860	2.58	3.770
.42	4.130	1.17	61.690	1.92	8.420	2.67	3.520
.50	4.670	1.25	139.288	2.00	7.330	2.75	3.300
.58	5.370	1.33	70.600	2.08	6.480	2.83	3.100
.67	6.300	1.42	39.220	2.17	5.800	2.92	2.930
.75	7.590	1.50	25.910	2.25	5.240	3.00	2.780

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-------------------------------------------------------------------------------
-
002:0003----------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
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```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	4.93	2.11	
Dep. Storage	(mm)=	1.00	8.00	
Average Slope	(%)=	.50	2.00	
Length	(m)=	80.00	80.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	139.29	20.27	
over	(min)	2.00	23.00	
Storage Coeff.	(min)=	2.41 (ii)	22.66 (ii)	
Unit Hyd. Tpeak	(min)=	2.00	23.00	
Unit Hyd. peak	(cms)=	.49	.05	
				TOTALS
PEAK FLOW	(cms)=	1.72	.07	1.729 (iii)
TIME TO PEAK	(hrs)=	1.25	1.70	1.251
RUNOFF VOLUME	(mm)=	46.26	12.90	36.255
TOTAL RAINFALL	(mm)=	47.26	47.26	47.263
RUNOFF COEFFICIENT	=	.98	.27	.767

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0004--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .45          .19
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        19.80
               over (min)        2.00        24.00
     Storage Coeff.  (min)=       2.10 (ii)   24.05 (ii)
     Unit Hyd. Tpeak (min)=       2.00        24.00
     Unit Hyd. peak  (cms)=        .54          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .16          .01          .161 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.72         1.251
     RUNOFF VOLUME    (mm)=      46.26        12.90        36.255
     TOTAL RAINFALL   (mm)=      47.26        47.26        47.263
     RUNOFF COEFFICIENT   =        .98          .27          .767

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0005--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        32.42
               over (min)        1.00         6.00
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```
     Storage Coeff.  (min)=        .69 (ii)    6.24 (ii)
     Unit Hyd. Tpeak (min)=       1.00         6.00
     Unit Hyd. peak  (cms)=       1.30          .18
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .28          .05          .306 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.37         1.251
     RUNOFF VOLUME    (mm)=      46.26        12.90        29.583
     TOTAL RAINFALL   (mm)=      47.26        47.26        47.263
     RUNOFF COEFFICIENT   =        .98          .27          .626

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0006--------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201            7.04    1.729    1.25  36.26    .000

                     +ID2 02:202             .64     .161    1.25  36.26    .000

                     +ID3 03:203            1.47     .306    1.25  29.58    .000

                      ============================================================
                      SUM 04:IGD            9.15    2.196    1.25  35.18    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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002:0007--------------------------------------------------------------------
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---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .658  .6756E+00
                            .006  .1110E+00   |    1.505  .8381E+00
                            .017  .1933E+00   |    3.249  .1071E+01
                            .032  .3282E+00   |    7.250  .1264E+01
                            .212  .4716E+00   |     .000  .0000E+00
```

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW >04: (IGD)	9.15	2.196	1.251	35.183
OUTFLOW<05: (SWMF)	9.15	.029	3.068	35.181
OVERFLOW<06: (SWMFO)	.00	.000	.000	.000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.332
TIME SHIFT OF PEAK FLOW (min)= 109.00
MAXIMUM STORAGE USED (ha.m.)=.3021E+00

002:0008---

CALIB STANDHYD 01:204 DT= 1.00	Area (ha)= 1.44 Total Imp(%)= 12.00 Dir. Conn.(%)= 12.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.17	1.27	
Dep. Storage	(mm)=	1.00	8.00	
Average Slope	(%)=	.50	5.00	
Length	(m)=	15.00	120.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)=		139.29	21.99	
over (min)		1.00	20.00	
Storage Coeff. (min)=		.88 (ii)	19.88 (ii)	
Unit Hyd. Tpeak (min)=		1.00	20.00	
Unit Hyd. peak (cms)=		1.15	.06	
				TOTALS
PEAK FLOW	(cms)=	.07	.04	.071 (iii)
TIME TO PEAK	(hrs)=	1.25	1.65	1.251
RUNOFF VOLUME	(mm)=	46.26	12.90	16.906
TOTAL RAINFALL	(mm)=	47.26	47.26	47.263
RUNOFF COEFFICIENT	=	.98	.27	.358

*** WARNING: For areas with impervious ratios below
20%, this routine may not be applicable.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0009--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39          .17
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        19.80
               over (min)         2.00        24.00
     Storage Coeff.  (min)=       2.10 (ii)   24.05 (ii)
     Unit Hyd. Tpeak (min)=       2.00        24.00
     Unit Hyd. peak  (cms)=        .54          .05
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .14          .01          .141 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.72         1.251
     RUNOFF VOLUME    (mm)=      46.26        12.90        36.255
     TOTAL RAINFALL   (mm)=      47.26        47.26        47.263
     RUNOFF COEFFICIENT   =        .98          .27          .767

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0010--------------------------------------------------------------------------
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--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
```

```
         .067      .133      .200
         .067      .161      .229
         .067      .189      .256

             NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                        (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .141  No_date    1:15     36.255    1     6.
   ========================================================================
   IDout= 04:INF         .49     .067  No_date    1:15     36.255    1     6.
   IDout= 07:IGD         .07     .074  No_date    1:15     36.255    1     0.
-------------------------------------------------------------------------------
-
002:0011-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .166 (i)
     TIME TO PEAK    (hrs)=    1.368
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0012-------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .028 (i)
     TIME TO PEAK    (hrs)=    1.901
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0013-------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .130 (i)
     TIME TO PEAK    (hrs)=    1.784
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0014-------------------------------------------------------------------------
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------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:204            1.44     .071    1.25  16.91    .000

                    +ID2 02:206            1.89     .166    1.37  15.96    .000

                    +ID3 05:SWMF           9.15     .029    3.07  35.18    .000

                    +ID4 07:IGD             .07     .074    1.25  36.26    .000

                    +ID5 08:207             .85     .028    1.90  15.96    .000

                    +ID6 09:208            3.33     .130    1.78  15.96    .000

                     ============================================================
                     SUM 03:IGMD          16.73     .287    1.58  26.64    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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002:0015-------------------------------------------------------------------------
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002:0002-------------------------------------------------------------------------
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  ** END OF RUN :   2

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\
--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 003
    NSTORM=   1
           #  1=kitSCS10.3h
-------------------------------------------------------------------------------
-
003:0002----------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
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003:0002----------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 10-year, 3 hour SCS Type II Storm, City
| Ptotal=  56.29 mm|    Comments: 10-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.910 |    .83  10.890 |   1.58  22.590 |   2.33   5.190
               .17   3.190 |    .92  14.590 |   1.67  17.260 |   2.42   4.730
               .25   3.530 |   1.00  21.160 |   1.75  13.770 |   2.50   4.340
               .33   3.930 |   1.08  35.090 |   1.83  11.350 |   2.58   4.000
               .42   4.430 |   1.17  76.090 |   1.92   9.590 |   2.67   3.720
               .50   5.070 |   1.25 169.551 |   2.00   8.260 |   2.75   3.460
               .58   5.900 |   1.33  87.120 |   2.08   7.230 |   2.83   3.240
               .67   7.010 |   1.42  48.190 |   2.17   6.400 |   2.92   3.050
               .75   8.580 |   1.50  31.460 |   2.25   5.740 |   3.00   2.870

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003:0003-------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.93         2.11
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        33.04
               over (min)        2.00        19.00
     Storage Coeff.  (min)=       2.23 (ii)   18.89 (ii)
     Unit Hyd. Tpeak (min)=       2.00        19.00
     Unit Hyd. peak  (cms)=        .52          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.13          .11         2.145 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.62         1.251
     RUNOFF VOLUME    (mm)=      55.29        18.15        44.147
     TOTAL RAINFALL   (mm)=      56.29        56.29        56.290
     RUNOFF COEFFICIENT   =        .98          .32          .784

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
003:0004-------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .45          .19
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        32.22
               over (min)        2.00        20.00
     Storage Coeff.  (min)=       1.94 (ii)   20.00 (ii)
```

```
     Unit Hyd. Tpeak (min)=       2.00        20.00
     Unit Hyd. peak  (cms)=        .57          .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .20          .01          .199 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.63         1.251
     RUNOFF VOLUME    (mm)=      55.29        18.15        44.147
     TOTAL RAINFALL   (mm)=      56.29        56.29        56.290
     RUNOFF COEFFICIENT   =        .98          .32          .784

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0005--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        50.89
               over (min)        1.00         5.00
     Storage Coeff.  (min)=        .64 (ii)    5.27 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.34          .22
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .35          .07          .391 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.35         1.251
     RUNOFF VOLUME    (mm)=      55.29        18.15        36.719
     TOTAL RAINFALL   (mm)=      56.29        56.29        56.290
     RUNOFF COEFFICIENT   =        .98          .32          .652

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0006-------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201            7.04    2.145    1.25  44.15    .000

                     +ID2 02:202             .64     .199    1.25  44.15    .000

                     +ID3 03:203            1.47     .391    1.25  36.72    .000

                      ============================================================
                      SUM 04:IGD            9.15    2.735    1.25  42.95    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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003:0007-------------------------------------------------------------------------
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---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .658  .6756E+00
                            .006  .1110E+00   |    1.505  .8381E+00
                            .017  .1933E+00   |    3.249  .1071E+01
                            .032  .3282E+00   |    7.250  .1264E+01
                            .212  .4716E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.15     2.735     1.251     42.954
     OUTFLOW<05: (SWMF  )       9.15      .070     3.001     42.949
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    2.577
                    TIME SHIFT OF PEAK FLOW         (min)=   105.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3588E+00

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003:0008-------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.44
| 01:204    DT= 1.00 |   Total Imp(%)=   12.00   Dir. Conn.(%)=   12.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17          1.27
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n             =       .013          .250

     Max.eff.Inten.(mm/hr)=     169.55         36.17
               over (min)         1.00         16.00
     Storage Coeff.  (min)=        .82 (ii)    16.38 (ii)
     Unit Hyd. Tpeak (min)=       1.00         16.00
     Unit Hyd. peak  (cms)=       1.20           .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .08           .07          .091 (iii)
     TIME TO PEAK    (hrs)=       1.25          1.57         1.251
     RUNOFF VOLUME    (mm)=      55.29         18.15        22.604
     TOTAL RAINFALL   (mm)=      56.29         56.29        56.290
     RUNOFF COEFFICIENT   =        .98           .32          .402
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
003:0009-------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39           .17
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      90.00         90.00
     Mannings n             =       .013          .250

     Max.eff.Inten.(mm/hr)=     169.55         32.22
               over (min)         2.00         20.00
```

```
     Storage Coeff.  (min)=       1.94 (ii)   20.00 (ii)
     Unit Hyd. Tpeak (min)=       2.00        20.00
     Unit Hyd. peak  (cms)=        .57          .06
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .17          .01          .174 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.63         1.251
     RUNOFF VOLUME    (mm)=      55.29        18.15        44.147
     TOTAL RAINFALL   (mm)=      56.29        56.29        56.290
     RUNOFF COEFFICIENT   =        .98          .32          .784

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
003:0010--------------------------------------------------------------------------
-
--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
         .067       .133       .200
         .067       .161       .229
         .067       .189       .256

            NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                       (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .174  No_date    1:15     44.147    1     6.
   ==========================================================================
   IDout= 04:INF         .46     .067  No_date    1:15     44.147    1     6.
   IDout= 07:IGD         .10     .107  No_date    1:15     44.147    1     0.
--------------------------------------------------------------------------------
-
003:0011--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090
```

```
     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .243 (i)
     TIME TO PEAK    (hrs)=    1.351
     RUNOFF VOLUME    (mm)=   22.128
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
003:0012----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .041 (i)
     TIME TO PEAK    (hrs)=    1.884
     RUNOFF VOLUME    (mm)=   22.127
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
003:0013----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .188 (i)
     TIME TO PEAK    (hrs)=    1.768
     RUNOFF VOLUME    (mm)=   22.128
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
```

```
-
003:0014--------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204            1.44     .091    1.25  22.60    .000

                     +ID2 02:206            1.89     .243    1.35  22.13    .000

                     +ID3 05:SWMF           9.15     .070    3.00  42.95    .000

                     +ID4 07:IGD             .10     .107    1.25  44.15    .000

                     +ID5 08:207             .85     .041    1.88  22.13    .000

                     +ID6 09:208            3.33     .188    1.77  22.13    .000

                      ============================================================
                      SUM 03:IGMD          16.76     .428    1.50  33.67    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
-
003:0015--------------------------------------------------------------------------
-
-------------------------------------------------------------------------------
-
003:0002--------------------------------------------------------------------------
-
-------------------------------------------------------------------------------
-
003:0002--------------------------------------------------------------------------
-
  ** END OF RUN :   3

********************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
```

```
    METOUT=   2 (output = METRIC)
    NRUN  = 004
    NSTORM=   1
           #  1=kitSCS25.3h
--------------------------------------------------------------------------------
-
004:0002--------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
-
004:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 25-year, 3 hour SCS Type II Storm, City
| Ptotal=  68.27 mm|    Comments: 25-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.260 |    .83  13.680 |   1.58  29.070 |   2.33   6.170
               .17   3.610 |    .92  18.580 |   1.67  22.100 |   2.42   5.570
               .25   4.030 |   1.00  27.210 |   1.75  17.500 |   2.50   5.070
               .33   4.540 |   1.08  45.020 |   1.83  14.300 |   2.58   4.640
               .42   5.190 |   1.17  93.660 |   1.92  11.960 |   2.67   4.270
               .50   6.010 |   1.25 191.557 |   2.00  10.200 |   2.75   3.950
               .58   7.090 |   1.33 106.330 |   2.08   8.840 |   2.83   3.670
               .67   8.560 |   1.42  61.230 |   2.17   7.760 |   2.92   3.420
               .75  10.620 |   1.50  40.460 |   2.25   6.880 |   3.00   3.210

--------------------------------------------------------------------------------
-
004:0003--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.93          2.11
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          2.00
     Length            (m)=      80.00         80.00
     Mannings n           =       .013          .250
```

```
     Max.eff.Inten.(mm/hr)=     191.56        50.68
               over (min)        2.00        16.00
     Storage Coeff.  (min)=      2.12 (ii)   16.16 (ii)
     Unit Hyd. Tpeak (min)=      2.00        16.00
     Unit Hyd. peak  (cms)=       .54          .07
                                                        *TOTALS*
     PEAK FLOW       (cms)=      2.44          .18         2.472 (iii)
     TIME TO PEAK    (hrs)=      1.25         1.57         1.251
     RUNOFF VOLUME    (mm)=     67.27        25.86        54.845
     TOTAL RAINFALL   (mm)=     68.27        68.27        68.268
     RUNOFF COEFFICIENT   =       .99          .38          .803

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
004:0004--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .45          .19
     Dep. Storage     (mm)=      1.00         8.00
     Average Slope     (%)=      1.00         2.00
     Length            (m)=     90.00        90.00
     Mannings n           =      .013         .250

     Max.eff.Inten.(mm/hr)=     191.56        49.09
               over (min)        2.00        17.00
     Storage Coeff.  (min)=      1.85 (ii)   17.11 (ii)
     Unit Hyd. Tpeak (min)=      2.00        17.00
     Unit Hyd. peak  (cms)=       .59          .07
                                                        *TOTALS*
     PEAK FLOW       (cms)=       .23          .02          .229 (iii)
     TIME TO PEAK    (hrs)=      1.25         1.58         1.251
     RUNOFF VOLUME    (mm)=     67.27        25.86        54.845
     TOTAL RAINFALL   (mm)=     68.27        68.27        68.268
     RUNOFF COEFFICIENT   =       .99          .38          .803

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
-
004:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56        70.26
               over (min)        1.00         5.00
     Storage Coeff.  (min)=        .61 (ii)    4.68 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.37          .24
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .39          .11          .462 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.33         1.251
     RUNOFF VOLUME    (mm)=      67.27        25.86        46.562
     TOTAL RAINFALL   (mm)=      68.27        68.27        68.268
     RUNOFF COEFFICIENT   =        .99          .38          .682

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
004:0006--------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201            7.04    2.472    1.25  54.84    .000

                     +ID2 02:202             .64     .229    1.25  54.84    .000

                     +ID3 03:203            1.47     .462    1.25  46.56    .000

                      ============================================================
                      SUM 04:IGD             9.15    3.163    1.25  53.51    .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

004:0007

| ROUTE RESERVOIR |
| IN>04:(IGD) |
| OUT<05:(SWMF) |

Requested routing time step = 1.0 min.

========= OUTLFOW STORAGE TABLE =========

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.000	.0000E+00	.658	.6756E+00
.006	.1110E+00	1.505	.8381E+00
.017	.1933E+00	3.249	.1071E+01
.032	.3282E+00	7.250	.1264E+01
.212	.4716E+00	.000	.0000E+00

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW >04: (IGD)	9.15	3.163	1.251	53.514
OUTFLOW<05: (SWMF)	9.15	.148	2.434	53.509
OVERFLOW<06: (SWMFO)	.00	.000	.000	.000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin](%)= 4.665
TIME SHIFT OF PEAK FLOW (min)= 71.00
MAXIMUM STORAGE USED (ha.m.)=.4203E+00

004:0008

CALIB STANDHYD	DT= 1.00

Area (ha)= 1.44
Total Imp(%)= 12.00 Dir. Conn.(%)= 12.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	.17	1.27
Dep. Storage (mm)=	1.00	8.00
Average Slope (%)=	.50	5.00
Length (m)=	15.00	120.00
Mannings n =	.013	.250
Max.eff.Inten.(mm/hr)=	191.56	53.76

```
               over (min)        1.00        14.00
     Storage Coeff.  (min)=        .78 (ii)   14.06 (ii)
     Unit Hyd. Tpeak (min)=       1.00        14.00
     Unit Hyd. peak  (cms)=       1.23          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .09          .12          .134 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.53         1.501
     RUNOFF VOLUME    (mm)=      67.27        25.86        30.826
     TOTAL RAINFALL   (mm)=      68.27        68.27        68.268
     RUNOFF COEFFICIENT   =        .99          .38          .452
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
004:0009--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39          .17
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56        49.09
               over (min)        2.00        17.00
     Storage Coeff.  (min)=       1.85 (ii)   17.11 (ii)
     Unit Hyd. Tpeak (min)=       2.00        17.00
     Unit Hyd. peak  (cms)=        .59          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .20          .01          .200 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.58         1.251
     RUNOFF VOLUME    (mm)=      67.27        25.86        54.845
     TOTAL RAINFALL   (mm)=      68.27        68.27        68.268
     RUNOFF COEFFICIENT   =        .99          .38          .803

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```

```
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
004:0010---------------------------------------------------------------------------
-
--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
         .067       .133       .200
         .067       .161       .229
         .067       .189       .256

             NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                        (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .200  No_date    1:15     54.845    1     6.
   ========================================================================
   IDout= 04:INF         .43     .067  No_date    1:15     54.845    1     6.
   IDout= 07:IGD         .13     .133  No_date    1:15     54.845    1     0.
-------------------------------------------------------------------------------
-
004:0011---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .336 (i)
     TIME TO PEAK    (hrs)=    1.351
     RUNOFF VOLUME    (mm)=   30.999
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
004:0012---------------------------------------------------------------------------
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-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .058 (i)
     TIME TO PEAK    (hrs)=    1.884
     RUNOFF VOLUME    (mm)=   30.998
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
004:0013--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .267 (i)
     TIME TO PEAK    (hrs)=    1.751
     RUNOFF VOLUME    (mm)=   30.999
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
004:0014--------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:204           1.44     .134    1.50  30.83    .000

                    +ID2 02:206           1.89     .336    1.35  31.00    .000

                    +ID3 05:SWMF          9.15     .148    2.43  53.51    .000

                    +ID4 07:IGD            .13     .133    1.25  54.84    .000
```

```
                    +ID5 08:207             .85     .058    1.88  31.00    .000

                    +ID6 09:208            3.33     .267    1.75  31.00    .000

                     ============================================================
                     SUM 03:IGMD          16.79     .630    1.58  43.43    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
004:0015---------------------------------------------------------------------
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-
004:0002---------------------------------------------------------------------
-
-------------------------------------------------------------------------------
-
004:0002---------------------------------------------------------------------
-
-------------------------------------------------------------------------------
-
004:0002---------------------------------------------------------------------
-
      FINISH
-------------------------------------------------------------------------------
-
*******************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
 001:0008 CALIB STANDHYD
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
   Simulation ended on 2023-03-03     at 10:58:44
===============================================================================
=
```

```
================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                        9   9  9   9   # 3053466
        StormWater Management HYdrologic Model           999    999    =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ********************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                  OTTHYMO-83 and OTTHYMO-89.                  *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
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 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: MTE Consultants Inc.                          +++++++++
 +++++++++                Burlington           SERIAL#:3053466        +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ********************************************************************************


 **********************   D E T A I L E D   O U T P U T   **********************
 ********************************************************************************
 *         DATE: 2023-02-16     TIME: 11:11:34     RUN COUNTER: 000021         *
 ********************************************************************************
 * Input   filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr12hr.dat           *
 * Output  filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr12hr.out           *
 * Summary filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr12hr.sum           *
 * User comments:                                                               *
 * 1:_____________________________________________________________________________*
 * 2:_____________________________________________________________________________*
 * 3:_____________________________________________________________________________*
 ********************************************************************************

--------------------------------------------------------------------------------
001:0001----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
-------------------
```

```
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=25mm.4hr
--------------------------------------------------------------------------------
001:0002------------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 25-mm, 4 hour Chicago Storm, (a=508.5, b
| Ptotal=  25.00 mm|    Comments: 25-mm, 4 hour Chicago Storm, (a=508.5, b
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   1.410 |   1.08   3.570 |   2.08   6.620 |   3.08   2.160
               .17   1.480 |   1.17   4.160 |   2.17   5.580 |   3.17   2.050
               .25   1.560 |   1.25   5.010 |   2.25   4.840 |   3.25   1.960
               .33   1.640 |   1.33   6.350 |   2.33   4.270 |   3.33   1.870
               .42   1.740 |   1.42   8.730 |   2.42   3.830 |   3.42   1.790
               .50   1.850 |   1.50  14.060 |   2.50   3.480 |   3.50   1.720
               .58   1.980 |   1.58  35.190 |   2.58   3.190 |   3.58   1.660
               .67   2.130 |   1.67  71.896 |   2.67   2.950 |   3.67   1.600
               .75   2.310 |   1.75  26.870 |   2.75   2.740 |   3.75   1.540
               .83   2.530 |   1.83  15.350 |   2.83   2.570 |   3.83   1.490
               .92   2.790 |   1.92  10.660 |   2.92   2.410 |   3.92   1.440
              1.00   3.130 |   2.00   8.160 |   3.00   2.280 |   4.00   1.400

--------------------------------------------------------------------------------
001:0003------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.93         2.11
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         9.45
               over (min)        3.00        31.00
     Storage Coeff.  (min)=       3.14 (ii)   30.62 (ii)
     Unit Hyd. Tpeak (min)=       3.00        31.00
     Unit Hyd. peak  (cms)=        .36          .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .82          .01           .817 (iii)
     TIME TO PEAK    (hrs)=       1.68         2.33          1.683
     RUNOFF VOLUME    (mm)=      24.00         2.97         17.692
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .96          .12           .708

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0004

CALIB STANDHYD 02:202 DT= 1.00	Area (ha)= .64	Total Imp(%)= 70.00	Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.45	.19	
Dep. Storage	(mm)=	1.00	8.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	90.00	90.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)=		71.90	9.45	
over (min)		3.00	32.00	
Storage Coeff. (min)=		2.74 (ii)	32.23 (ii)	
Unit Hyd. Tpeak (min)=		3.00	32.00	
Unit Hyd. peak (cms)=		.40	.04	
				TOTALS
PEAK FLOW	(cms)=	.08	.00	.077 (iii)
TIME TO PEAK	(hrs)=	1.67	2.35	1.667
RUNOFF VOLUME	(mm)=	24.00	2.97	17.692
TOTAL RAINFALL	(mm)=	25.00	25.00	25.000
RUNOFF COEFFICIENT	=	.96	.12	.708

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0005

CALIB STANDHYD 03:203 DT= 1.00	Area (ha)= 1.47	Total Imp(%)= 50.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.74	.74	
Dep. Storage	(mm)=	1.00	8.00	
Average Slope	(%)=	2.00	5.00	
Length	(m)=	20.00	20.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)=		71.90	4.69	
over (min)		1.00	13.00	
Storage Coeff. (min)=		.90 (ii)	12.93 (ii)	
Unit Hyd. Tpeak (min)=		1.00	13.00	
Unit Hyd. peak (cms)=		1.14	.09	
				TOTALS
PEAK FLOW	(cms)=	.15	.01	.147 (iii)
TIME TO PEAK	(hrs)=	1.67	1.95	1.667
RUNOFF VOLUME	(mm)=	24.00	2.97	13.486
TOTAL RAINFALL	(mm)=	25.00	25.00	25.000
RUNOFF COEFFICIENT	=	.96	.12	.539

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
001:0006----------------------------------------------------------------------
------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201           7.04     .817    1.68  17.69    .000
                     +ID2 02:202            .64     .077    1.67  17.69    .000
                     +ID3 03:203           1.47     .147    1.67  13.49    .000
                      ============================================================
                      SUM 04:IGD           9.15    1.038    1.67  17.02    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
001:0007----------------------------------------------------------------------
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .673  .6756E+00
                            .006  .1110E+00   |    1.521  .8381E+00
                            .026  .1933E+00   |    3.269  .1071E+01
                            .043  .3282E+00   |    7.270  .1264E+01
                            .225  .4716E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.15     1.038     1.667     17.016
     OUTFLOW<05: (SWMF  )       9.15      .014     4.067     17.015
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.380
                    TIME SHIFT OF PEAK FLOW         (min)=   144.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.1449E+00

--------------------------------------------------------------------------------
001:0008----------------------------------------------------------------------
---------------------
| CALIB STANDHYD    |   Area    (ha)=    1.44
| 01:204    DT= 1.00 |   Total Imp(%)=   12.00   Dir. Conn.(%)=   12.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17          1.27
     Dep. Storage     (mm)=       1.00          8.00
```

```
     Average Slope     (%)=        .50         5.00
     Length            (m)=      15.00       120.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         9.45
               over (min)         1.00        28.00
     Storage Coeff.  (min)=       1.15 (ii)   27.78 (ii)
     Unit Hyd. Tpeak (min)=       1.00        28.00
     Unit Hyd. peak  (cms)=        .99          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .03          .01          .034 (iii)
     TIME TO PEAK    (hrs)=       1.67         2.27         1.667
     RUNOFF VOLUME    (mm)=      24.00         2.97         5.496
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .12          .220
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
001:0009--------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39          .17
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         9.45
               over (min)         3.00        32.00
     Storage Coeff.  (min)=       2.74 (ii)   32.23 (ii)
     Unit Hyd. Tpeak (min)=       3.00        32.00
     Unit Hyd. peak  (cms)=        .40          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .07          .00          .067 (iii)
     TIME TO PEAK    (hrs)=       1.67         2.35         1.667
     RUNOFF VOLUME    (mm)=      24.00         2.97        17.692
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .12          .708

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
001:0010--------------------------------------------------------------------------
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```
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
         .067       .133       .200
         .067       .161       .229
         .067       .189       .256

            NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                       (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .067  No_date    1:40     17.692    1     8.
   ========================================================================
   IDout= 04:INF         .56     .067  No_date    1:40     17.692    1     8.
   IDout= 07:IGD         .00     .000  No_date    1:40     17.692    1     0.
-------------------------------------------------------------------------------
001:0011---------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .028 (i)
     TIME TO PEAK    (hrs)=    1.783
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
001:0012---------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .005 (i)
     TIME TO PEAK    (hrs)=    2.417
     RUNOFF VOLUME    (mm)=    3.807
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
001:0013---------------------------------------------------------------------------
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```
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .024 (i)
     TIME TO PEAK    (hrs)=    2.267
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
001:0014--------------------------------------------------------------------------
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:204            1.44     .034    1.67   5.50    .000
                    +ID2 02:206            1.89     .028    1.78   3.81    .000
                    +ID3 05:SWMF           9.15     .014    4.07  17.01    .000
                    +ID4 07:IGD             .00     .000    1.67  17.69    .000
                    +ID5 08:207             .85     .005    2.42   3.81    .000
                    +ID6 09:208            3.33     .024    2.27   3.81    .000
                     ============================================================
                     SUM 03:IGMD          16.66     .056    2.23  11.21    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
001:0015--------------------------------------------------------------------------
  ** END OF RUN :   1

********************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=kitSCS2.3h
--------------------------------------------------------------------------------
002:0002--------------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
```

```
*#*************************************************************************
--------------------------------------------------------------------------------
002:0002----------------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 2-year, 3 hour SCS Type II Storm, City o
| Ptotal=  34.28 mm|    Comments: 2-year, 3 hour SCS Type II Storm, City o
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.680 |    .83   7.040 |   1.58  12.520 |   2.33   4.070
               .17   2.860 |    .92   8.810 |   1.67  10.060 |   2.42   3.800
               .25   3.070 |   1.00  11.860 |   1.75   8.430 |   2.50   3.570
               .33   3.330 |   1.08  18.310 |   1.83   7.270 |   2.58   3.370
               .42   3.630 |   1.17  39.760 |   1.92   6.400 |   2.67   3.190
               .50   4.000 |   1.25 109.401 |   2.00   5.720 |   2.75   3.030
               .58   4.470 |   1.33  45.910 |   2.08   5.180 |   2.83   2.890
               .67   5.070 |   1.42  24.590 |   2.17   4.750 |   2.92   2.760
               .75   5.880 |   1.50  16.600 |   2.25   4.380 |   3.00   2.650

--------------------------------------------------------------------------------
002:0003----------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.93         2.11
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40         7.80
               over (min)        3.00        32.00
     Storage Coeff.  (min)=       2.65 (ii)   32.34 (ii)
     Unit Hyd. Tpeak (min)=       3.00        32.00
     Unit Hyd. peak  (cms)=        .41          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.26          .02          1.261 (iii)
     TIME TO PEAK    (hrs)=       1.27         1.90          1.268
     RUNOFF VOLUME    (mm)=      33.28         6.48         25.238
     TOTAL RAINFALL   (mm)=      34.28        34.28         34.276
     RUNOFF COEFFICIENT   =        .97          .19           .736

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0004----------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .45          .19
```

```
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40         7.40
               over (min)        2.00        35.00
     Storage Coeff.  (min)=       2.31 (ii)   34.85 (ii)
     Unit Hyd. Tpeak (min)=       2.00        35.00
     Unit Hyd. peak  (cms)=        .51          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .12          .00          .123 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.95         1.251
     RUNOFF VOLUME    (mm)=      33.28         6.48        25.238
     TOTAL RAINFALL   (mm)=      34.28        34.28        34.276
     RUNOFF COEFFICIENT   =        .97          .19          .736

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0005----------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40        14.89
               over (min)        1.00         8.00
     Storage Coeff.  (min)=        .76 (ii)    8.34 (ii)
     Unit Hyd. Tpeak (min)=       1.00         8.00
     Unit Hyd. peak  (cms)=       1.24          .14
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .22          .02          .228 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.42         1.251
     RUNOFF VOLUME    (mm)=      33.28         6.48        19.880
     TOTAL RAINFALL   (mm)=      34.28        34.28        34.276
     RUNOFF COEFFICIENT   =        .97          .19          .580

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0006----------------------------------------------------------------------------
-----------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
```

```
-----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:201             7.04    1.261    1.27  25.24    .000
                    +ID2 02:202              .64     .123    1.25  25.24    .000
                    +ID3 03:203             1.47     .228    1.25  19.88    .000
                     ============================================================
                     SUM 04:IGD             9.15    1.603    1.25  24.38    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
002:0007----------------------------------------------------------------------
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .673  .6756E+00
                            .006  .1110E+00   |    1.521  .8381E+00
                            .026  .1933E+00   |    3.269  .1071E+01
                            .043  .3282E+00   |    7.270  .1264E+01
                            .225  .4716E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.15     1.603     1.251     24.377
     OUTFLOW<05: (SWMF  )       9.15      .027     3.068     24.375
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.701
                  TIME SHIFT OF PEAK FLOW         (min)=   109.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.2048E+00

--------------------------------------------------------------------------------
002:0008----------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.44
| 01:204    DT= 1.00 |   Total Imp(%)=   12.00   Dir. Conn.(%)=   12.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17          1.27
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=     109.40          8.27
               over (min)         1.00         29.00
     Storage Coeff.  (min)=        .97 (ii)    29.07 (ii)
     Unit Hyd. Tpeak (min)=       1.00         29.00
     Unit Hyd. peak  (cms)=       1.09           .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .05           .02          .053 (iii)
```

```
     TIME TO PEAK    (hrs)=       1.25         1.83          1.251
     RUNOFF VOLUME    (mm)=      33.28         6.48          9.699
     TOTAL RAINFALL   (mm)=      34.28        34.28         34.276
     RUNOFF COEFFICIENT   =        .97          .19           .283
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0009----------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39          .17
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40         7.40
                over (min)        2.00        35.00
     Storage Coeff.  (min)=       2.31 (ii)   34.85 (ii)
     Unit Hyd. Tpeak (min)=       2.00        35.00
     Unit Hyd. peak  (cms)=        .51          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .11          .00          .107 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.95         1.251
     RUNOFF VOLUME    (mm)=      33.28         6.48        25.238
     TOTAL RAINFALL   (mm)=      34.28        34.28        34.276
     RUNOFF COEFFICIENT   =        .97          .19          .736

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0010----------------------------------------------------------------------
--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
```

```
        .067      .133      .200
        .067      .161      .229
        .067      .189      .256

            NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                       (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .107  No_date    1:15     25.238    1     8.
   ==========================================================================
   IDout= 04:INF         .52     .067  No_date    1:15     25.238    1     8.
   IDout= 07:IGD         .04     .040  No_date    1:15     25.238    1     0.
-------------------------------------------------------------------------------
002:0011---------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .077 (i)
     TIME TO PEAK    (hrs)=    1.368
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
002:0012---------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .013 (i)
     TIME TO PEAK    (hrs)=    1.951
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
002:0013---------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .060 (i)
     TIME TO PEAK    (hrs)=    1.801
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

002:0014---

ADD HYD (IGMD)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1	01:204	1.44	.053	1.25	9.70	.000
+ID2	02:206	1.89	.077	1.37	8.20	.000
+ID3	05:SWMF	9.15	.027	3.07	24.38	.000
+ID4	07:IGD	.04	.040	1.25	25.24	.000
+ID5	08:207	.85	.013	1.95	8.20	.000
+ID6	09:208	3.33	.060	1.80	8.20	.000
SUM	03:IGMD	16.70	.137	1.75	17.23	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

002:0015---

002:0002---
** END OF RUN : 2

****

| START | Project dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 003
NSTORM= 1
# 1=kitSCS5.3h

003:0002---
*#**********
*# Project Name: [Wilmot Woods] Project Number: [35056-104]
*# Date : 26-01-2023
*# Modeller : [AJC]
*# Company : MTE Consultants Ltd.
*# License # : 3057174
*#**********

003:0002---

| READ STORM | Filename: 5-year, 3 hour SCS Type II Storm, City o
| Ptotal= 47.26 mm | Comments: 5-year, 3 hour SCS Type II Storm, City o
---

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr

.08	2.810	.83	9.480	1.58	18.860	2.33	4.770
.17	3.060	.92	12.460	1.67	14.610	2.42	4.380
.25	3.350	1.00	17.720	1.75	11.810	2.50	4.050
.33	3.700	1.08	28.800	1.83	9.860	2.58	3.770
.42	4.130	1.17	61.690	1.92	8.420	2.67	3.520
.50	4.670	1.25	139.288	2.00	7.330	2.75	3.300
.58	5.370	1.33	70.600	2.08	6.480	2.83	3.100
.67	6.300	1.42	39.220	2.17	5.800	2.92	2.930
.75	7.590	1.50	25.910	2.25	5.240	3.00	2.780

003:0003

CALIB STANDHYD	Area (ha)= 7.04
01:201 DT= 1.00	Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	4.93	2.11	
Dep. Storage	(mm)=	1.00	8.00	
Average Slope	(%)=	.50	2.00	
Length	(m)=	80.00	80.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)=		139.29	20.27	
over (min)		2.00	23.00	
Storage Coeff. (min)=		2.41 (ii)	22.66 (ii)	
Unit Hyd. Tpeak (min)=		2.00	23.00	
Unit Hyd. peak (cms)=		.49	.05	
				TOTALS
PEAK FLOW	(cms)=	1.72	.07	1.729 (iii)
TIME TO PEAK	(hrs)=	1.25	1.70	1.251
RUNOFF VOLUME	(mm)=	46.26	12.90	36.255
TOTAL RAINFALL	(mm)=	47.26	47.26	47.263
RUNOFF COEFFICIENT	=	.98	.27	.767

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

003:0004

CALIB STANDHYD	Area (ha)= .64
02:202 DT= 1.00	Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	.45	.19
Dep. Storage	(mm)=	1.00	8.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	90.00	90.00
Mannings n	=	.013	.250
Max.eff.Inten.(mm/hr)=		139.29	19.80
over (min)		2.00	24.00
Storage Coeff. (min)=		2.10 (ii)	24.05 (ii)
Unit Hyd. Tpeak (min)=		2.00	24.00

```
     Unit Hyd. peak  (cms)=        .54          .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .16          .01          .161 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.72         1.251
     RUNOFF VOLUME    (mm)=      46.26        12.90        36.255
     TOTAL RAINFALL   (mm)=      47.26        47.26        47.263
     RUNOFF COEFFICIENT   =        .98          .27          .767

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0005----------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        32.42
               over (min)        1.00         6.00
     Storage Coeff.  (min)=        .69 (ii)    6.24 (ii)
     Unit Hyd. Tpeak (min)=       1.00         6.00
     Unit Hyd. peak  (cms)=       1.30          .18
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .28          .05          .306 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.37         1.251
     RUNOFF VOLUME    (mm)=      46.26        12.90        29.583
     TOTAL RAINFALL   (mm)=      47.26        47.26        47.263
     RUNOFF COEFFICIENT   =        .98          .27          .626

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0006----------------------------------------------------------------------
------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:201            7.04    1.729    1.25  36.26    .000
                    +ID2 02:202             .64     .161    1.25  36.26    .000
                    +ID3 03:203            1.47     .306    1.25  29.58    .000
                     ============================================================
                     SUM 04:IGD            9.15    2.196    1.25  35.18    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------------------------------------------------------------------
003:0007--------------------------------------------------------------------------
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .673  .6756E+00
                           .006  .1110E+00   |    1.521  .8381E+00
                           .026  .1933E+00   |    3.269  .1071E+01
                           .043  .3282E+00   |    7.270  .1264E+01
                           .225  .4716E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.15     2.196     1.251     35.183
     OUTFLOW<05: (SWMF  )       9.15      .039     3.051     35.181
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.769
                   TIME SHIFT OF PEAK FLOW         (min)=   108.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2962E+00

--------------------------------------------------------------------------------
003:0008--------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.44
| 01:204    DT= 1.00 |   Total Imp(%)=   12.00   Dir. Conn.(%)=   12.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17          1.27
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=     139.29         21.99
               over (min)         1.00         20.00
     Storage Coeff.  (min)=        .88 (ii)    19.88 (ii)
     Unit Hyd. Tpeak (min)=       1.00         20.00
     Unit Hyd. peak  (cms)=       1.15           .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .07           .04          .071 (iii)
     TIME TO PEAK    (hrs)=       1.25          1.65         1.251
     RUNOFF VOLUME    (mm)=      46.26         12.90        16.906
     TOTAL RAINFALL   (mm)=      47.26         47.26        47.263
     RUNOFF COEFFICIENT   =        .98           .27          .358
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
```

```
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0009----------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39          .17
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        19.80
               over (min)         2.00        24.00
     Storage Coeff.  (min)=       2.10 (ii)   24.05 (ii)
     Unit Hyd. Tpeak (min)=       2.00        24.00
     Unit Hyd. peak  (cms)=        .54          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .14          .01          .141 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.72         1.251
     RUNOFF VOLUME    (mm)=      46.26        12.90        36.255
     TOTAL RAINFALL   (mm)=      47.26        47.26        47.263
     RUNOFF COEFFICIENT   =        .98          .27          .767

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0010----------------------------------------------------------------------
--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
         .067       .133       .200
         .067       .161       .229
         .067       .189       .256

            NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                       (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .141  No_date    1:15     36.255    1     6.
   ==========================================================================
   IDout= 04:INF         .49     .067  No_date    1:15     36.255    1     6.
```

```
   IDout= 07:IGD         .07     .074  No_date    1:15     36.255    1     0.
--------------------------------------------------------------------------------
003:0011--------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .166 (i)
     TIME TO PEAK    (hrs)=    1.368
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0012--------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .028 (i)
     TIME TO PEAK    (hrs)=    1.901
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0013--------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .130 (i)
     TIME TO PEAK    (hrs)=    1.784
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0014--------------------------------------------------------------------------
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204           1.44     .071    1.25  16.91    .000
```

```
                  +ID2 02:206           1.89     .166    1.37  15.96    .000
                  +ID3 05:SWMF          9.15     .039    3.05  35.18    .000
                  +ID4 07:IGD            .07     .074    1.25  36.26    .000
                  +ID5 08:207            .85     .028    1.90  15.96    .000
                  +ID6 09:208           3.33     .130    1.78  15.96    .000
                   ============================================================
                   SUM 03:IGMD         16.73     .296    1.58  26.64    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
003:0015----------------------------------------------------------------------
--------------------------------------------------------------------------------
003:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
003:0002----------------------------------------------------------------------
  ** END OF RUN :   3

********************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 004
    NSTORM=   1
           #  1=kitSCS10.3h
--------------------------------------------------------------------------------
004:0002----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
004:0002----------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 10-year, 3 hour SCS Type II Storm, City
| Ptotal=  56.29 mm|    Comments: 10-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.910 |    .83  10.890 |   1.58  22.590 |   2.33   5.190
               .17   3.190 |    .92  14.590 |   1.67  17.260 |   2.42   4.730
               .25   3.530 |   1.00  21.160 |   1.75  13.770 |   2.50   4.340
               .33   3.930 |   1.08  35.090 |   1.83  11.350 |   2.58   4.000
               .42   4.430 |   1.17  76.090 |   1.92   9.590 |   2.67   3.720
               .50   5.070 |   1.25 169.551 |   2.00   8.260 |   2.75   3.460
               .58   5.900 |   1.33  87.120 |   2.08   7.230 |   2.83   3.240
```

```
              .67   7.010 |   1.42  48.190 |   2.17   6.400 |   2.92   3.050
              .75   8.580 |   1.50  31.460 |   2.25   5.740 |   3.00   2.870

--------------------------------------------------------------------------------
004:0003----------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.93         2.11
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        33.04
               over (min)        2.00        19.00
     Storage Coeff.  (min)=       2.23 (ii)   18.89 (ii)
     Unit Hyd. Tpeak (min)=       2.00        19.00
     Unit Hyd. peak  (cms)=        .52          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.13          .11          2.145 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.62          1.251
     RUNOFF VOLUME    (mm)=      55.29        18.15         44.147
     TOTAL RAINFALL   (mm)=      56.29        56.29         56.290
     RUNOFF COEFFICIENT   =        .98          .32           .784

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0004----------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .45          .19
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        32.22
               over (min)        2.00        20.00
     Storage Coeff.  (min)=       1.94 (ii)   20.00 (ii)
     Unit Hyd. Tpeak (min)=       2.00        20.00
     Unit Hyd. peak  (cms)=        .57          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .20          .01           .199 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.63          1.251
     RUNOFF VOLUME    (mm)=      55.29        18.15         44.147
     TOTAL RAINFALL   (mm)=      56.29        56.29         56.290
     RUNOFF COEFFICIENT   =        .98          .32           .784
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0005----------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74           .74
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=       2.00          5.00
     Length            (m)=      20.00         20.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=     169.55         50.89
               over (min)        1.00          5.00
     Storage Coeff.  (min)=        .64 (ii)    5.27 (ii)
     Unit Hyd. Tpeak (min)=       1.00          5.00
     Unit Hyd. peak  (cms)=       1.34           .22
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .35           .07          .391 (iii)
     TIME TO PEAK    (hrs)=       1.25          1.35         1.251
     RUNOFF VOLUME    (mm)=      55.29         18.15        36.719
     TOTAL RAINFALL   (mm)=      56.29         56.29        56.290
     RUNOFF COEFFICIENT   =        .98           .32          .652

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0006----------------------------------------------------------------------
------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201           7.04    2.145    1.25  44.15    .000
                     +ID2 02:202            .64     .199    1.25  44.15    .000
                     +ID3 03:203           1.47     .391    1.25  36.72    .000
                      ============================================================
                      SUM 04:IGD           9.15    2.735    1.25  42.95    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
004:0007----------------------------------------------------------------------
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

(cms)	(ha.m.)	(cms)	(ha.m.)
.000	.0000E+00	.673	.6756E+00
.006	.1110E+00	1.521	.8381E+00
.026	.1933E+00	3.269	.1071E+01
.043	.3282E+00	7.270	.1264E+01
.225	.4716E+00	.000	.0000E+00

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW >04: (IGD)	9.15	2.735	1.251	42.954
OUTFLOW<05: (SWMF)	9.15	.076	2.934	42.949
OVERFLOW<06: (SWMFO)	.00	.000	.000	.000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.766
TIME SHIFT OF PEAK FLOW (min)= 101.00
MAXIMUM STORAGE USED (ha.m.)=.3541E+00

004:0008

CALIB STANDHYD	Area (ha)= 1.44
01:204 DT= 1.00	Total Imp(%)= 12.00 Dir. Conn.(%)= 12.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.17	1.27	
Dep. Storage	(mm)=	1.00	8.00	
Average Slope	(%)=	.50	5.00	
Length	(m)=	15.00	120.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)=		169.55	36.17	
over (min)		1.00	16.00	
Storage Coeff. (min)=		.82 (ii)	16.38 (ii)	
Unit Hyd. Tpeak (min)=		1.00	16.00	
Unit Hyd. peak (cms)=		1.20	.07	
				TOTALS
PEAK FLOW	(cms)=	.08	.07	.091 (iii)
TIME TO PEAK	(hrs)=	1.25	1.57	1.251
RUNOFF VOLUME	(mm)=	55.29	18.15	22.604
TOTAL RAINFALL	(mm)=	56.29	56.29	56.290
RUNOFF COEFFICIENT	=	.98	.32	.402

*** WARNING: For areas with impervious ratios below
20%, this routine may not be applicable.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

004:0009

```
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39          .17
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        32.22
               over (min)        2.00        20.00
     Storage Coeff.  (min)=       1.94 (ii)   20.00 (ii)
     Unit Hyd. Tpeak (min)=       2.00        20.00
     Unit Hyd. peak  (cms)=        .57          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .17          .01          .174 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.63         1.251
     RUNOFF VOLUME    (mm)=      55.29        18.15        44.147
     TOTAL RAINFALL   (mm)=      56.29        56.29        56.290
     RUNOFF COEFFICIENT   =        .98          .32          .784

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0010----------------------------------------------------------------------------
--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
         .067       .133       .200
         .067       .161       .229
         .067       .189       .256

            NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                       (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .174  No_date    1:15     44.147    1     6.
   ========================================================================
   IDout= 04:INF         .46     .067  No_date    1:15     44.147    1     6.
   IDout= 07:IGD         .10     .107  No_date    1:15     44.147    1     0.
--------------------------------------------------------------------------------
004:0011----------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090
```

```
     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .243 (i)
     TIME TO PEAK    (hrs)=    1.351
     RUNOFF VOLUME    (mm)=   22.128
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0012----------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .041 (i)
     TIME TO PEAK    (hrs)=    1.884
     RUNOFF VOLUME    (mm)=   22.127
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0013----------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .188 (i)
     TIME TO PEAK    (hrs)=    1.768
     RUNOFF VOLUME    (mm)=   22.128
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0014----------------------------------------------------------------------
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204           1.44     .091    1.25  22.60    .000
                     +ID2 02:206           1.89     .243    1.35  22.13    .000
                     +ID3 05:SWMF          9.15     .076    2.93  42.95    .000
                     +ID4 07:IGD            .10     .107    1.25  44.15    .000
                     +ID5 08:207            .85     .041    1.88  22.13    .000
                     +ID6 09:208           3.33     .188    1.77  22.13    .000
                      ========================================================
                      SUM 03:IGMD         16.76     .438    1.50  33.67    .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

004:0015---

004:0002---

004:0002---

004:0002---
** END OF RUN : 4

****

| START | Project dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--- Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 005
NSTORM= 1
# 1=kitSCS25.3h

005:0002---
*#**********
*# Project Name: [Wilmot Woods] Project Number: [35056-104]
*# Date : 26-01-2023
*# Modeller : [AJC]
*# Company : MTE Consultants Ltd.
*# License # : 3057174
*#**********

005:0002---

| READ STORM | Filename: 25-year, 3 hour SCS Type II Storm, City
| Ptotal= 68.27 mm| Comments: 25-year, 3 hour SCS Type II Storm, City
---

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	3.260	.83	13.680	1.58	29.070	2.33	6.170
.17	3.610	.92	18.580	1.67	22.100	2.42	5.570
.25	4.030	1.00	27.210	1.75	17.500	2.50	5.070
.33	4.540	1.08	45.020	1.83	14.300	2.58	4.640
.42	5.190	1.17	93.660	1.92	11.960	2.67	4.270
.50	6.010	1.25	191.557	2.00	10.200	2.75	3.950
.58	7.090	1.33	106.330	2.08	8.840	2.83	3.670
.67	8.560	1.42	61.230	2.17	7.760	2.92	3.420
.75	10.620	1.50	40.460	2.25	6.880	3.00	3.210

005:0003---

```
----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.93         2.11
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56        50.68
               over (min)        2.00        16.00
     Storage Coeff.  (min)=       2.12 (ii)   16.16 (ii)
     Unit Hyd. Tpeak (min)=       2.00        16.00
     Unit Hyd. peak  (cms)=        .54          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.44          .18          2.472 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.57          1.251
     RUNOFF VOLUME    (mm)=      67.27        25.86         54.845
     TOTAL RAINFALL   (mm)=      68.27        68.27         68.268
     RUNOFF COEFFICIENT   =        .99          .38           .803

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
005:0004----------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .45          .19
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56        49.09
               over (min)        2.00        17.00
     Storage Coeff.  (min)=       1.85 (ii)   17.11 (ii)
     Unit Hyd. Tpeak (min)=       2.00        17.00
     Unit Hyd. peak  (cms)=        .59          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .23          .02           .229 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.58          1.251
     RUNOFF VOLUME    (mm)=      67.27        25.86         54.845
     TOTAL RAINFALL   (mm)=      68.27        68.27         68.268
     RUNOFF COEFFICIENT   =        .99          .38           .803

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

005:0005---

CALIB STANDHYD	03:203 DT= 1.00	Area (ha)= 1.47 Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	.74	.74
Dep. Storage	(mm)=	1.00	8.00
Average Slope	(%)=	2.00	5.00
Length	(m)=	20.00	20.00
Mannings n	=	.013	.250
Max.eff.Inten.(mm/hr)=	over (min)	191.56	70.26
	over (min)	1.00	5.00
Storage Coeff.	(min)=	.61 (ii)	4.68 (ii)
Unit Hyd. Tpeak	(min)=	1.00	5.00
Unit Hyd. peak	(cms)=	1.37	.24

				TOTALS
PEAK FLOW	(cms)=	.39	.11	.462 (iii)
TIME TO PEAK	(hrs)=	1.25	1.33	1.251
RUNOFF VOLUME	(mm)=	67.27	25.86	46.562
TOTAL RAINFALL	(mm)=	68.27	68.27	68.268
RUNOFF COEFFICIENT	=	.99	.38	.682

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

005:0006---

ADD HYD (IGD)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1	01:201	7.04	2.472	1.25	54.84	.000
+ID2	02:202	.64	.229	1.25	54.84	.000
+ID3	03:203	1.47	.462	1.25	46.56	.000
SUM	04:IGD	9.15	3.163	1.25	53.51	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

005:0007---

ROUTE RESERVOIR	IN>04:(IGD)	OUT<05:(SWMF)

Requested routing time step = 1.0 min.

========= OUTLFOW STORAGE TABLE =========

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.000	.0000E+00	.673	.6756E+00
.006	.1110E+00	1.521	.8381E+00
.026	.1933E+00	3.269	.1071E+01
.043	.3282E+00	7.270	.1264E+01

```
                          .225  .4716E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.15     3.163     1.251     53.514
     OUTFLOW<05: (SWMF  )       9.15      .155     2.401     53.509
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.893
                  TIME SHIFT OF PEAK FLOW         (min)=    69.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.4165E+00

--------------------------------------------------------------------------------
005:0008----------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.44
| 01:204    DT= 1.00 |   Total Imp(%)=   12.00   Dir. Conn.(%)=   12.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17          1.27
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=     191.56         53.76
               over (min)         1.00         14.00
     Storage Coeff.  (min)=        .78 (ii)    14.06 (ii)
     Unit Hyd. Tpeak (min)=       1.00         14.00
     Unit Hyd. peak  (cms)=       1.23           .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .09           .12          .134 (iii)
     TIME TO PEAK    (hrs)=       1.25          1.53         1.501
     RUNOFF VOLUME    (mm)=      67.27         25.86        30.826
     TOTAL RAINFALL   (mm)=      68.27         68.27        68.268
     RUNOFF COEFFICIENT   =        .99           .38          .452
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
005:0009----------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39           .17
```

```
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56        49.09
               over (min)        2.00        17.00
     Storage Coeff.  (min)=       1.85 (ii)   17.11 (ii)
     Unit Hyd. Tpeak (min)=       2.00        17.00
     Unit Hyd. peak  (cms)=        .59          .07
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .20          .01          .200 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.58         1.251
     RUNOFF VOLUME    (mm)=      67.27        25.86        54.845
     TOTAL RAINFALL   (mm)=      68.27        68.27        68.268
     RUNOFF COEFFICIENT   =        .99          .38          .803

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
005:0010----------------------------------------------------------------------------
--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
         .067       .133       .200
         .067       .161       .229
         .067       .189       .256

            NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                       (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .200  No_date    1:15     54.845    1     6.
   ==========================================================================
   IDout= 04:INF         .43     .067  No_date    1:15     54.845    1     6.
   IDout= 07:IGD         .13     .133  No_date    1:15     54.845    1     0.
--------------------------------------------------------------------------------
005:0011----------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .336 (i)
     TIME TO PEAK    (hrs)=    1.351
```

```
     RUNOFF VOLUME    (mm)=   30.999
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---------------------------------------------------------------------------------
005:0012----------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .058 (i)
     TIME TO PEAK    (hrs)=    1.884
     RUNOFF VOLUME    (mm)=   30.998
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---------------------------------------------------------------------------------
005:0013----------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .267 (i)
     TIME TO PEAK    (hrs)=    1.751
     RUNOFF VOLUME    (mm)=   30.999
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---------------------------------------------------------------------------------
005:0014----------------------------------------------------------------------------
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204            1.44     .134    1.50  30.83    .000
                     +ID2 02:206            1.89     .336    1.35  31.00    .000
                     +ID3 05:SWMF           9.15     .155    2.40  53.51    .000
                     +ID4 07:IGD             .13     .133    1.25  54.84    .000
                     +ID5 08:207             .85     .058    1.88  31.00    .000
                     +ID6 09:208            3.33     .267    1.75  31.00    .000
                      ============================================================
                      SUM 03:IGMD          16.79     .639    1.58  43.43    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------------
005:0015----------------------------------------------------------------------------
```

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--------------------------------------------------------------------------------
005:0002--------------------------------------------------------------------------
--------------------------------------------------------------------------------
005:0002--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
--------------------------------------------------------------------------------
005:0002--------------------------------------------------------------------------
  ** END OF RUN :   5

********************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 006
    NSTORM=   1
           #  1=kitSCS50.3h
--------------------------------------------------------------------------------
006:0002--------------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
006:0002--------------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 50-year, 3 hour SCS Type II Storm, City
| Ptotal=  77.65 mm|    Comments: 50-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.490 |    .83  15.570 |   1.58  33.550 |   2.33   6.820
               .17   3.880 |    .92  21.290 |   1.67  25.420 |   2.42   6.130
               .25   4.360 |   1.00  31.380 |   1.75  20.040 |   2.50   5.550
               .33   4.950 |   1.08  52.080 |   1.83  16.280 |   2.58   5.060
               .42   5.690 |   1.17 107.590 |   1.92  13.550 |   2.67   4.640
               .50   6.640 |   1.25 215.802 |   2.00  11.500 |   2.75   4.270
               .58   7.890 |   1.33 121.920 |   2.08   9.910 |   2.83   3.950
               .67   9.590 |   1.42  70.790 |   2.17   8.660 |   2.92   3.670
               .75  11.990 |   1.50  46.810 |   2.25   7.640 |   3.00   3.430

--------------------------------------------------------------------------------
006:0003--------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
```

```
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.93         2.11
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     215.80        66.09
               over (min)        2.00        15.00
     Storage Coeff.  (min)=       2.02 (ii)   14.65 (ii)
     Unit Hyd. Tpeak (min)=       2.00        15.00
     Unit Hyd. peak  (cms)=        .55          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.77          .24          2.821 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.53          1.251
     RUNOFF VOLUME    (mm)=      76.65        32.37         63.365
     TOTAL RAINFALL   (mm)=      77.65        77.65         77.649
     RUNOFF COEFFICIENT   =        .99          .42           .816

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
006:0004--------------------------------------------------------------------------
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .45          .19
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     215.80        66.09
               over (min)        2.00        15.00
     Storage Coeff.  (min)=       1.76 (ii)   15.31 (ii)
     Unit Hyd. Tpeak (min)=       2.00        15.00
     Unit Hyd. peak  (cms)=        .60          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .26          .02           .261 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.55          1.251
     RUNOFF VOLUME    (mm)=      76.65        32.37         63.365
     TOTAL RAINFALL   (mm)=      77.65        77.65         77.649
     RUNOFF COEFFICIENT   =        .99          .42           .816

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

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006:0005-------------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     215.80        93.68
               over (min)        1.00         4.00
     Storage Coeff.  (min)=        .58 (ii)    4.21 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.40          .27
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .44          .14           .551 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.30          1.251
     RUNOFF VOLUME    (mm)=      76.65        32.37         54.509
     TOTAL RAINFALL   (mm)=      77.65        77.65         77.649
     RUNOFF COEFFICIENT   =        .99          .42           .702

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
006:0006-------------------------------------------------------------------------
------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201            7.04    2.821    1.25  63.36    .000
                     +ID2 02:202             .64     .261    1.25  63.36    .000
                     +ID3 03:203            1.47     .551    1.25  54.51    .000
                      ============================================================
                      SUM 04:IGD            9.15    3.633    1.25  61.94    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
006:0007-------------------------------------------------------------------------
----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )    |
| OUT<05:(SWMF  )    |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)    |    (cms)    (ha.m.)
                            .000  .0000E+00    |     .673  .6756E+00
                            .006  .1110E+00    |    1.521  .8381E+00
                            .026  .1933E+00    |    3.269  .1071E+01
                            .043  .3282E+00    |    7.270  .1264E+01
                            .225  .4716E+00    |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
```

```
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.15     3.633     1.251     61.942
     OUTFLOW<05: (SWMF  )       9.15      .220     2.234     61.938
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    6.063
                    TIME SHIFT OF PEAK FLOW         (min)=    59.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.4683E+00

--------------------------------------------------------------------------------
006:0008----------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.44
| 01:204    DT= 1.00 |   Total Imp(%)=   12.00   Dir. Conn.(%)=   12.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17          1.27
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n            =       .013          .250

     Max.eff.Inten.(mm/hr)=     215.80         69.58
               over (min)         1.00         13.00
     Storage Coeff.  (min)=        .74 (ii)    12.72 (ii)
     Unit Hyd. Tpeak (min)=       1.00         13.00
     Unit Hyd. peak  (cms)=       1.26           .09
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .10           .15          .177 (iii)
     TIME TO PEAK    (hrs)=       1.25          1.50         1.501
     RUNOFF VOLUME    (mm)=      76.65         32.37        37.683
     TOTAL RAINFALL   (mm)=      77.65         77.65        77.649
     RUNOFF COEFFICIENT   =        .99           .42          .485
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
006:0009----------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39           .17
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      90.00         90.00
```

```
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     215.80        66.09
               over (min)         2.00        15.00
     Storage Coeff.  (min)=       1.76 (ii)   15.31 (ii)
     Unit Hyd. Tpeak (min)=       2.00        15.00
     Unit Hyd. peak  (cms)=        .60          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .22          .02          .228 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.55         1.251
     RUNOFF VOLUME    (mm)=      76.65        32.37        63.365
     TOTAL RAINFALL   (mm)=      77.65        77.65        77.649
     RUNOFF COEFFICIENT   =        .99          .42          .816

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
006:0010----------------------------------------------------------------------------
--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
         .067       .133       .200
         .067       .161       .229
         .067       .189       .256

            NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                       (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .228  No_date    1:15     63.365    1     5.
   ========================================================================
   IDout= 04:INF         .41     .067  No_date    1:15     63.365    1     5.
   IDout= 07:IGD         .15     .160  No_date    1:15     63.365    1     0.
--------------------------------------------------------------------------------
006:0011----------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .420 (i)
     TIME TO PEAK    (hrs)=    1.351
     RUNOFF VOLUME    (mm)=   38.361
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .494
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

006:0012---

| CALIB NASHYD | Area (ha)= .85 Curve Number (CN)=82.00
| 08:207 DT= 1.00 | Ia (mm)= 8.400 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= .490

Unit Hyd Qpeak (cms)= .066

PEAK FLOW (cms)= .073 (i)
TIME TO PEAK (hrs)= 1.868
RUNOFF VOLUME (mm)= 38.361
TOTAL RAINFALL (mm)= 77.649
RUNOFF COEFFICIENT = .494

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

006:0013---

| CALIB NASHYD | Area (ha)= 3.33 Curve Number (CN)=82.00
| 09:208 DT= 1.00 | Ia (mm)= 8.400 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= .390

Unit Hyd Qpeak (cms)= .326

PEAK FLOW (cms)= .335 (i)
TIME TO PEAK (hrs)= 1.751
RUNOFF VOLUME (mm)= 38.361
TOTAL RAINFALL (mm)= 77.649
RUNOFF COEFFICIENT = .494

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

006:0014---

ADD HYD (IGMD)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1	01:204	1.44	.177	1.50	37.68	.000
+ID2	02:206	1.89	.420	1.35	38.36	.000
+ID3	05:SWMF	9.15	.220	2.23	61.94	.000
+ID4	07:IGD	.15	.160	1.25	63.36	.000
+ID5	08:207	.85	.073	1.87	38.36	.000
+ID6	09:208	3.33	.335	1.75	38.36	.000
SUM	03:IGMD	16.81	.857	1.50	51.36	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

006:0015---

006:0002---

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006:0002-------------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------------
  ** END OF RUN :   6

*************************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 007
    NSTORM=   1
           #  1=kitSC100.3h
-------------------------------------------------------------------------------------
007:0002-------------------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
-------------------------------------------------------------------------------------
007:0002-------------------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 100-year, 3 hour SCS Type II Storm, City
| Ptotal=  87.08 mm|    Comments: 100-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.700 |    .83  17.510 |   1.58  38.190 |   2.33   7.460
               .17   4.140 |    .92  24.100 |   1.67  28.840 |   2.42   6.680
               .25   4.680 |   1.00  35.700 |   1.75  22.650 |   2.50   6.020
               .33   5.340 |   1.08  59.350 |   1.83  18.330 |   2.58   5.470
               .42   6.180 |   1.17 121.590 |   1.92  15.190 |   2.67   4.990
               .50   7.260 |   1.25 239.354 |   2.00  12.830 |   2.75   4.580
               .58   8.690 |   1.33 137.520 |   2.08  11.000 |   2.83   4.220
               .67  10.630 |   1.42  80.540 |   2.17   9.560 |   2.92   3.910
               .75  13.390 |   1.50  53.350 |   2.25   8.410 |   3.00   3.630

-------------------------------------------------------------------------------------
007:0003-------------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
```

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.93         2.11
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35        84.57
               over (min)        2.00        13.00
     Storage Coeff.  (min)=       1.94 (ii)   13.38 (ii)
     Unit Hyd. Tpeak (min)=       2.00        13.00
     Unit Hyd. peak  (cms)=        .57          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       3.10          .31          3.176 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50          1.251
     RUNOFF VOLUME    (mm)=      86.08        39.26         72.036
     TOTAL RAINFALL   (mm)=      87.08        87.08         87.082
     RUNOFF COEFFICIENT   =        .99          .45           .827

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
007:0004----------------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .45          .19
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35        82.26
               over (min)        2.00        14.00
     Storage Coeff.  (min)=       1.69 (ii)   14.11 (ii)
     Unit Hyd. Tpeak (min)=       2.00        14.00
     Unit Hyd. peak  (cms)=        .62          .08
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .29          .03           .292 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.52          1.251
     RUNOFF VOLUME    (mm)=      86.08        39.26         72.036
     TOTAL RAINFALL   (mm)=      87.08        87.08         87.082
     RUNOFF COEFFICIENT   =        .99          .45           .827

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
007:0005----------------------------------------------------------------------------
```

```
---------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
---------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35       113.80
               over (min)        1.00         4.00
     Storage Coeff.  (min)=        .56 (ii)    3.92 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.42          .29
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .49          .18          .631 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.30         1.251
     RUNOFF VOLUME    (mm)=      86.08        39.26        62.671
     TOTAL RAINFALL   (mm)=      87.08        87.08        87.082
     RUNOFF COEFFICIENT   =        .99          .45          .720

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
007:0006----------------------------------------------------------------------
------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201           7.04    3.176    1.25  72.04    .000
                     +ID2 02:202            .64     .292    1.25  72.04    .000
                     +ID3 03:203           1.47     .631    1.25  62.67    .000
                      ============================================================
                      SUM 04:IGD           9.15    4.099    1.25  70.53    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
007:0007----------------------------------------------------------------------
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .673  .6756E+00
                           .006  .1110E+00   |    1.521  .8381E+00
                           .026  .1933E+00   |    3.269  .1071E+01
                           .043  .3282E+00   |    7.270  .1264E+01
                           .225  .4716E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
```

```
     INFLOW >04: (IGD   )       9.15     4.099     1.251     70.531
     OUTFLOW<05: (SWMF  )       9.15      .325     2.084     70.526
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    7.924
                  TIME SHIFT OF PEAK FLOW         (min)=    50.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.5173E+00

--------------------------------------------------------------------------------
007:0008----------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.44
| 01:204    DT= 1.00 |   Total Imp(%)=   12.00   Dir. Conn.(%)=   12.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17          1.27
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=     239.35         87.32
               over (min)         1.00         12.00
     Storage Coeff.  (min)=        .71 (ii)   11.65 (ii)
     Unit Hyd. Tpeak (min)=       1.00         12.00
     Unit Hyd. peak  (cms)=       1.28           .10
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .11           .20          .226 (iii)
     TIME TO PEAK    (hrs)=       1.25          1.48         1.418
     RUNOFF VOLUME    (mm)=      86.08         39.26        44.879
     TOTAL RAINFALL   (mm)=      87.08         87.08        87.082
     RUNOFF COEFFICIENT   =        .99           .45          .515
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
007:0009----------------------------------------------------------------------
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39           .17
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      90.00         90.00
     Mannings n           =       .013          .250
```

```
     Max.eff.Inten.(mm/hr)=     239.35        82.26
               over (min)        2.00        14.00
     Storage Coeff.  (min)=       1.69 (ii)   14.11 (ii)
     Unit Hyd. Tpeak (min)=       2.00        14.00
     Unit Hyd. peak  (cms)=        .62          .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .25          .02          .256 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.52         1.251
     RUNOFF VOLUME    (mm)=      86.08        39.26        72.036
     TOTAL RAINFALL   (mm)=      87.08        87.08        87.082
     RUNOFF COEFFICIENT   =        .99          .45          .827

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
007:0010----------------------------------------------------------------------------
--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
         .067       .133       .200
         .067       .161       .229
         .067       .189       .256

            NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                       (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .256  No_date    1:15     72.036    1     5.
   ========================================================================
   IDout= 04:INF         .39     .067  No_date    1:15     72.036    1     5.
   IDout= 07:IGD         .17     .189  No_date    1:15     72.036    1     0.
--------------------------------------------------------------------------------
007:0011----------------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .507 (i)
     TIME TO PEAK    (hrs)=    1.351
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529
```

```
     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
007:0012----------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .088 (i)
     TIME TO PEAK    (hrs)=    1.868
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
007:0013----------------------------------------------------------------------
----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .406 (i)
     TIME TO PEAK    (hrs)=    1.751
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
007:0014----------------------------------------------------------------------
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204            1.44     .226    1.42  44.88    .000
                     +ID2 02:206            1.89     .507    1.35  46.05    .000
                     +ID3 05:SWMF           9.15     .325    2.08  70.53    .000
                     +ID4 07:IGD             .17     .189    1.25  72.04    .000
                     +ID5 08:207             .85     .088    1.87  46.05    .000
                     +ID6 09:208            3.33     .406    1.75  46.05    .000
                      ============================================================
                      SUM 03:IGMD          16.83    1.101    1.50  59.52    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
007:0015----------------------------------------------------------------------
--------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
```

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--------------------------------------------------------------------------------
007:0002--------------------------------------------------------------------------
--------------------------------------------------------------------------------
007:0002--------------------------------------------------------------------------
--------------------------------------------------------------------------------
007:0002--------------------------------------------------------------------------
--------------------------------------------------------------------------------
007:0002--------------------------------------------------------------------------
      FINISH
--------------------------------------------------------------------------------
********************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
 001:0008 CALIB STANDHYD
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
   Simulation ended on 2023-02-16     at 11:11:37
================================================================================
```

SWMF2

```
================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                        9   9  9   9   # 3053466
        StormWater Management HYdrologic Model           999    999    =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ********************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                  OTTHYMO-83 and OTTHYMO-89.                  *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.           *********
 *********                   Ottawa,  Ontario: (613) 836-3884           *********
 *********                   Gatineau, Quebec: (819) 243-6858           *********
 *********                   E-Mail: swmhymo@jfsa.Com                   *********
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: MTE Consultants Inc.                          +++++++++
 +++++++++                Burlington           SERIAL#:3053466        +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ********************************************************************************


 **********************   D E T A I L E D   O U T P U T   **********************
 ********************************************************************************
 *         DATE: 2023-01-30     TIME: 13:25:58     RUN COUNTER: 000008         *
 ********************************************************************************
 * Input   filename: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\pr3hr.dat           *
 * Output  filename: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\pr3hr.out           *
 * Summary filename: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\pr3hr.sum           *
 * User comments:                                                              *
 * 1:_____________________________________________________________________________*
 * 2:_____________________________________________________________________________*
 * 3:_____________________________________________________________________________*
 ********************************************************************************

--------------------------------------------------------------------------------
-
001:0001---------------------------------------------------------------------
```

```
-
*#************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=25mm.4hr
-------------------------------------------------------------------------------
-
001:0002---------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 25-mm, 4 hour Chicago Storm, (a=508.5, b
| Ptotal=  25.00 mm|    Comments: 25-mm, 4 hour Chicago Storm, (a=508.5, b
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   1.410 |   1.08   3.570 |   2.08   6.620 |   3.08   2.160
               .17   1.480 |   1.17   4.160 |   2.17   5.580 |   3.17   2.050
               .25   1.560 |   1.25   5.010 |   2.25   4.840 |   3.25   1.960
               .33   1.640 |   1.33   6.350 |   2.33   4.270 |   3.33   1.870
               .42   1.740 |   1.42   8.730 |   2.42   3.830 |   3.42   1.790
               .50   1.850 |   1.50  14.060 |   2.50   3.480 |   3.50   1.720
               .58   1.980 |   1.58  35.190 |   2.58   3.190 |   3.58   1.660
               .67   2.130 |   1.67  71.896 |   2.67   2.950 |   3.67   1.600
               .75   2.310 |   1.75  26.870 |   2.75   2.740 |   3.75   1.540
               .83   2.530 |   1.83  15.350 |   2.83   2.570 |   3.83   1.490
               .92   2.790 |   1.92  10.660 |   2.92   2.410 |   3.92   1.440
              1.00   3.130 |   2.00   8.160 |   3.00   2.280 |   4.00   1.400

-------------------------------------------------------------------------------
-
001:0003---------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.27
| 01:209    DT= 1.00 |   Total Imp(%)=   68.00   Dir. Conn.(%)=   68.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.02         4.25
```

```
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         9.45
               over (min)         3.00        31.00
     Storage Coeff.  (min)=       3.14 (ii)   30.62 (ii)
     Unit Hyd. Tpeak (min)=       3.00        31.00
     Unit Hyd. peak  (cms)=        .36          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.49          .02          1.495 (iii)
     TIME TO PEAK    (hrs)=       1.68         2.33          1.683
     RUNOFF VOLUME    (mm)=      24.00         2.97         17.271
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .96          .12           .691

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0004--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .033 (i)
     TIME TO PEAK    (hrs)=    2.167
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.00
| 03:211    DT= 1.00 |   Total Imp(%)=   55.00   Dir. Conn.(%)=   55.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=       1.10          .90
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         4.69
               over (min)        1.00        13.00
     Storage Coeff.  (min)=        .90 (ii)   12.93 (ii)
     Unit Hyd. Tpeak (min)=       1.00        13.00
     Unit Hyd. peak  (cms)=       1.14          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .22          .01          .220 (iii)
     TIME TO PEAK    (hrs)=       1.67         1.95         1.667
     RUNOFF VOLUME    (mm)=      24.00         2.97        14.538
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .12          .582

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0006--------------------------------------------------------------------------
-
-------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209           13.27    1.495    1.68  17.27    .000

                     +ID2 02:210            4.17     .033    2.17   3.81    .000

                     +ID3 03:211            2.00     .220    1.67  14.54    .000

                      ============================================================
                      SUM 04:WEL           19.44    1.711    1.67  14.10    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
-
001:0007--------------------------------------------------------------------------
-
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
```

```
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .542  .8024E+00
                           .007  .5180E-01   |    1.159  .1055E+01
                           .014  .1172E+00   |    2.093  .1318E+01
                           .122  .3284E+00   |    3.243  .1591E+01
                           .176  .4043E+00   |    4.570  .1878E+01
                           .380  .6398E+00   |    8.371  .2186E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.44     1.711     1.667     14.102
     OUTFLOW<05: (SWMF  )      19.44      .067     3.617     14.102
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    3.892
                   TIME SHIFT OF PEAK FLOW         (min)=   117.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2209E+00

------------------------------------------------------------------------------
-
001:0008---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .009 (i)
     TIME TO PEAK    (hrs)=    1.967
     RUNOFF VOLUME    (mm)=    2.246
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0009---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390
```

```
     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .004 (i)
     TIME TO PEAK    (hrs)=    2.267
     RUNOFF VOLUME    (mm)=    2.245
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0010---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .002 (i)
     TIME TO PEAK    (hrs)=    1.917
     RUNOFF VOLUME    (mm)=    2.245
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0011---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.16   Curve Number   (CN)=70.00
| 02:215    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .680

     Unit Hyd Qpeak  (cms)=     .065

     PEAK FLOW       (cms)=     .003 (i)
     TIME TO PEAK    (hrs)=    2.717
     RUNOFF VOLUME    (mm)=    2.245
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
```

```
001:0012-------------------------------------------------------------------------
-
------------------------
| ADD HYD (CN        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:214           .27     .002    1.92   2.24    .000

                      +ID2 02:215           1.16     .003    2.72   2.25    .000

                      +ID3 05:SWMF         19.44     .067    3.62  14.10    .000

                      +ID4 07:212           1.56     .009    1.97   2.25    .000

                      +ID5 08:213           1.00     .004    2.27   2.25    .000

                       ============================================================
                       SUM 09:CN           23.43     .074    3.02  12.08    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
-
001:0013-------------------------------------------------------------------------
-
  ** END OF RUN :   1

*******************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=kitSCS2.3h
-------------------------------------------------------------------------------
-
002:0002-------------------------------------------------------------------------
-
*#**************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
```

```
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#**************************************************************************
------------------------------------------------------------------------------
-
002:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 2-year, 3 hour SCS Type II Storm, City o
| Ptotal=  34.28 mm|    Comments: 2-year, 3 hour SCS Type II Storm, City o
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.680 |    .83   7.040 |   1.58  12.520 |   2.33   4.070
               .17   2.860 |    .92   8.810 |   1.67  10.060 |   2.42   3.800
               .25   3.070 |   1.00  11.860 |   1.75   8.430 |   2.50   3.570
               .33   3.330 |   1.08  18.310 |   1.83   7.270 |   2.58   3.370
               .42   3.630 |   1.17  39.760 |   1.92   6.400 |   2.67   3.190
               .50   4.000 |   1.25 109.401 |   2.00   5.720 |   2.75   3.030
               .58   4.470 |   1.33  45.910 |   2.08   5.180 |   2.83   2.890
               .67   5.070 |   1.42  24.590 |   2.17   4.750 |   2.92   2.760
               .75   5.880 |   1.50  16.600 |   2.25   4.380 |   3.00   2.650

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002:0003--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.27
| 01:209    DT= 1.00 |   Total Imp(%)=   68.00   Dir. Conn.(%)=   68.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.02         4.25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40         7.80
               over (min)         3.00        32.00
     Storage Coeff.  (min)=       2.65 (ii)   32.34 (ii)
     Unit Hyd. Tpeak (min)=       3.00        32.00
     Unit Hyd. peak  (cms)=        .41          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.31          .05         2.309 (iii)
     TIME TO PEAK    (hrs)=       1.27         1.90         1.268
     RUNOFF VOLUME    (mm)=      33.28         6.48        24.702
     TOTAL RAINFALL   (mm)=      34.28        34.28        34.276
     RUNOFF COEFFICIENT   =        .97          .19          .721

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
          CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
002:0004--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .084 (i)
     TIME TO PEAK    (hrs)=    1.718
     RUNOFF VOLUME    (mm)=    8.202
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .239

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
002:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.00
| 03:211    DT= 1.00 |   Total Imp(%)=   55.00   Dir. Conn.(%)=   55.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.10          .90
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40        14.89
               over (min)        1.00         8.00
     Storage Coeff.  (min)=        .76 (ii)    8.34 (ii)
     Unit Hyd. Tpeak (min)=       1.00         8.00
     Unit Hyd. peak  (cms)=       1.24          .14
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .33          .02          .340 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.42         1.251
     RUNOFF VOLUME    (mm)=      33.28         6.48        21.219
     TOTAL RAINFALL   (mm)=      34.28        34.28        34.276
     RUNOFF COEFFICIENT   =        .97          .19          .619
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
002:0006--------------------------------------------------------------------
-
------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209           13.27    2.309    1.27  24.70    .000

                     +ID2 02:210            4.17     .084    1.72   8.20    .000

                     +ID3 03:211            2.00     .340    1.25  21.22    .000

                      ============================================================
                      SUM 04:WEL           19.44    2.637    1.25  20.80    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
-
002:0007--------------------------------------------------------------------
-
----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>04:(WEL    )   |
| OUT<05:(SWMF   )   |    =========  OUTLFOW STORAGE TABLE  =========
----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
                             .000  .0000E+00   |     .542  .8024E+00
                             .007  .5180E-01   |    1.159  .1055E+01
                             .014  .1172E+00   |    2.093  .1318E+01
                             .122  .3284E+00   |    3.243  .1591E+01
                             .176  .4043E+00   |    4.570  .1878E+01
                             .380  .6398E+00   |    8.371  .2186E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.44     2.637     1.251     20.805
     OUTFLOW<05: (SWMF  )      19.44      .121     3.001     20.804
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
```

```
                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.585
                    TIME SHIFT OF PEAK FLOW        (min)=   105.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3273E+00

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-
002:0008----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .025 (i)
     TIME TO PEAK    (hrs)=    1.534
     RUNOFF VOLUME    (mm)=    5.039
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .147

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
002:0009----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .011 (i)
     TIME TO PEAK    (hrs)=    1.818
     RUNOFF VOLUME    (mm)=    5.039
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .147

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0010----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
```

```
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .005 (i)
     TIME TO PEAK    (hrs)=    1.484
     RUNOFF VOLUME    (mm)=    5.038
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .147

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
002:0011----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.16   Curve Number   (CN)=70.00
| 02:215    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .680

     Unit Hyd Qpeak  (cms)=     .065

     PEAK FLOW       (cms)=     .009 (i)
     TIME TO PEAK    (hrs)=    2.234
     RUNOFF VOLUME    (mm)=    5.039
     TOTAL RAINFALL   (mm)=   34.276
     RUNOFF COEFFICIENT   =     .147

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
002:0012----------------------------------------------------------------------
-
------------------------
| ADD HYD (CN        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:214            .27     .005    1.48   5.04    .000

                     +ID2 02:215           1.16     .009    2.23   5.04    .000

                     +ID3 05:SWMF         19.44     .121    3.00  20.80    .000

                     +ID4 07:212           1.56     .025    1.53   5.04    .000

                     +ID5 08:213           1.00     .011    1.82   5.04    .000

                      ============================================================
                      SUM 09:CN            23.43     .141    2.22  18.12    .000
```

```
   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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002:0013--------------------------------------------------------------------------
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002:0002--------------------------------------------------------------------------
-
  ** END OF RUN :   2

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 003
    NSTORM=   1
           #  1=kitSCS5.3h
--------------------------------------------------------------------------------
-
003:0002--------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
-
003:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 5-year, 3 hour SCS Type II Storm, City o
| Ptotal=  47.26 mm|    Comments: 5-year, 3 hour SCS Type II Storm, City o
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.810 |    .83   9.480 |   1.58  18.860 |   2.33   4.770
```

```
              .17   3.060 |    .92  12.460 |   1.67  14.610 |   2.42   4.380
              .25   3.350 |   1.00  17.720 |   1.75  11.810 |   2.50   4.050
              .33   3.700 |   1.08  28.800 |   1.83   9.860 |   2.58   3.770
              .42   4.130 |   1.17  61.690 |   1.92   8.420 |   2.67   3.520
              .50   4.670 |   1.25 139.288 |   2.00   7.330 |   2.75   3.300
              .58   5.370 |   1.33  70.600 |   2.08   6.480 |   2.83   3.100
              .67   6.300 |   1.42  39.220 |   2.17   5.800 |   2.92   2.930
              .75   7.590 |   1.50  25.910 |   2.25   5.240 |   3.00   2.780

-------------------------------------------------------------------------------
-
003:0003---------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.27
| 01:209    DT= 1.00 |   Total Imp(%)=   68.00   Dir. Conn.(%)=   68.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.02         4.25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        20.27
               over (min)        2.00        23.00
     Storage Coeff.  (min)=       2.41 (ii)   22.66 (ii)
     Unit Hyd. Tpeak (min)=       2.00        23.00
     Unit Hyd. peak  (cms)=        .49          .05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       3.16          .14          3.168 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.70          1.251
     RUNOFF VOLUME    (mm)=      46.26        12.90         35.588
     TOTAL RAINFALL   (mm)=      47.26        47.26         47.263
     RUNOFF COEFFICIENT   =        .98          .27           .753

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
003:0004---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330
```

```
     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .182 (i)
     TIME TO PEAK    (hrs)=    1.701
     RUNOFF VOLUME    (mm)=   15.962
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0005---------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.00
| 03:211    DT= 1.00 |   Total Imp(%)=   55.00   Dir. Conn.(%)=   55.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.10          .90
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        32.42
               over (min)        1.00         6.00
     Storage Coeff.  (min)=        .69 (ii)    6.24 (ii)
     Unit Hyd. Tpeak (min)=       1.00         6.00
     Unit Hyd. peak  (cms)=       1.30          .18
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .43          .06          .452 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.37         1.251
     RUNOFF VOLUME    (mm)=      46.26        12.90        31.251
     TOTAL RAINFALL   (mm)=      47.26        47.26        47.263
     RUNOFF COEFFICIENT   =        .98          .27          .661

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
003:0006---------------------------------------------------------------------
-
------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209          13.27    3.168    1.25  35.59    .000
```

```
                  +ID2 02:210            4.17     .182    1.70  15.96    .000

                  +ID3 03:211            2.00     .452    1.25  31.25    .000

                   ============================================================
                   SUM 04:WEL           19.44    3.632    1.25  30.93    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
003:0007---------------------------------------------------------------------------
-
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .542  .8024E+00
                            .007  .5180E-01   |    1.159  .1055E+01
                            .014  .1172E+00   |    2.093  .1318E+01
                            .122  .3284E+00   |    3.243  .1591E+01
                            .176  .4043E+00   |    4.570  .1878E+01
                            .380  .6398E+00   |    8.371  .2186E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.44     3.632     1.251     30.932
     OUTFLOW<05: (SWMF  )      19.44      .233     2.518     30.931
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    6.421
                   TIME SHIFT OF PEAK FLOW         (min)=    76.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.4701E+00

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-
003:0008---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200
```

```
     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .058 (i)
     TIME TO PEAK    (hrs)=    1.534
     RUNOFF VOLUME    (mm)=   10.316
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .218

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
003:0009---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .025 (i)
     TIME TO PEAK    (hrs)=    1.784
     RUNOFF VOLUME    (mm)=   10.316
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .218

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
003:0010---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .011 (i)
     TIME TO PEAK    (hrs)=    1.468
     RUNOFF VOLUME    (mm)=   10.315
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .218

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
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003:0011-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.16   Curve Number   (CN)=70.00
| 02:215    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .680

     Unit Hyd Qpeak  (cms)=     .065

     PEAK FLOW       (cms)=     .020 (i)
     TIME TO PEAK    (hrs)=    2.168
     RUNOFF VOLUME    (mm)=   10.316
     TOTAL RAINFALL   (mm)=   47.263
     RUNOFF COEFFICIENT   =     .218

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
003:0012-------------------------------------------------------------------------
-
-------------------------
| ADD HYD (CN        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:214            .27     .011    1.47  10.31    .000

                     +ID2 02:215           1.16     .020    2.17  10.32    .000

                     +ID3 05:SWMF         19.44     .233    2.52  30.93    .000

                     +ID4 07:212           1.56     .058    1.53  10.32    .000

                     +ID5 08:213           1.00     .025    1.78  10.32    .000

                      ============================================================
                      SUM 09:CN            23.43     .285    2.03  27.42    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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003:0013-------------------------------------------------------------------------
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003:0002-------------------------------------------------------------------------
-
-------------------------------------------------------------------------------
-
003:0002-------------------------------------------------------------------------
```

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-
  ** END OF RUN :   3

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\
--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 004
    NSTORM=   1
           #  1=kitSCS10.3h
--------------------------------------------------------------------------------
-
004:0002----------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
-
004:0002----------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 10-year, 3 hour SCS Type II Storm, City
| Ptotal=  56.29 mm|    Comments: 10-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.910 |    .83  10.890 |   1.58  22.590 |   2.33   5.190
               .17   3.190 |    .92  14.590 |   1.67  17.260 |   2.42   4.730
               .25   3.530 |   1.00  21.160 |   1.75  13.770 |   2.50   4.340
               .33   3.930 |   1.08  35.090 |   1.83  11.350 |   2.58   4.000
               .42   4.430 |   1.17  76.090 |   1.92   9.590 |   2.67   3.720
               .50   5.070 |   1.25 169.551 |   2.00   8.260 |   2.75   3.460
               .58   5.900 |   1.33  87.120 |   2.08   7.230 |   2.83   3.240
               .67   7.010 |   1.42  48.190 |   2.17   6.400 |   2.92   3.050
               .75   8.580 |   1.50  31.460 |   2.25   5.740 |   3.00   2.870

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004:0003--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.27
| 01:209    DT= 1.00 |   Total Imp(%)=   68.00   Dir. Conn.(%)=   68.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.02         4.25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        33.04
               over (min)         2.00        19.00
     Storage Coeff.  (min)=       2.23 (ii)   18.89 (ii)
     Unit Hyd. Tpeak (min)=       2.00        19.00
     Unit Hyd. peak  (cms)=        .52          .06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       3.90          .23         3.929 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.62         1.251
     RUNOFF VOLUME    (mm)=      55.29        18.15        43.404
     TOTAL RAINFALL   (mm)=      56.29        56.29        56.290
     RUNOFF COEFFICIENT   =        .98          .32          .771

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
004:0004--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .264 (i)
     TIME TO PEAK    (hrs)=    1.684
     RUNOFF VOLUME    (mm)=   22.128
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .393

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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004:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.00
| 03:211    DT= 1.00 |   Total Imp(%)=   55.00   Dir. Conn.(%)=   55.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.10          .90
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        50.89
               over (min)        1.00         5.00
     Storage Coeff.  (min)=        .64 (ii)    5.27 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.34          .22
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .52          .09          .573 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.35         1.251
     RUNOFF VOLUME    (mm)=      55.29        18.15        38.576
     TOTAL RAINFALL   (mm)=      56.29        56.29        56.290
     RUNOFF COEFFICIENT   =        .98          .32          .685

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0006--------------------------------------------------------------------------
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------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209          13.27    3.929    1.25  43.40    .000

                     +ID2 02:210           4.17     .264    1.68  22.13    .000

                     +ID3 03:211           2.00     .573    1.25  38.58    .000

                      ============================================================
                      SUM 04:WEL          19.44    4.525    1.25  38.34    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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004:0007--------------------------------------------------------------------------
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---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .542  .8024E+00
                            .007  .5180E-01   |    1.159  .1055E+01
                            .014  .1172E+00   |    2.093  .1318E+01
                            .122  .3284E+00   |    3.243  .1591E+01
                            .176  .4043E+00   |    4.570  .1878E+01
                            .380  .6398E+00   |    8.371  .2186E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.44     4.525     1.251     38.344
     OUTFLOW<05: (SWMF  )      19.44      .324     2.384     38.342
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    7.153
                   TIME SHIFT OF PEAK FLOW        (min)=    68.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.5749E+00

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004:0008--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .087 (i)
     TIME TO PEAK    (hrs)=    1.518
     RUNOFF VOLUME    (mm)=   14.735
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .262

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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004:0009--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .037 (i)
     TIME TO PEAK    (hrs)=    1.768
     RUNOFF VOLUME    (mm)=   14.735
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .262

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0010--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .017 (i)
     TIME TO PEAK    (hrs)=    1.468
     RUNOFF VOLUME    (mm)=   14.734
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .262

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0011--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    1.16   Curve Number   (CN)=70.00
| 02:215    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .680

     Unit Hyd Qpeak  (cms)=     .065

     PEAK FLOW       (cms)=     .029 (i)
```

```
     TIME TO PEAK    (hrs)=    2.134
     RUNOFF VOLUME    (mm)=   14.735
     TOTAL RAINFALL   (mm)=   56.290
     RUNOFF COEFFICIENT   =     .262

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0012---------------------------------------------------------------------
-
------------------------
| ADD HYD (CN        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:214            .27     .017    1.47  14.73    .000

                     +ID2 02:215           1.16     .029    2.13  14.73    .000

                     +ID3 05:SWMF         19.44     .324    2.38  38.34    .000

                     +ID4 07:212           1.56     .087    1.52  14.74    .000

                     +ID5 08:213           1.00     .037    1.77  14.73    .000

                      ============================================================
                      SUM 09:CN            23.43     .410    1.88  34.32    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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004:0013---------------------------------------------------------------------
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004:0002---------------------------------------------------------------------
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004:0002---------------------------------------------------------------------
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004:0002---------------------------------------------------------------------
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  ** END OF RUN :   4

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=kitSCS25.3h
--------------------------------------------------------------------------------
-
005:0002----------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
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005:0002----------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 25-year, 3 hour SCS Type II Storm, City
| Ptotal=  68.27 mm|    Comments: 25-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.260 |    .83  13.680 |   1.58  29.070 |   2.33   6.170
               .17   3.610 |    .92  18.580 |   1.67  22.100 |   2.42   5.570
               .25   4.030 |   1.00  27.210 |   1.75  17.500 |   2.50   5.070
               .33   4.540 |   1.08  45.020 |   1.83  14.300 |   2.58   4.640
               .42   5.190 |   1.17  93.660 |   1.92  11.960 |   2.67   4.270
               .50   6.010 |   1.25 191.557 |   2.00  10.200 |   2.75   3.950
               .58   7.090 |   1.33 106.330 |   2.08   8.840 |   2.83   3.670
               .67   8.560 |   1.42  61.230 |   2.17   7.760 |   2.92   3.420
               .75  10.620 |   1.50  40.460 |   2.25   6.880 |   3.00   3.210

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-
005:0003----------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.27
| 01:209    DT= 1.00 |   Total Imp(%)=   68.00   Dir. Conn.(%)=   68.00
```

```
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.02         4.25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56        50.68
               over (min)         2.00        16.00
     Storage Coeff.  (min)=       2.12 (ii)   16.16 (ii)
     Unit Hyd. Tpeak (min)=       2.00        16.00
     Unit Hyd. peak  (cms)=        .54          .07
                                                        *TOTALS*
     PEAK FLOW       (cms)=       4.47          .36          4.531 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.57          1.251
     RUNOFF VOLUME    (mm)=      67.27        25.86         54.016
     TOTAL RAINFALL   (mm)=      68.27        68.27         68.268
     RUNOFF COEFFICIENT   =        .99          .38           .791

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0004---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .374 (i)
     TIME TO PEAK    (hrs)=    1.684
     RUNOFF VOLUME    (mm)=   30.999
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .454

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0005---------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.00
```

```
| 03:211    DT= 1.00 |   Total Imp(%)=   55.00   Dir. Conn.(%)=   55.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.10          .90
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56        70.26
               over (min)         1.00         5.00
     Storage Coeff.  (min)=        .61 (ii)    4.68 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.37          .24
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .59          .13          .672 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.33         1.251
     RUNOFF VOLUME    (mm)=      67.27        25.86        48.633
     TOTAL RAINFALL   (mm)=      68.27        68.27        68.268
     RUNOFF COEFFICIENT   =        .99          .38          .712

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0006---------------------------------------------------------------------
-
------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209          13.27    4.531    1.25  54.02    .000

                     +ID2 02:210           4.17     .374    1.68  31.00    .000

                     +ID3 03:211           2.00     .672    1.25  48.63    .000

                      ============================================================
                      SUM 04:WEL          19.44    5.245    1.25  48.52    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
005:0007---------------------------------------------------------------------
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```
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .542  .8024E+00
                           .007  .5180E-01   |    1.159  .1055E+01
                           .014  .1172E+00   |    2.093  .1318E+01
                           .122  .3284E+00   |    3.243  .1591E+01
                           .176  .4043E+00   |    4.570  .1878E+01
                           .380  .6398E+00   |    8.371  .2186E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.44     5.245     1.251     48.525
     OUTFLOW<05: (SWMF  )      19.44      .456     2.301     48.523
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    8.693
                   TIME SHIFT OF PEAK FLOW         (min)=    63.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.7162E+00

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-
005:0008----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .126 (i)
     TIME TO PEAK    (hrs)=    1.518
     RUNOFF VOLUME    (mm)=   21.360
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .313

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0009----------------------------------------------------------------------
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```
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .054 (i)
     TIME TO PEAK    (hrs)=    1.768
     RUNOFF VOLUME    (mm)=   21.359
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .313

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0010--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .025 (i)
     TIME TO PEAK    (hrs)=    1.468
     RUNOFF VOLUME    (mm)=   21.359
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .313

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0011--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    1.16   Curve Number   (CN)=70.00
| 02:215    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .680

     Unit Hyd Qpeak  (cms)=     .065

     PEAK FLOW       (cms)=     .042 (i)
     TIME TO PEAK    (hrs)=    2.134
     RUNOFF VOLUME    (mm)=   21.359
     TOTAL RAINFALL   (mm)=   68.268
     RUNOFF COEFFICIENT   =     .313

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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005:0012--------------------------------------------------------------------------
-
------------------------
| ADD HYD (CN        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:214            .27     .025    1.47  21.36    .000

                     +ID2 02:215            1.16     .042    2.13  21.36    .000

                     +ID3 05:SWMF          19.44     .456    2.30  48.52    .000

                     +ID4 07:212            1.56     .126    1.52  21.36    .000

                     +ID5 08:213            1.00     .054    1.77  21.36    .000

                      ============================================================
                      SUM 09:CN             23.43     .587    1.88  43.90    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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005:0013--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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  ** END OF RUN :   5

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 006
    NSTORM=   1
           #  1=kitSCS50.3h
--------------------------------------------------------------------------------
-
006:0002---------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
-
006:0002---------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 50-year, 3 hour SCS Type II Storm, City
| Ptotal=  77.65 mm|    Comments: 50-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.490 |    .83  15.570 |   1.58  33.550 |   2.33   6.820
               .17   3.880 |    .92  21.290 |   1.67  25.420 |   2.42   6.130
               .25   4.360 |   1.00  31.380 |   1.75  20.040 |   2.50   5.550
               .33   4.950 |   1.08  52.080 |   1.83  16.280 |   2.58   5.060
               .42   5.690 |   1.17 107.590 |   1.92  13.550 |   2.67   4.640
               .50   6.640 |   1.25 215.802 |   2.00  11.500 |   2.75   4.270
               .58   7.890 |   1.33 121.920 |   2.08   9.910 |   2.83   3.950
               .67   9.590 |   1.42  70.790 |   2.17   8.660 |   2.92   3.670
               .75  11.990 |   1.50  46.810 |   2.25   7.640 |   3.00   3.430

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006:0003---------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.27
| 01:209    DT= 1.00 |   Total Imp(%)=   68.00   Dir. Conn.(%)=   68.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=       9.02         4.25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     215.80        66.09
               over (min)         2.00        15.00
     Storage Coeff.  (min)=       2.02 (ii)   14.65 (ii)
     Unit Hyd. Tpeak (min)=       2.00        15.00
     Unit Hyd. peak  (cms)=        .55          .08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       5.08          .48          5.174 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.53          1.251
     RUNOFF VOLUME    (mm)=      76.65        32.37         62.479
     TOTAL RAINFALL   (mm)=      77.65        77.65         77.649
     RUNOFF COEFFICIENT   =        .99          .42           .805

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0004--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .469 (i)
     TIME TO PEAK    (hrs)=    1.668
     RUNOFF VOLUME    (mm)=   38.361
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .494

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.00
| 03:211    DT= 1.00 |   Total Imp(%)=   55.00   Dir. Conn.(%)=   55.00
----------------------
```

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.10          .90
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     215.80        93.68
               over (min)         1.00         4.00
     Storage Coeff.  (min)=        .58 (ii)    4.21 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.40          .27
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .66          .17          .795 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.30         1.251
     RUNOFF VOLUME    (mm)=      76.65        32.37        56.723
     TOTAL RAINFALL   (mm)=      77.65        77.65        77.649
     RUNOFF COEFFICIENT   =        .99          .42          .731

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0006--------------------------------------------------------------------------
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-------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:209          13.27    5.174    1.25  62.48    .000

                      +ID2 02:210           4.17     .469    1.67  38.36    .000

                      +ID3 03:211           2.00     .795    1.25  56.72    .000

                       ============================================================
                       SUM 04:WEL          19.44    6.028    1.25  56.71    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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006:0007--------------------------------------------------------------------------
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----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>04:(WEL    )   |
```

```
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .542  .8024E+00
                           .007  .5180E-01   |    1.159  .1055E+01
                           .014  .1172E+00   |    2.093  .1318E+01
                           .122  .3284E+00   |    3.243  .1591E+01
                           .176  .4043E+00   |    4.570  .1878E+01
                           .380  .6398E+00   |    8.371  .2186E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.44     6.028     1.251     56.714
     OUTFLOW<05: (SWMF  )      19.44      .600     2.234     56.712
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    9.952
                    TIME SHIFT OF PEAK FLOW         (min)=    59.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.8262E+00

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006:0008-------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .162 (i)
     TIME TO PEAK    (hrs)=    1.518
     RUNOFF VOLUME    (mm)=   27.050
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .348

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
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006:0009-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
```

```
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .069 (i)
     TIME TO PEAK    (hrs)=    1.768
     RUNOFF VOLUME    (mm)=   27.049
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .348

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0010--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .032 (i)
     TIME TO PEAK    (hrs)=    1.468
     RUNOFF VOLUME    (mm)=   27.049
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .348

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0011--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    1.16   Curve Number   (CN)=70.00
| 02:215    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .680

     Unit Hyd Qpeak  (cms)=     .065

     PEAK FLOW       (cms)=     .054 (i)
     TIME TO PEAK    (hrs)=    2.118
     RUNOFF VOLUME    (mm)=   27.049
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .348

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0012-------------------------------------------------------------------------
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------------------------
| ADD HYD (CN        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:214            .27     .032    1.47  27.05    .000

                     +ID2 02:215            1.16     .054    2.12  27.05    .000

                     +ID3 05:SWMF          19.44     .600    2.23  56.71    .000

                     +ID4 07:212            1.56     .162    1.52  27.05    .000

                     +ID5 08:213            1.00     .069    1.77  27.05    .000

                      ============================================================
                      SUM 09:CN             23.43     .754    2.05  51.66    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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006:0013-------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
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  ** END OF RUN :   6

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 007
    NSTORM=   1
           #  1=kitSC100.3h
--------------------------------------------------------------------------------
-
007:0002----------------------------------------------------------------------------
-
*#**************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#**************************************************************************
--------------------------------------------------------------------------------
-
007:0002----------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 100-year, 3 hour SCS Type II Storm, City
| Ptotal=  87.08 mm|    Comments: 100-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.700 |    .83  17.510 |   1.58  38.190 |   2.33   7.460
               .17   4.140 |    .92  24.100 |   1.67  28.840 |   2.42   6.680
               .25   4.680 |   1.00  35.700 |   1.75  22.650 |   2.50   6.020
               .33   5.340 |   1.08  59.350 |   1.83  18.330 |   2.58   5.470
               .42   6.180 |   1.17 121.590 |   1.92  15.190 |   2.67   4.990
               .50   7.260 |   1.25 239.354 |   2.00  12.830 |   2.75   4.580
               .58   8.690 |   1.33 137.520 |   2.08  11.000 |   2.83   4.220
               .67  10.630 |   1.42  80.540 |   2.17   9.560 |   2.92   3.910
               .75  13.390 |   1.50  53.350 |   2.25   8.410 |   3.00   3.630

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007:0003----------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.27
| 01:209    DT= 1.00 |   Total Imp(%)=   68.00   Dir. Conn.(%)=   68.00
```

```
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.02         4.25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35        84.57
               over (min)         2.00        13.00
     Storage Coeff.  (min)=       1.94 (ii)   13.38 (ii)
     Unit Hyd. Tpeak (min)=       2.00        13.00
     Unit Hyd. peak  (cms)=        .57          .09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       5.67          .62          5.829 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50          1.251
     RUNOFF VOLUME    (mm)=      86.08        39.26         71.099
     TOTAL RAINFALL   (mm)=      87.08        87.08         87.082
     RUNOFF COEFFICIENT   =        .99          .45           .816

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
007:0004---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .569 (i)
     TIME TO PEAK    (hrs)=    1.668
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0005---------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.00
```

```
| 03:211    DT= 1.00 |   Total Imp(%)=   55.00   Dir. Conn.(%)=   55.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.10          .90
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35       113.80
               over (min)         1.00         4.00
     Storage Coeff.  (min)=        .56 (ii)    3.92 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.42          .29
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .73          .22          .905 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.30         1.251
     RUNOFF VOLUME    (mm)=      86.08        39.26        65.012
     TOTAL RAINFALL   (mm)=      87.08        87.08        87.082
     RUNOFF COEFFICIENT   =        .99          .45          .747

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
007:0006----------------------------------------------------------------------
-
-------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209          13.27    5.829    1.25  71.10    .000

                     +ID2 02:210           4.17     .569    1.67  46.05    .000

                     +ID3 03:211           2.00     .905    1.25  65.01    .000

                      ============================================================
                      SUM 04:WEL          19.44    6.813    1.25  65.10    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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007:0007----------------------------------------------------------------------
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```
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .542  .8024E+00
                           .007  .5180E-01   |    1.159  .1055E+01
                           .014  .1172E+00   |    2.093  .1318E+01
                           .122  .3284E+00   |    3.243  .1591E+01
                           .176  .4043E+00   |    4.570  .1878E+01
                           .380  .6398E+00   |    8.371  .2186E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.44     6.813     1.251     65.100
     OUTFLOW<05: (SWMF  )      19.44      .833     2.118     65.098
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   12.223
                   TIME SHIFT OF PEAK FLOW        (min)=    52.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.9215E+00

--------------------------------------------------------------------------------
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007:0008----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .201 (i)
     TIME TO PEAK    (hrs)=    1.518
     RUNOFF VOLUME    (mm)=   33.144
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .381

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0009----------------------------------------------------------------------
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```
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .086 (i)
     TIME TO PEAK    (hrs)=    1.768
     RUNOFF VOLUME    (mm)=   33.143
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .381

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0010---------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .039 (i)
     TIME TO PEAK    (hrs)=    1.468
     RUNOFF VOLUME    (mm)=   33.143
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .381

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0011---------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    1.16   Curve Number   (CN)=70.00
| 02:215    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .680

     Unit Hyd Qpeak  (cms)=     .065

     PEAK FLOW       (cms)=     .067 (i)
     TIME TO PEAK    (hrs)=    2.118
     RUNOFF VOLUME    (mm)=   33.143
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .381

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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007:0012----------------------------------------------------------------------
-
-------------------------
| ADD HYD (CN        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:214            .27     .039    1.47  33.14    .000

                     +ID2 02:215            1.16     .067    2.12  33.14    .000

                     +ID3 05:SWMF          19.44     .833    2.12  65.10    .000

                     +ID4 07:212            1.56     .201    1.52  33.14    .000

                     +ID5 08:213            1.00     .086    1.77  33.14    .000

                      ============================================================
                      SUM 09:CN             23.43    1.047    1.95  59.65    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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007:0013----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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-
      FINISH
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-
******************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2023-01-30     at 13:26:01
==============================================================================
=
```

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================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                         9   9  9   9   # 3053466
        StormWater Management HYdrologic Model           999    999    =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ********************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                  OTTHYMO-83 and OTTHYMO-89.                  *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
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 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: MTE Consultants Inc.                          +++++++++
 +++++++++                Burlington           SERIAL#:3053466        +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ********************************************************************************


 ***********************   D E T A I L E D   O U T P U T   **********************
 ********************************************************************************
 *         DATE: 2023-03-03     TIME: 10:58:34     RUN COUNTER: 000028         *
 ********************************************************************************
 * Input   filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr25mm4h.dat        *
 * Output  filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr25mm4h.out        *
 * Summary filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr25mm4h.sum        *
 * User comments:                                                              *
 * 1:_____________________________________________________________________     *
 * 2:_____________________________________________________________________     *
 * 3:_____________________________________________________________________     *
 ********************************************************************************

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001:0001--------------------------------------------------------------------------
-
*#*************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=25mm.4hr
-------------------------------------------------------------------------------
-
001:0002--------------------------------------------------------------------------
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--------------------
| READ STORM       |    Filename: 25-mm, 4 hour Chicago Storm, (a=508.5, b
| Ptotal=  25.00 mm|    Comments: 25-mm, 4 hour Chicago Storm, (a=508.5, b
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   1.410 |   1.08   3.570 |   2.08   6.620 |   3.08   2.160
               .17   1.480 |   1.17   4.160 |   2.17   5.580 |   3.17   2.050
               .25   1.560 |   1.25   5.010 |   2.25   4.840 |   3.25   1.960
               .33   1.640 |   1.33   6.350 |   2.33   4.270 |   3.33   1.870
               .42   1.740 |   1.42   8.730 |   2.42   3.830 |   3.42   1.790
               .50   1.850 |   1.50  14.060 |   2.50   3.480 |   3.50   1.720
               .58   1.980 |   1.58  35.190 |   2.58   3.190 |   3.58   1.660
               .67   2.130 |   1.67  71.896 |   2.67   2.950 |   3.67   1.600
               .75   2.310 |   1.75  26.870 |   2.75   2.740 |   3.75   1.540
               .83   2.530 |   1.83  15.350 |   2.83   2.570 |   3.83   1.490
               .92   2.790 |   1.92  10.660 |   2.92   2.410 |   3.92   1.440
              1.00   3.130 |   2.00   8.160 |   3.00   2.280 |   4.00   1.400

-------------------------------------------------------------------------------
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001:0003--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
```

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.93         2.11
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         9.45
               over (min)        3.00        31.00
     Storage Coeff.  (min)=       3.14 (ii)   30.62 (ii)
     Unit Hyd. Tpeak (min)=       3.00        31.00
     Unit Hyd. peak  (cms)=        .36          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .82          .01          .817 (iii)
     TIME TO PEAK    (hrs)=       1.68         2.33         1.683
     RUNOFF VOLUME    (mm)=      24.00         2.97        17.692
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .12          .708

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0004--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .45          .19
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         9.45
               over (min)        3.00        32.00
     Storage Coeff.  (min)=       2.74 (ii)   32.23 (ii)
     Unit Hyd. Tpeak (min)=       3.00        32.00
     Unit Hyd. peak  (cms)=        .40          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .08          .00          .077 (iii)
     TIME TO PEAK    (hrs)=       1.67         2.35         1.667
     RUNOFF VOLUME    (mm)=      24.00         2.97        17.692
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
```

```
     RUNOFF COEFFICIENT   =        .96          .12          .708

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0005---------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         4.69
               over (min)        1.00        13.00
     Storage Coeff.  (min)=        .90 (ii)   12.93 (ii)
     Unit Hyd. Tpeak (min)=       1.00        13.00
     Unit Hyd. peak  (cms)=       1.14          .09
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .15          .01          .147 (iii)
     TIME TO PEAK    (hrs)=       1.67         1.95         1.667
     RUNOFF VOLUME    (mm)=      24.00         2.97        13.486
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .12          .539

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0006---------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201            7.04     .817    1.68  17.69    .000
```

```
                  +ID2 02:202             .64     .077    1.67  17.69    .000

                  +ID3 03:203            1.47     .147    1.67  13.49    .000

                   ============================================================
                   SUM 04:IGD            9.15    1.038    1.67  17.02    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0007--------------------------------------------------------------------------
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---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .673  .6756E+00
                            .006  .1110E+00   |    1.521  .8381E+00
                            .026  .1933E+00   |    3.269  .1071E+01
                            .043  .3282E+00   |    7.270  .1264E+01
                            .225  .4716E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.15     1.038     1.667     17.016
     OUTFLOW<05: (SWMF  )       9.15      .014     4.067     17.015
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.380
                   TIME SHIFT OF PEAK FLOW         (min)=   144.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.1449E+00

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001:0008--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.44
| 01:204    DT= 1.00 |   Total Imp(%)=   12.00   Dir. Conn.(%)=   12.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=        .17         1.27
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         5.00
     Length            (m)=      15.00       120.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         9.45
               over (min)        1.00        28.00
     Storage Coeff.  (min)=       1.15 (ii)   27.78 (ii)
     Unit Hyd. Tpeak (min)=       1.00        28.00
     Unit Hyd. peak  (cms)=        .99          .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .03          .01          .034 (iii)
     TIME TO PEAK    (hrs)=       1.67         2.27         1.667
     RUNOFF VOLUME    (mm)=      24.00         2.97         5.496
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .12          .220
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0009--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39          .17
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         9.45
               over (min)        3.00        32.00
     Storage Coeff.  (min)=       2.74 (ii)   32.23 (ii)
     Unit Hyd. Tpeak (min)=       3.00        32.00
     Unit Hyd. peak  (cms)=        .40          .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .07          .00          .067 (iii)
     TIME TO PEAK    (hrs)=       1.67         2.35         1.667
     RUNOFF VOLUME    (mm)=      24.00         2.97        17.692
```

```
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .96          .12           .708

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0010--------------------------------------------------------------------------
-
--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
         .067       .133       .200
         .067       .161       .229
         .067       .189       .256

             NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                        (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .067  No_date    1:40     17.692    1     8.
   ============================================================================
   IDout= 04:INF         .56     .067  No_date    1:40     17.692    1     8.
   IDout= 07:IGD         .00     .000  No_date    1:40     17.692    1     0.
--------------------------------------------------------------------------------
-
001:0011--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .028 (i)
     TIME TO PEAK    (hrs)=    1.783
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
```

```
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0012--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .005 (i)
     TIME TO PEAK    (hrs)=    2.417
     RUNOFF VOLUME    (mm)=    3.807
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
001:0013--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .024 (i)
     TIME TO PEAK    (hrs)=    2.267
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0014--------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:204           1.44     .034    1.67   5.50    .000
```

```
                    +ID2 02:206            1.89     .028    1.78   3.81    .000

                    +ID3 05:SWMF           9.15     .014    4.07  17.01    .000

                    +ID4 07:IGD             .00     .000    1.67  17.69    .000

                    +ID5 08:207             .85     .005    2.42   3.81    .000

                    +ID6 09:208            3.33     .024    2.27   3.81    .000

                     ============================================================
                     SUM 03:IGMD          16.66     .056    2.23  11.21    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
-
001:0015---------------------------------------------------------------------
-
      FINISH
------------------------------------------------------------------------------
-
*******************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
 001:0008 CALIB STANDHYD
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
   Simulation ended on 2023-03-03     at 10:58:34
===============================================================================
=
```

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================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                         9   9  9   9   # 3053466
        StormWater Management HYdrologic Model           999    999    =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ********************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                  OTTHYMO-83 and OTTHYMO-89.                  *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                   Ottawa,  Ontario: (613) 836-3884          *********
 *********                   Gatineau, Quebec: (819) 243-6858          *********
 *********                   E-Mail: swmhymo@jfsa.Com                  *********
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: MTE Consultants Inc.                          +++++++++
 +++++++++                Burlington           SERIAL#:3053466        +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ********************************************************************************


 ***********************   D E T A I L E D   O U T P U T   **********************
 ********************************************************************************
 *         DATE: 2023-03-03     TIME: 10:58:54     RUN COUNTER: 000030         *
 ********************************************************************************
 * Input   filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\PR5010~1.DAT        *
 * Output  filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\PR5010~1.out        *
 * Summary filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\PR5010~1.sum        *
 * User comments:                                                               *
 * 1:_____________________________________________________________________      *
 * 2:_____________________________________________________________________      *
 * 3:_____________________________________________________________________      *
 ********************************************************************************

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001:0001--------------------------------------------------------------------------
-
*#*************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=kitSCS50.3h
-----------------------------------------------------------------------------------
-
001:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 50-year, 3 hour SCS Type II Storm, City
| Ptotal=  77.65 mm|    Comments: 50-year, 3 hour SCS Type II Storm, City
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.490 |    .83  15.570 |   1.58  33.550 |   2.33   6.820
               .17   3.880 |    .92  21.290 |   1.67  25.420 |   2.42   6.130
               .25   4.360 |   1.00  31.380 |   1.75  20.040 |   2.50   5.550
               .33   4.950 |   1.08  52.080 |   1.83  16.280 |   2.58   5.060
               .42   5.690 |   1.17 107.590 |   1.92  13.550 |   2.67   4.640
               .50   6.640 |   1.25 215.802 |   2.00  11.500 |   2.75   4.270
               .58   7.890 |   1.33 121.920 |   2.08   9.910 |   2.83   3.950
               .67   9.590 |   1.42  70.790 |   2.17   8.660 |   2.92   3.670
               .75  11.990 |   1.50  46.810 |   2.25   7.640 |   3.00   3.430

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001:0003--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.93         2.11
     Dep. Storage     (mm)=       1.00         8.00
```

```
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     215.80        66.09
               over (min)        2.00        15.00
     Storage Coeff.  (min)=       2.02 (ii)   14.65 (ii)
     Unit Hyd. Tpeak (min)=       2.00        15.00
     Unit Hyd. peak  (cms)=        .55          .08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       2.77          .24          2.821 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.53          1.250
     RUNOFF VOLUME    (mm)=      76.65        32.37         63.365
     TOTAL RAINFALL   (mm)=      77.65        77.65         77.649
     RUNOFF COEFFICIENT   =        .99          .42           .816

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0004--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .45          .19
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     215.80        66.09
               over (min)        2.00        15.00
     Storage Coeff.  (min)=       1.76 (ii)   15.31 (ii)
     Unit Hyd. Tpeak (min)=       2.00        15.00
     Unit Hyd. peak  (cms)=        .60          .07
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .26          .02           .261 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.55          1.250
     RUNOFF VOLUME    (mm)=      76.65        32.37         63.365
     TOTAL RAINFALL   (mm)=      77.65        77.65         77.649
     RUNOFF COEFFICIENT   =        .99          .42           .816

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
           CN* =  76.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0005--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     215.80        93.68
               over (min)        1.00         4.00
     Storage Coeff.  (min)=        .58 (ii)    4.21 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.40          .27
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .44          .14          .551 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.30         1.250
     RUNOFF VOLUME    (mm)=      76.65        32.37        54.509
     TOTAL RAINFALL   (mm)=      77.65        77.65        77.649
     RUNOFF COEFFICIENT   =        .99          .42          .702

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
001:0006--------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201            7.04    2.821    1.25  63.36    .000

                     +ID2 02:202             .64     .261    1.25  63.36    .000

                     +ID3 03:203            1.47     .551    1.25  54.51    .000
```

```
                    ============================================================
                    SUM 04:IGD            9.15    3.633    1.25  61.94    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0007--------------------------------------------------------------------------
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---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .605  .6756E+00
                            .006  .1110E+00   |    1.446  .8381E+00
                            .017  .1933E+00   |    3.182  .1071E+01
                            .032  .3282E+00   |    7.179  .1264E+01
                            .170  .4716E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.15     3.633     1.250     61.942
     OUTFLOW<05: (SWMF  )       9.15      .189     2.350     61.938
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    5.195
                   TIME SHIFT OF PEAK FLOW         (min)=    66.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.4805E+00

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001:0008--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.44
| 01:204    DT= 1.00 |   Total Imp(%)=   12.00   Dir. Conn.(%)=   12.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17         1.27
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         5.00
```

```
     Length            (m)=      15.00       120.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     215.80        69.58
               over (min)        1.00        13.00
     Storage Coeff.  (min)=        .74 (ii)   12.72 (ii)
     Unit Hyd. Tpeak (min)=       1.00        13.00
     Unit Hyd. peak  (cms)=       1.26          .09
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .10          .15          .177 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50         1.500
     RUNOFF VOLUME    (mm)=      76.65        32.37        37.683
     TOTAL RAINFALL   (mm)=      77.65        77.65        77.649
     RUNOFF COEFFICIENT   =        .99          .42          .485
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0009--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39          .17
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     215.80        66.09
               over (min)        2.00        15.00
     Storage Coeff.  (min)=       1.76 (ii)   15.31 (ii)
     Unit Hyd. Tpeak (min)=       2.00        15.00
     Unit Hyd. peak  (cms)=        .60          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .22          .02          .228 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.55         1.250
     RUNOFF VOLUME    (mm)=      76.65        32.37        63.365
     TOTAL RAINFALL   (mm)=      77.65        77.65        77.649
     RUNOFF COEFFICIENT   =        .99          .42          .816
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0010--------------------------------------------------------------------------
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--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
         .067       .133       .200
         .067       .161       .229
         .067       .189       .256

             NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                        (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .228  No_date    1:15     63.365    1     5.
   ========================================================================
   IDout= 04:INF         .41     .067  No_date    1:15     63.365    1     5.
   IDout= 07:IGD         .15     .160  No_date    1:15     63.365    1     0.
--------------------------------------------------------------------------------
-
001:0011--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .420 (i)
     TIME TO PEAK    (hrs)=    1.350
     RUNOFF VOLUME    (mm)=   38.361
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .494

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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001:0012--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .073 (i)
     TIME TO PEAK    (hrs)=    1.867
     RUNOFF VOLUME    (mm)=   38.361
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .494

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0013--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .335 (i)
     TIME TO PEAK    (hrs)=    1.750
     RUNOFF VOLUME    (mm)=   38.361
     TOTAL RAINFALL   (mm)=   77.649
     RUNOFF COEFFICIENT   =     .494

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
001:0014--------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:204           1.44     .177    1.50  37.68    .000

                    +ID2 02:206           1.89     .420    1.35  38.36    .000
```

```
                  +ID3 05:SWMF          9.15     .189    2.35  61.94    .000

                  +ID4 07:IGD            .15     .160    1.25  63.36    .000

                  +ID5 08:207            .85     .073    1.87  38.36    .000

                  +ID6 09:208           3.33     .335    1.75  38.36    .000

                   ============================================================
                   SUM 03:IGMD         16.81     .831    1.50  51.36    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
001:0015--------------------------------------------------------------------------
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  ** END OF RUN :   1

********************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=kitSC100.3h
--------------------------------------------------------------------------------
-
002:0002--------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056-104]
*#  Date        : 26-01-2023
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
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002:0002--------------------------------------------------------------------------
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-
--------------------
| READ STORM       |    Filename: 100-year, 3 hour SCS Type II Storm, City
| Ptotal=  87.08 mm|    Comments: 100-year, 3 hour SCS Type II Storm, City
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	3.700	.83	17.510	1.58	38.190	2.33	7.460
.17	4.140	.92	24.100	1.67	28.840	2.42	6.680
.25	4.680	1.00	35.700	1.75	22.650	2.50	6.020
.33	5.340	1.08	59.350	1.83	18.330	2.58	5.470
.42	6.180	1.17	121.590	1.92	15.190	2.67	4.990
.50	7.260	1.25	239.354	2.00	12.830	2.75	4.580
.58	8.690	1.33	137.520	2.08	11.000	2.83	4.220
.67	10.630	1.42	80.540	2.17	9.560	2.92	3.910
.75	13.390	1.50	53.350	2.25	8.410	3.00	3.630

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002:0003----------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    7.04
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	4.93	2.11	
Dep. Storage	(mm)=	1.00	8.00	
Average Slope	(%)=	.50	2.00	
Length	(m)=	80.00	80.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	239.35	84.57	
over	(min)	2.00	13.00	
Storage Coeff.	(min)=	1.94 (ii)	13.38 (ii)	
Unit Hyd. Tpeak	(min)=	2.00	13.00	
Unit Hyd. peak	(cms)=	.57	.09	
				TOTALS
PEAK FLOW	(cms)=	3.10	.31	3.176 (iii)
TIME TO PEAK	(hrs)=	1.25	1.50	1.251
RUNOFF VOLUME	(mm)=	86.08	39.26	72.036
TOTAL RAINFALL	(mm)=	87.08	87.08	87.082
RUNOFF COEFFICIENT	=	.99	.45	.827

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------------------------------------------------------------------
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002:0004--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .64
| 02:202    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .45          .19
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35        82.26
               over (min)        2.00        14.00
     Storage Coeff.  (min)=       1.69 (ii)   14.11 (ii)
     Unit Hyd. Tpeak (min)=       2.00        14.00
     Unit Hyd. peak  (cms)=        .62          .08
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .29          .03          .292 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.52         1.251
     RUNOFF VOLUME    (mm)=      86.08        39.26        72.036
     TOTAL RAINFALL   (mm)=      87.08        87.08        87.082
     RUNOFF COEFFICIENT   =        .99          .45          .827

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
002:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35       113.80
               over (min)        1.00         4.00
```

```
     Storage Coeff.  (min)=        .56 (ii)    3.92 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.42          .29
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .49          .18          .631 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.30         1.251
     RUNOFF VOLUME    (mm)=      86.08        39.26        62.671
     TOTAL RAINFALL   (mm)=      87.08        87.08        87.082
     RUNOFF COEFFICIENT   =        .99          .45          .720

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
002:0006--------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201            7.04    3.176    1.25  72.04    .000

                     +ID2 02:202             .64     .292    1.25  72.04    .000

                     +ID3 03:203            1.47     .631    1.25  62.67    .000

                      ============================================================
                      SUM 04:IGD            9.15    4.099    1.25  70.53    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
002:0007--------------------------------------------------------------------------
-
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .605  .6756E+00
                            .006  .1110E+00   |    1.446  .8381E+00
                            .017  .1933E+00   |    3.182  .1071E+01
                            .032  .3282E+00   |    7.179  .1264E+01
                            .170  .4716E+00   |     .000  .0000E+00
```

```
     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.15     4.099     1.251     70.531
     OUTFLOW<05: (SWMF  )       9.15      .291     2.134     70.527
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    7.102
                   TIME SHIFT OF PEAK FLOW         (min)=    53.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.5284E+00

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-
002:0008--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.44
| 01:204    DT= 1.00 |   Total Imp(%)=   12.00   Dir. Conn.(%)=   12.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .17          1.27
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n             =       .013          .250

     Max.eff.Inten.(mm/hr)=     239.35         87.32
               over (min)         1.00         12.00
     Storage Coeff.  (min)=         .71 (ii)   11.65 (ii)
     Unit Hyd. Tpeak (min)=       1.00         12.00
     Unit Hyd. peak  (cms)=       1.28           .10
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .11           .20           .226 (iii)
     TIME TO PEAK    (hrs)=       1.25          1.48          1.418
     RUNOFF VOLUME    (mm)=      86.08         39.26         44.879
     TOTAL RAINFALL   (mm)=      87.08         87.08         87.082
     RUNOFF COEFFICIENT   =        .99           .45           .515
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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002:0009--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .56
| 02:205    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39          .17
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35        82.26
               over (min)         2.00        14.00
     Storage Coeff.  (min)=       1.69 (ii)   14.11 (ii)
     Unit Hyd. Tpeak (min)=       2.00        14.00
     Unit Hyd. peak  (cms)=        .62          .08
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .25          .02          .256 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.52         1.251
     RUNOFF VOLUME    (mm)=      86.08        39.26        72.036
     TOTAL RAINFALL   (mm)=      87.08        87.08        87.082
     RUNOFF COEFFICIENT   =        .99          .45          .827

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
002:0010--------------------------------------------------------------------------
-
--------------------
| DIVERT HYD       |
| INID=02  (205   )|
--------------------
      Outflow / Inflow  Relationships
      Flow 04 +  Flow 07 =  Total
       (cms)      (cms)      (cms)
         .000       .000       .000
         .067       .000       .067
         .067       .040       .107
         .067       .074       .141
         .067       .107       .174
```

```
         .067      .133      .200
         .067      .161      .229
         .067      .189      .256

             NHYD       AREA    QPEAK  TpeakDate_hh:mm       R.V.  NFE WetHrs
                        (ha)    (cms)                        (mm)       (hrs)
   IDin = 02:205         .56     .256  No_date    1:15     72.036    1     5.
   ========================================================================
   IDout= 04:INF         .39     .067  No_date    1:15     72.036    1     5.
   IDout= 07:IGD         .17     .189  No_date    1:15     72.036    1     0.
-------------------------------------------------------------------------------
-
002:0011-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.89   Curve Number   (CN)=82.00
| 02:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .802

     PEAK FLOW       (cms)=     .507 (i)
     TIME TO PEAK    (hrs)=    1.351
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0012-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 08:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .088 (i)
     TIME TO PEAK    (hrs)=    1.868
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0013-------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 09:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .406 (i)
     TIME TO PEAK    (hrs)=    1.751
     RUNOFF VOLUME    (mm)=   46.050
     TOTAL RAINFALL   (mm)=   87.082
     RUNOFF COEFFICIENT   =     .529

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
002:0014-------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGMD      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204            1.44     .226    1.42  44.88    .000

                     +ID2 02:206            1.89     .507    1.35  46.05    .000

                     +ID3 05:SWMF           9.15     .291    2.13  70.53    .000

                     +ID4 07:IGD             .17     .189    1.25  72.04    .000

                     +ID5 08:207             .85     .088    1.87  46.05    .000

                     +ID6 09:208            3.33     .406    1.75  46.05    .000

                      ============================================================
                      SUM 03:IGMD          16.83    1.065    1.42  59.52    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
-
002:0015-------------------------------------------------------------------------
-
-------------------------------------------------------------------------------
-
002:0002-------------------------------------------------------------------------
-
```

```
      FINISH
-------------------------------------------------------------------------------
-
*******************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
 001:0008 CALIB STANDHYD
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.
   Simulation ended on 2023-03-03     at 10:58:55
===============================================================================
=
```

Appendix D

SWM Design Sheets

NORTH SWMF (SWMF1)

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number:	35056-104
Date:	January 26, 2022
Design By:	AJC
File:	Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_Revised Submission.xlsx

MOE VOLUME REQUIREMENTS - NORTH SWMF

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)	Imperviousness (%)
9.15	66.8

Interpolated Storage Volume Requirement (m^3/ha)

217.50

Permanent Pool Required (m^3)

1624

Extended Detention Volume Required (m^3)

366

Table 3.2 Water Quality Storage Requirements based on Receiving Waters (from MOE Stormwater Management Planning and Design Manual, March 2003)

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

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number: 35056-104
Date: February 11, 2023
Design By: AJC
File: Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_Revised Submission.xlsx

STAGE-STORAGE RELATIONSHIP - NORTH SWMF

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						
m	*m*	m^2	m^3	m^3	m^2	m^3	m^3	m^3	m^3	m^3	*m*		*m*
338.00		367	0	0	1252	0	0	0					338.00
338.10		401	39	39	1308	129	129	168					338.10
338.20		435	42	81	1364	134	263	344					338.20
338.30		470	46	127	1420	140	403	530					338.30
338.40		506	49	176	1478	145	548	724					338.40
338.50		542	53	229	1536	151	699	928					338.50
338.60		579	57	286	1595	157	856	1142					338.60
338.70		616	60	346	1655	163	1019	1365					338.70
338.80		655	64	410	1716	169	1188	1598					338.80
338.90		694	68	478	1779	175	1363	1841					338.90
339.00		751	73	551	1869	183	1546	2097					339.00
339.10		810	79	630	1962	192	1738	2368					339.10
339.20		870	85	715	2057	201	1939	2654					339.20
339.30		932	91	806	2153	211	2150	2956					339.30
339.40		996	97	903	2250	221	2371	3274					339.40
339.50		**1089**	**105**	**1008**	**2361**	**231**	**2602**	**3610**		**3610**		**Permanent Pool**	**339.50**
339.50	0.00				3450	0	0	3610	0				339.50
339.60	0.10				3611	354	354	3964	354	366	339.61	MOE Extended Detention	339.60
339.70	0.20				3775	370	724	4334	724				339.70
339.80	0.30				3940	386	1110	4720	1110	1449	339.89	25mm4hr	339.80
339.90	0.40				4107	403	1513	5123	1513				339.90
340.00	0.50				4276	420	1933	5543	1933	2092	340.04	2yr	340.00
340.10	0.60				4464	438	2371	5981	2371				340.10
340.20	0.70				4553	451	2822	6432	2822	3021	340.25	5yr	340.20
340.30	0.80				4642	460	3282	6892	3282	3588	340.37	10yr	340.30
340.40	0.90				4731	469	3751	7361	3751	4203	340.50	25yr	340.40
340.50	1.00				4821	478	4229	7839	4229				340.50
340.60	1.10				4912	487	4716	8326	4716	4805	340.63	50yr	340.60
340.70	1.20				5003	496	5212	8822	5212	5284	340.72	100yr	340.70
340.80	1.30				5094	505	5717	9327	5717				340.80
340.90	1.40				5186	515	6232	9842	6232				340.90
341.00	1.50				5279	524	6756	10366	6756				341.00
341.10	1.60				5372	533	7289	10899	7289				341.10
341.20	1.70				5446	541	7830	11440	7830				341.20
341.30	1.80				5561	551	8381	11991	8381				341.30
341.40	1.90				5657	561	8942	12552	8942				341.40
341.50	2.00				5753	571	9513	13123	9513				341.50
341.60	2.10				5954	586	10099	13709	10099				341.60
341.70	2.20				6155	606	10705	14315	10705				341.70
341.80	2.30				6355	626	11331	14941	11331				341.80
341.90	2.40				6556	646	11977	15587	11977				341.90
342.00	2.50				6758	666	12643	16253	12643				342.00

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

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Orifice Calculations

$Q_o = C_d * A_o * (2 * g * H_o)^{0.5}$

	Orifice 1	Orifice 2
C_d	0.63	0.63
Invert (m)	339.50	339.80
Width (m)	0.000	0.000
Diameter/Height (m)	0.075	0.150
Type (H/V)	V	V

C_d	Description
0.63	Orifice Plate
0.80	Orifice Tube

Weir Calculations

$Q_w = 2/3 * C_d * (2g)^{1/2} * L * H_w^{3/2} + 8/15 * C_d * (2g)^{1/2} * \tan\theta * H_w^{5/2}$

	Weir 1	Weir 2	Weir 3
C_d	0.50	0.50	0.50
Invert (m)	340.30	341.00	341.70
Length (m)	0.700	1.700	5.000
Side Slope (H:V)	0	0	20
Side Slope (rad)	0.000	0.000	1.521

Notch	Weir Wall	Overflow

STAGE-DISCHARGE RELATIONSHIP - NORTH SWMF (25mm Event)

Stage	Active Volume	Orifice 1			Orifice 2			Weir 1	Weir 2	Weir 3	Sub Total Flow	Total Flow	Comments
		Area	H_o	Flow	Area	H_o	Flow	Flow	Flow	Flow			
m	m^3	m^2	*m*	m^3/s	m^2	*m*	m^3/s	m^3/s	m^3/s	m^3/s		m^3/s	
339.50	0	0.000	0.00	0.0000	0.000	0.00	0.0000				0.0000	0.0000	Permanent Pool, Orifice 1 Starts
339.60	354	0.004	0.06	0.0031	0.000	0.00	0.0000	0.0000	0.0000	0.0000	0.0031	0.0031	
339.70	724	0.004	0.16	0.0050	0.000	0.00	0.0000	0.0000	0.0000	0.0000	0.0050	0.0050	
339.80	1110	0.004	0.26	0.0063	0.000	0.00	0.0000	0.0000	0.0000	0.0000	0.0063	0.0063	Orifice 2
339.90	1513	0.004	0.36	0.0074	0.013	0.05	0.0078	0.0000	0.0000	0.0000	0.0152	0.0152	
340.00	1933	0.004	0.46	0.0084	0.018	0.13	0.0174	0.0000	0.0000	0.0000	0.0258	0.0258	
340.10	2371	0.004	0.56	0.0092	0.018	0.23	0.0234	0.0000	0.0000	0.0000	0.0326	0.0326	
340.20	2822	0.004	0.66	0.0100	0.018	0.33	0.0281	0.0000	0.0000	0.0000	0.0381	0.0381	
340.30	3282	0.004	0.76	0.0108	0.018	0.43	0.0321	0.0000	0.0000	0.0000	0.0429	0.0429	Notch 1 in internal weir
340.40	3751	0.004	0.86	0.0114	0.018	0.53	0.0357	0.0327	0.0000	0.0000	0.0799	0.0799	
340.50	4229	0.004	0.96	0.0121	0.018	0.63	0.0390	0.0924	0.0000	0.0000	0.1435	0.1435	
340.60	4716	0.004	1.06	0.0127	0.018	0.73	0.0420	0.1698	0.0000	0.0000	0.2245	0.2245	
340.70	5212	0.004	1.16	0.0133	0.018	0.83	0.0448	0.2615	0.0000	0.0000	0.3195	0.3195	
340.80	5717	0.004	1.26	0.0139	0.018	0.93	0.0474	0.3654	0.0000	0.0000	0.4267	0.4267	
340.90	6232	0.004	1.36	0.0144	0.018	1.03	0.0499	0.4803	0.0000	0.0000	0.5447	0.5447	
341.00	6756	0.004	1.46	0.0149	0.018	1.13	0.0523	0.6053	0.0000	0.0000	0.6725	0.6725	Internal Weir Wall
341.10	7289	0.004	1.56	0.0154	0.018	1.23	0.0546	0.7395	0.0794	0.0000	0.8889	0.8889	
341.20	7830	0.004	1.66	0.0159	0.018	1.33	0.0568	0.8824	0.2245	0.0000	1.1796	1.1796	
341.30	8381	0.004	1.76	0.0164	0.018	1.43	0.0589	1.0335	0.4124	0.0000	1.5212	1.5212	
341.40	8942	0.004	1.86	0.0168	0.018	1.53	0.0609	1.1924	0.6350	0.0000	1.9051	1.9051	
341.50	9513	0.004	1.96	0.0173	0.018	1.63	0.0629	1.3586	0.8874	0.0000	2.3262	2.3262	
341.60	10099	0.004	2.06	0.0177	0.018	1.73	0.0648	1.5319	1.1666	0.0000	2.7810	2.7810	
341.70	10705	0.004	2.16	0.0181	0.018	1.83	0.0666	1.7121	1.4700	0.0000	3.2668	3.2668	Overflow
341.80	11331	0.004	2.26	0.0185	0.018	1.93	0.0684	1.8987	1.7960	0.3082	4.0899	4.0899	
341.90	11977	0.004	2.36	0.0189	0.018	2.03	0.0702	2.0917	2.1431	1.0829	5.4068	5.4068	
342.00	12643	0.004	2.46	0.0193	0.018	2.13	0.0719	2.2909	2.5100	2.3776	7.2697	7.2697	

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

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Orifice Calculations

$Q_o = C_d * A_o * (2 * g * H_o)^{0.5}$

	Orifice 1	Orifice 2
C_d	0.63	0.63
Invert (m)	339.50	339.80
Width (m)	0.000	0.000
Diameter/Height (m)	0.075	0.150
Type (H/V)	V	V

C_d	Description
0.63	Orifice Plate
0.80	Orifice Tube

Weir Calculations

$Q_w = 2/3 * C_d * (2g)^{1/2} * L * H_w^{3/2} + 8/15 * C_d * (2g)^{1/2} * \tan\theta * H_w^{5/2}$

	Weir 1	Weir 2	Weir 3
C_d	0.50	0.50	0.50
Invert (m)	340.30	341.00	341.70
Length (m)	0.700	1.700	5.000
Side Slope (H:V)	0	0	20
Side Slope (rad)	0.000	0.000	1.521

Notch	Weir Wall	Overflow

STAGE-DISCHARGE RELATIONSHIP - NORTH SWMF (2 - 25 Year Event)

Stage	Active Volume	Orifice 1			Orifice 2			Weir 1	Weir 2	Weir 3	Sub Total Flow	Total Flow	Comments
		Area	H_o	Flow	Area	H_o	Flow	Flow	Flow	Flow			
m	m^3	m^2	*m*	m^3/s	m^2	*m*	m^3/s	m^3/s	m^3/s	m^3/s		m^3/s	
339.50	0	0.000	0.00	0.0000	0.000	0.00	0.0000				0.0000	0.0000	Permanent Pool, Orifice 1 Starts
339.60	354	0.004	0.06	0.0031	0.000	0.00	0.0000	0.0000	0.0000	0.0000	0.0031	0.0031	
339.70	724	0.004	0.16	0.0050	0.000	0.00	0.0000	0.0000	0.0000	0.0000	0.0050	0.0050	
339.80	1110	0.004	0.26	0.0063	0.000	0.00	0.0000	0.0000	0.0000	0.0000	0.0063	0.0063	Orifice 2
339.90	1513				0.013	0.05	0.0078	0.0000	0.0000	0.0000	0.0078	0.0078	
340.00	1933				0.018	0.13	0.0174	0.0000	0.0000	0.0000	0.0174	0.0174	
340.10	2371				0.018	0.23	0.0234	0.0000	0.0000	0.0000	0.0234	0.0234	
340.20	2822				0.018	0.33	0.0281	0.0000	0.0000	0.0000	0.0281	0.0281	
340.30	3282				0.018	0.43	0.0321	0.0000	0.0000	0.0000	0.0321	0.0321	Notch 1 in internal weir
340.40	3751				0.018	0.53	0.0357	0.0327	0.0000	0.0000	0.0684	0.0684	
340.50	4229				0.018	0.63	0.0390	0.0924	0.0000	0.0000	0.1314	0.1314	
340.60	4716				0.018	0.73	0.0420	0.1698	0.0000	0.0000	0.2118	0.2118	
340.70	5212				0.018	0.83	0.0448	0.2615	0.0000	0.0000	0.3063	0.3063	
340.80	5717				0.018	0.93	0.0474	0.3654	0.0000	0.0000	0.4128	0.4128	
340.90	6232	***Orifice 1 not flowing due to IGMD Tailwater Effects***			0.018	1.03	0.0499	0.4803	0.0000	0.0000	0.5303	0.5303	
341.00	6756				0.018	1.13	0.0523	0.6053	0.0000	0.0000	0.6576	0.6576	Internal Weir Wall
341.10	7289				0.018	1.23	0.0546	0.7395	0.0794	0.0000	0.8735	0.8735	
341.20	7830				0.018	1.33	0.0568	0.8824	0.2245	0.0000	1.1637	1.1637	
341.30	8381				0.018	1.43	0.0589	1.0335	0.4124	0.0000	1.5048	1.5048	
341.40	8942				0.018	1.53	0.0609	1.1924	0.6350	0.0000	1.8883	1.8883	
341.50	9513				0.018	1.63	0.0629	1.3586	0.8874	0.0000	2.3089	2.3089	
341.60	10099				0.018	1.73	0.0648	1.5319	1.1666	0.0000	2.7633	2.7633	
341.70	10705				0.018	1.83	0.0666	1.7121	1.4700	0.0000	3.2487	3.2487	Overflow
341.80	11331				0.018	1.93	0.0684	1.8987	1.7960	0.3082	4.0713	4.0713	
341.90	11977				0.018	2.03	0.0702	2.0917	2.1431	1.0829	5.3879	5.3879	
342.00	12643				0.018	2.13	0.0719	2.2909	2.5100	2.3776	7.2504	7.2504	

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

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Orifice Calculations

$Q_o = C_d * A_o * (2 * g * H_o)^{0.5}$

	Orifice 1	Orifice 2
C_d	0.63	0.63
Invert (m)	339.50	339.80
Width (m)	0.000	0.000
Diameter/Height (m)	0.075	0.150
Type (H/V)	V	V

C_d	Description
0.63	Orifice Plate
0.80	Orifice Tube

Weir Calculations

$Q_w = 2/3 * C_d * (2g)^{1/2} * L * H_w^{3/2} + 8/15 * C_d * (2g)^{1/2} * \tan\theta * H_w^{5/2}$

	Weir 1	Weir 2	Weir 3
C_d	0.50	0.50	0.50
Invert (m)	340.30	341.00	341.70
Length (m)	0.700	1.700	5.000
Side Slope (H:V)	0	0	20
Side Slope (rad)	0.000	0.000	1.521

Notch	Weir Wall	Overflow

STAGE-DISCHARGE RELATIONSHIP - NORTH SWMF (50-100 Year Event)

Stage	Active Volume	Orifice 1			Orifice 2			Weir 1	Weir 2	Weir 3	Sub Total Flow	Total Flow	Comments
		Area	H_o	Flow	Area	H_o	Flow	Flow	Flow	Flow			
m	m^3	m^2	*m*	m^3/s	m^2	*m*	m^3/s	m^3/s	m^3/s	m^3/s		m^3/s	
339.50	0	0.000	0.00	0.0000	0.000	0.00	0.0000				0.0000	0.0000	Permanent Pool, Orifice 1 Starts
339.60	354	0.004	0.06	0.0031	0.000	0.00	0.0000	0.0000	0.0000	0.0000	0.0031	0.0031	
339.70	724	0.004	0.16	0.0050	0.000	0.00	0.0000	0.0000	0.0000	0.0000	0.0050	0.0050	
339.80	1110	0.004	0.26	0.0063	0.000	0.00	0.0000	0.0000	0.0000	0.0000	0.0063	0.0063	Orifice 2
339.90	1513				0.013	0.05	0.0078	0.0000	0.0000	0.0000	0.0078	0.0078	
340.00	1933				0.018	0.13	0.0174	0.0000	0.0000	0.0000	0.0174	0.0174	
340.10	2371				0.018	0.23	0.0234	0.0000	0.0000	0.0000	0.0234	0.0234	
340.20	2822				0.018	0.33	0.0281	0.0000	0.0000	0.0000	0.0281	0.0281	
340.30	3282				0.018	0.43	0.0321	0.0000	0.0000	0.0000	0.0321	0.0321	Notch 1 in internal weir
340.40	3751							0.0327	0.0000	0.0000	0.0327	0.0327	
340.50	4229							0.0924	0.0000	0.0000	0.0924	0.0924	
340.60	4716							0.1698	0.0000	0.0000	0.1698	0.1698	
340.70	5212							0.2615	0.0000	0.0000	0.2615	0.2615	
340.80	5717							0.3654	0.0000	0.0000	0.3654	0.3654	
340.90	6232	*Orifice 1 not flowing due to IGMD Tailwater Effects*						0.4803	0.0000	0.0000	0.4803	0.4803	
341.00	6756							0.6053	0.0000	0.0000	0.6053	0.6053	Internal Weir Wall
341.10	7289				*Orifice 2 not flowing due to IGMD Tailwater Effects*			0.7395	0.0794	0.0000	0.8189	0.8189	
341.20	7830							0.8824	0.2245	0.0000	1.1070	1.1070	
341.30	8381							1.0335	0.4124	0.0000	1.4460	1.4460	
341.40	8942							1.1924	0.6350	0.0000	1.8274	1.8274	
341.50	9513							1.3586	0.8874	0.0000	2.2460	2.2460	
341.60	10099							1.5319	1.1666	0.0000	2.6985	2.6985	
341.70	10705							1.7121	1.4700	0.0000	3.1821	3.1821	Overflow
341.80	11331							1.8987	1.7960	0.3082	4.0029	4.0029	
341.90	11977							2.0917	2.1431	1.0829	5.3177	5.3177	
342.00	12643							2.2909	2.5100	2.3776	7.1785	7.1785	

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

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FALLING HEAD DRAWDOWN CALCULATION - NORTH SWMF
MOE SWM Planning and Design Manual, 2003

$$t = \frac{0.66C_2h^{1.5} + 2C_3h^{0.5}}{2.75A_O}$$ Equation 4.11

where

t =	154607.144	*s*	
	42.9	*hr*	drawdown time
A_p =	3567.365	m^2	surface area of the pond
C =	0.63		discharge coefficient
d =	75	*mm*	diameter of the orifice
A_O =	0.00441786	m^2	cross-sectional area of the orifice
g =	9.81	m/s^2	gravitational acceleration constant
h_1 =	339.610	*m*	starting water elevation above the orifice
h_2 =	339.538	*m*	ending water elevation above the orifice
h =	0.0725	*m*	maximum water elevation above the orifice
C_2 =	1634		slope coefficient from the area-depth linear regression
C_3 =	3448.9		intercept from the area-depth linear regression

	ELEVATION *m*	STAGE *m*	AREA m^2	COMMENTS
1	339.50	0	3450	Permanent pool
2	339.60	0.1	3611	339.61 = MOE Ext Det
3	339.70	0.2	3775	
4	339.80	0.3	3940	

DRAWDOWN TIME: 154607 *s*
42.9 *hr*

Regression Output:

m_1 =	1634.00	slope coefficient from the area-depth linear regression
b =	3448.90	intercept from the area-depth linear regression
se_1 =	6.48	standard error for coefficient m_1
se_b =	1.21	standard error for constant b
R^2 =	1.0000	coefficient of determination
se_y =	1.45	standard error of the *y* estimate
F =	63570.38	F statistic
df =	2	degrees of freedom
ss_{reg} =	133498	regression sum of squares
ss_{resid} =	4	residual sum of squares

Wilmot Woods

STORMWATER MANAGEMENT

New Hamburg, Ontario

Project Number: 35056-104
Date: February 11, 2023
Design By: AJC
File: Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_Revised Submission.xlsx

STAGE DISCHARGE DRAWDOWN CALCULATION (North SWMF 25mm-4hr)

Stage	Elevation *m*	Discharge m^3/s	Volume m^3	Comments
1	339.50	0.000	0	
2	339.60	0.003	354	
3	339.70	0.005	724	
4	339.80	0.006	1110	
5	339.90	0.015	1513	
6	340.00	0.026	1933	
7	340.10	0.033	2371	
8	340.20	0.038	2822	
9	340.30	0.043	3282	
10	340.40	0.080	3751	
11	340.50	0.144	4229	
12	340.60	0.225	4716	
13	340.70	0.320	5212	
14	340.80	0.427	5717	
15	340.90	0.545	6232	
16	341.00	0.673	6756	
17	341.10	0.889	7289	

h_1 =	339.89	*m*	starting elevation
h_2 =	339.50	*m*	bottom elevation
V =	1449	m^3	starting volume
t =	5.0	*min*	time step

Drawdown Time = 68.33 *hrs*

65 *mm* remaining
231.4 m^3 remaining

Remaining after:	m^3	*mm*
12 *hrs*	1059	287
24 *hrs*	812	223
36 *hrs*	603	167
48 *hrs*	434	122
72 *hrs*	206	58

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number:	35056-104
Date:	January 22, 2023
Design By:	AJC
File:	Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_Revised Submission.xlsx

FOREBAY DESIGN CALCULATIONS - NORTH SWMF

MOE SWM Planning and Design Manual, 2003

Forebay Design Flows

Flow into forebay during the 1:5-year return period event (from STM Design Sheet)	1.562	m^3/s
Flow into forebay during the 25 mm - 4 hour design storm event	1.038	m^3/s
Peak flow from main pond outlet for the 25mm design storm (from SWMHYMO)	0.014	m^3/s

Forebay Characteristics

b =	9.0	*m*	bottom width
y =	1.5	*m*	depth
z =	3	:1	side slope
w =	13.5	*m*	average width
R =	1.10	*m*	hydraulic radius
A =	20.3	m^2	cross-sectional area

1. Length Calculation Based on Settling Velocity

L = forebay flow length *(m)*
r = length-to-width ratio
Q_p = peak flow rate through forebay (m^3/s)
v_s = settling velocity *(m/s)*

Equation 4.5: Forebay Settling Length

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

Q_p =	1.04	m^3/s	peak flow rate through forebay
v_s =	0.0055	*m/s*	settling velocity
r =	1.03		length-to-width ratio
L =	13.9	*m*	required settling length
L =	*13.9*	*m*	*trial length*

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

Q_p =	0.014	m^3/s	peak flow rate through forebay
v_s =	0.0003	*m/s*	settling velocity
r =	0.26		length-to-width ratio
L =	3.5	*m*	required settling length
L =	*3.5*	*m*	*trial length*

Table 1: Average settling velocities

	Mass Removed	Particle Size Range	Average Settling Velocity
	%	µm	m/s
	80 - 100	x ≤ 20	0.00000254
Enhanced:	70 - 80	20 < x ≤ 40	0.00001300
Normal:	60 - 70	40 < x ≤ 60	0.00002540
Basic:	40 - 60	60 < x ≤ 130	0.00012700
Medium Sand:	20 - 40	130 < x ≤ 400	0.00059267
Gross Grit:	0 - 20	400 < x ≤ 4000	0.00550333

2. Length Calculation Based on Flow Dispersion Length

Q =	1.56	m^3/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 =	16.7	m	required length of dispersion

Equation 4.6: Dispersion Length

3. Required Forebay Length

L =	**16.7**	***m***	**required design length**
L (actual) =	**40.0**	***m***	
r =	2.96		design length-to-width ratio (typical minimum of 2.0)

4. Scour Velocity

v_s =	0.15	*m/s*	scour velocity (typical value = 0.15 *m/s*)
v =	**0.077**	***m/s***	**actual velocity**

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

5. Weir Flow From Forebay

L =	10	*m*	length of crest of weir
α =	1.65		coefficient
H =	0.5	*m*	head
Q =	5.83	m^3/s	**discharge**

Equation 4.4: Weir Flow

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

6. Estimated Cleanout Frequencies

a) Forebay

Forebay volume	1008	m^3
Estimated TSS removal efficiency	50%	
Impervious level	66.8%	
Estimated annual sediment loading	2.6	m^3/ha
Contributing area	9.15	*ha*
Annual sediment volume	12	m^3/yr
Cleanout frequency for 33% volume reduction	**28.0**	***years***
Cleanout Volume	**332.6**	m^3

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) Stormwater Management Pond

Wetpond volume (excluding forebay)	2602	m^3
Estimated TSS removal efficiency	30%	
Impervious level	66.8%	
Estimated annual sediment loading	2.6	m^3/ha
Contributing area	9.15	*ha*
Annual sediment volume	7	m^3/yr
Cleanout frequency for 33% volume reduction	**120.3**	***years***

SWMF1 OUTLET CAPACITY CHECKS

Capacity of single CSP Culvert in North SWMF Channel

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data		
Roughness Coefficient	0.010	
Channel Slope	0.010	m/m
Normal Depth	375.0	mm
Diameter	375.0	mm

Results		
Discharge	227.93	L/s
Flow Area	0.1	m²
Wetted Perimeter	1.2	m
Hydraulic Radius	93.8	mm
Top Width	0.00	m
Critical Depth	339.5	mm
Percent Full	100.0	%
Critical Slope	0.009	m/m
Velocity	2.06	m/s
Velocity Head	0.22	m
Specific Energy	0.59	m
Froude Number	(N/A)	
Maximum Discharge	245.18	L/s
Discharge Full	227.93	L/s
Slope Full	0.010	m/m
Flow Type	Supercritical	

GVF Input Data		
Downstream Depth	0.0	mm
Length	0.0	m
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.0	mm
Profile Description	N/A	
Profile Headloss	0.00	m
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	375.0	mm
Critical Depth	339.5	mm
Channel Slope	0.010	m/m
Critical Slope	0.009	m/m

Capacity of SWMF1 Outlet Channel

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data		
Roughness Coefficient	0.030	
Channel Slope	0.004	m/m
Normal Depth	300.0	mm
Left Side Slope	5.000	H:V
Right Side Slope	5.000	H:V
Bottom Width	3.00	m

Results		
Discharge	978.40	L/s
Flow Area	1.4	m²
Wetted Perimeter	6.1	m
Hydraulic Radius	222.8	mm
Top Width	6.00	m
Critical Depth	197.2	mm
Critical Slope	0.016	m/m
Velocity	0.72	m/s
Velocity Head	0.03	m
Specific Energy	0.33	m
Froude Number	0.488	
Flow Type	Subcritical	

GVF Input Data		
Downstream Depth	0.0	mm
Length	0.0	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	300.0	mm
Critical Depth	197.2	mm
Channel Slope	0.004	m/m
Critical Slope	0.016	m/m

SUPPLEMENTAL IGMD TAILWATER/BACKWATER EFFECT CHECK

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number: 35056-104
Date: February 11, 2023
Design By: AJC
File: Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_Revised Submission.xlsx

STAGE-STORAGE RELATIONSHIP - FLOODPLAIN ELEVATIONS (TAILWATER EFFECTS IN SWMF1)

Stage	Active Depth	Forebay			Main Pond			Total Pond Volume	Volume Summary	Ponding Elevation	Comments	Stage
		Area	Volume	Cumulative Volume	Area	Volume	Cumulative Volume					
m	m	m^2	m^3	m^3	m^2	m^3	m^3	m^3	m^3	m		m
337.50					4	0	0	0				337.50
337.60					34	2	2	2				337.60
337.70					85	6	8	8				337.70
337.80					121	11	19	19				337.80
337.90					156	14	33	33				337.90
338.00					200	18	51	51				338.00
338.10					253	23	74	74				338.10
338.20					301	28	102	102				338.20
338.30					369	34	136	136				338.30
338.40					822	60	196	196				338.40
338.50					930	88	284	284				338.50
338.60					1043	99	383	383				338.60
338.70					1226	114	497	497				338.70
338.80					1365	130	627	627				338.80
338.90					1491	143	770	770				338.90
339.00					1615	156	926	926				339.00
339.10					2234	193	1119	1119				339.10
339.20					4974	361	1480	1480				339.20
339.30					22797	1389	2869	2869	3157	339.33	25mm4hr	339.30
339.40					36568	2969	5838	5838	8175	339.48	2yr	339.40
339.50					48010	4229	10067	10067				339.50
339.60					63905	5596	15663	15663	15820	339.61	5yr	339.60
339.70					78768	7134	22797	22797	22860	339.71	10yr	339.70
339.80					94697	8674	31471	31471	32240	339.81	25yr	339.80
339.90					108872	10179	41650	41650	42440	339.91	50yr	339.90
340.00					118583	11373	53023	53023				

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number:	35056-104
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Orifice Calculations

$Q_o=C_d*A_o*(2*g*H_o)^{0.5}$

	Orifice 1	Orifice 2
C_d	0.80	0.63
Invert (m)	337.54	500.00
Width (m)	0.000	0.000
Diameter/Height (m)	1.750	0.000
Type (H/V)	V	V

C_d	Description
0.63	Orifice Plate
0.80	Orifice Tube

STAGE-DISCHARGE RELATIONSHIP - FLOODPLAIN

Stage	Active Volume	Culvert			Orifice 2			Total Flow	Comments
		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	
337.50	0	0.000	0.00	0.0000	0.000	0.00	0.0000	0.0000	Bottom of IGMD
337.60	2	0.026	0.03	0.0157	0.000	0.00	0.0000	0.0157	
337.70	8	0.110	0.08	0.1100	0.000	0.00	0.0000	0.1100	
337.80	19	0.223	0.13	0.2851	0.000	0.00	0.0000	0.2851	
337.90	33	0.357	0.18	0.5360	0.000	0.00	0.0000	0.5360	
338.00	51	0.505	0.23	0.8576	0.000	0.00	0.0000	0.8576	
338.10	74	0.664	0.28	1.2442	0.000	0.00	0.0000	1.2442	
338.20	102	0.830	0.33	1.6900	0.000	0.00	0.0000	1.6900	
338.30	136	1.002	0.38	2.1887	0.000	0.00	0.0000	2.1887	
338.40	196	1.176	0.43	2.7335	0.000	0.00	0.0000	2.7335	
338.50	284	1.351	0.48	3.3172	0.000	0.00	0.0000	3.3172	
338.60	383	1.524	0.53	3.9314	0.000	0.00	0.0000	3.9314	
338.70	497	1.692	0.58	4.5673	0.000	0.00	0.0000	4.5673	
338.80	627	1.854	0.63	5.2145	0.000	0.00	0.0000	5.2145	
338.90	770	2.006	0.68	5.8607	0.000	0.00	0.0000	5.8607	
339.00	926	2.144	0.73	6.4911	0.000	0.00	0.0000	6.4911	
339.10	1119	2.264	0.78	7.0856	0.000	0.00	0.0000	7.0856	
339.20	1480	2.358	0.83	7.6137	0.000	0.00	0.0000	7.6137	
339.30	2869	2.405	0.89	8.0182	0.000	0.00	0.0000	8.0182	
339.40	5838	2.405	0.99	8.4591	0.000	0.00	0.0000	8.4591	
339.50	10067	2.405	1.09	8.8781	0.000	0.00	0.0000	8.8781	
339.60	15663	2.405	1.19	9.2782	0.000	0.00	0.0000	9.2782	
339.70	22797	2.405	1.29	9.6618	0.000	0.00	0.0000	9.6618	
339.80	31471	2.405	1.39	10.0307	0.000	0.00	0.0000	10.0307	
339.90	41650	2.405	1.49	10.3865	0.000	0.00	0.0000	10.3865	
340.00	53023	2.405	1.59	10.7305	0.000	0.00	0.0000	10.7305	

Culvert Calculator Report
25mm4hr - Outlet Culvert Backwater Effects Check

Comments: Confirm no backwater effects in outlet culvert as a result of IGMD tailwaterss

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	339.89	m	Headwater Depth/Height	0.17	
Computed Headwater Elev	339.55	m	Discharge	0.0140	m³/s
Inlet Control HW Elev.	339.55	m	Tailwater Elevation	339.33	m
Outlet Control HW Elev.	339.55	m	Control Type	Entrance Control	

Grades					
Upstream Invert	339.45	m	Downstream Invert	339.00	m
Length	84.00	m	Constructed Slope	0.005357	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.33	m
Slope Type	Steep		Normal Depth	0.07	m
Flow Regime	N/A		Critical Depth	0.07	m
Velocity Downstream	0.09	m/s	Critical Slope	0.005014	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	339.55	m	Upstream Velocity Head	0.03	m
Ke	0.20		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	339.55	m	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	0.3	m²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
2yr - Outlet Culvert Backwater Effects Check

Comments: Confirm no backwater effects in outlet culvert as a result of IGMD tailwaterss

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	340.04	m	Headwater Depth/Height	0.24	
Computed Headwater Eleva	339.60	m	Discharge	0.0270	m³/s
Inlet Control HW Elev.	339.59	m	Tailwater Elevation	339.48	m
Outlet Control HW Elev.	339.60	m	Control Type	Entrance Control	

Grades					
Upstream Invert	339.45	m	Downstream Invert	339.00	m
Length	84.00	m	Constructed Slope	0.005357	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.48	m
Slope Type	Steep		Normal Depth	0.10	m
Flow Regime	N/A		Critical Depth	0.10	m
Velocity Downstream	0.11	m/s	Critical Slope	0.004722	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	339.60	m	Upstream Velocity Head	0.04	m
Ke	0.20		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	339.59	m	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	0.3	m²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
5yr - Outlet Culvert Backwater Effects Check

Comments: Confirm no backwater effects in outlet culvert as a result of IGMD tailwaterss

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	340.25	m	Headwater Depth/Height	0.30	
Computed Headwater Eleva	339.64	m	Discharge	0.0390	m³/s
Inlet Control HW Elev.	339.62	m	Tailwater Elevation	339.61	m
Outlet Control HW Elev.	339.64	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.45	m	Downstream Invert	339.00	m
Length	84.00	m	Constructed Slope	0.005357	m/m

Hydraulic Profile					
Profile	CompositePressureProfileS1		Depth, Downstream	0.61	m
Slope Type	N/A		Normal Depth	0.12	m
Flow Regime	Subcritical		Critical Depth	0.12	m
Velocity Downstream	0.13	m/s	Critical Slope	0.004585	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	339.64	m	Upstream Velocity Head	0.02	m
Ke	0.20		Entrance Loss	0.00	m

Inlet Control Properties					
Inlet Control HW Elev.	339.62	m	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	0.3	m²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
10yr - Outlet Culvert Backwater Effects Check

Comments: Confirm no backwater effects in outlet culvert as a result of IGMD tailwaterss

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	340.37	m	Headwater Depth/Height	0.47	
Computed Headwater Eleva	339.74	m	Discharge	0.0760	m³/s
Inlet Control HW Elev.	339.71	m	Tailwater Elevation	339.71	m
Outlet Control HW Elev.	339.74	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.45	m	Downstream Invert	339.00	m
Length	84.00	m	Constructed Slope	0.005357	m/m

Hydraulic Profile					
Profile	CompositePressureProfileS1		Depth, Downstream	0.71	m
Slope Type	N/A		Normal Depth	0.17	m
Flow Regime	Subcritical		Critical Depth	0.17	m
Velocity Downstream	0.26	m/s	Critical Slope	0.004459	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	339.74	m	Upstream Velocity Head	0.02	m
Ke	0.20		Entrance Loss	0.00	m

Inlet Control Properties					
Inlet Control HW Elev.	339.71	m	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	0.3	m²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
25yr - Outlet Culvert Backwater Effects Check

Comments: Confirm no backwater effects in outlet culvert as a result of IGMD tailwaterss

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	340.50	m	Headwater Depth/Height	0.71	
Computed Headwater Eleva	339.88	m	Discharge	0.1550	m³/s
Inlet Control HW Elev.	339.81	m	Tailwater Elevation	339.81	m
Outlet Control HW Elev.	339.88	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.45	m	Downstream Invert	339.00	m
Length	84.00	m	Constructed Slope	0.005357	m/m

Hydraulic Profile					
Profile	CompositePressureProfileS1		Depth, Downstream	0.81	m
Slope Type	N/A		Normal Depth	0.24	m
Flow Regime	Subcritical		Critical Depth	0.25	m
Velocity Downstream	0.53	m/s	Critical Slope	0.004594	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	339.88	m	Upstream Velocity Head	0.03	m
Ke	0.20		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	339.81	m	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	0.3	m²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
50yr - Outlet Culvert Backwater Effects Check

Comments: Confirm no backwater effects in outlet culvert as a result of IGMD tailwaterss

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	340.60	m	Headwater Depth/Height	0.97	
Computed Headwater Eleva	340.04	m	Discharge	0.2200	m³/s
Inlet Control HW Elev.	339.91	m	Tailwater Elevation	339.91	m
Outlet Control HW Elev.	340.04	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.45	m	Downstream Invert	339.00	m
Length	84.00	m	Constructed Slope	0.005357	m/m

Hydraulic Profile					
Profile	CompositePressureProfileS1		Depth, Downstream	0.91	m
Slope Type	N/A		Normal Depth	0.29	m
Flow Regime	Subcritical		Critical Depth	0.30	m
Velocity Downstream	0.75	m/s	Critical Slope	0.004858	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	340.04	m	Upstream Velocity Head	0.03	m
Ke	0.20		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	339.91	m	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	0.3	m²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

SOUTH SWMF (SWMF2)

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number:	35056-104
Date:	January 30, 2023
Design By:	AJC
File:	Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_Revised Submission.xlsx

MOE VOLUME REQUIREMENTS - SOUTH SWMF

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)	Imperviousness (%)
19.44	52.9

Interpolated Storage Volume Requirement (m^3/ha)

184.84

Permanent Pool Required (m^3)

2816

Extended Detention Volume Required (m^3)

778

Table 3.2 Water Quality Storage Requirements based on Receiving Waters (from MOE Stormwater Management Planning and Design Manual, March 2003)

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

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

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STAGE-STORAGE RELATIONSHIP - SOUTH SWMF

Stage	Active Depth	Forebay			Main Pond			Active Storage Volume	Volume Summary	Ponding Elevation	Comments	Stage
		Area	Volume	Cumulative Volume	Area	Volume	Cumulative Volume					
m	*m*	m^2	m^3	m^3	m^2	m^3	m^3	m^3	m^3	*m*		*m*
339.20		1126.00	0.00	0	2314	0	0				**Bottom of Pond**	339.20
339.30		1184.00	116	116	2401	236	236					339.30
339.40		1243.00	122	238	2488	245	481					339.40
339.50		1303.00	128	366	2577	254	735					339.50
339.60		1363.00	134	500	2666	263	998					339.60
339.70		1424.00	140	640	2756	272	1270					339.70
339.80		1486.00	146	786	2846	281	1551					339.80
339.90		1548.00	152	938	2939	290	1841					339.90
340.00		1612	159	1097	3031	299	2140					340.00
340.10		1676	165	1262	3125	308	2448					340.10
340.20		1762	172	1434	3253	319	2767					340.20
340.30		1852	181	1615	3383	332	3099					340.30
340.40		1942	190	1805	3515	345	3444					340.40
340.50		2035	199	2004	3649	359	3803					340.50
340.60		2130	209	2213	3785	372	4175					340.60
340.70		2230	219	2432	3945	387	4562				**Permanent Pool**	340.70
340.70	*0.00*				*6175*		*6994*	*0*				*340.70*
340.80	0.10				6412	518	7512	518				340.80
340.90	0.20				6651	654	8166	1172	778	340.84	MOE Extended Detention	340.90
341.00	0.30				6893	678	8844	1850				341.00
341.10	0.40				7138	702	9546	2552	2209	341.05	25mm4hr	341.10
341.20	0.50				7493	732	10278	3284				341.20
341.30	0.60				7675	759	11037	4043	3723	341.26	2yr	341.30
341.40	0.70				7786	774	11811	4817	4701	341.39	5yr	341.40
341.50	0.80				7899	785	12596	5602	5749	341.52	10yr	341.50
341.60	0.90				8011	796	13392	6398	7162	341.70	25yr	341.60
341.70	1.00				8125	807	14199	7205				341.70
341.80	1.10				8238	819	15018	8024	8262	341.83	50yr	341.80
341.90	1.20				8353	830	15848	8854	9215	341.94	100yr	341.90
342.00	1.30				8467	842	16690	9696				342.00
342.10	1.40				8582	853	17543	10549				342.10
342.20	1.50				8698	865	18408	11414				342.20
342.30	1.60				8814	876	19284	12290				342.30
342.40	1.70				8931	888	20172	13178				342.40
342.50	1.80				9049	900	21072	14078				342.50
342.60	1.90				9166	911	21983	14989				342.60
342.70	2.00				9284	923	22906	15912				342.70
342.80	2.10				9403	935	23841	16847				342.80
342.90	2.20				9638	953	24794	17800				342.90
343.00	2.30				9880	976	25770	18776				343.00
343.10	2.40				10130	1001	26771	19777				343.10
343.20	2.50				10394	1027	27798	20804				343.20
343.30	2.60				10654	1053	28851	21857				343.30

Wilmot Woods
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Orifice Calculations

$Q_o=C_d*A_o*(2*g*H_o)^{0.5}$

	Orifice 1	Orifice 2
C_d	0.63	0.63
Invert (m)	340.70	500.00
Width (m)	0.000	0.000
Diameter/Height (m)	0.130	0.000
Type (H/V)	V	V

C_d	Description
0.63	Orifice Plate
0.80	Orifice Tube

Weir Calculations

$Q_w = 2/3*C_d*(2g)^{1/2}*L*H_w^{3/2} + 8/15*C_d*(2g)^{1/2}*\tan\theta*H_w^{5/2}$

	Weir 1	Weir 2	Weir 3
C_d	0.50	0.50	0.50
Invert (m)	340.90	341.80	343.00
Length (m)	0.400	1.400	5.000
Side Slope (H:V)	0	0	20
Side Slope (rad)	0.000	0.000	1.521

Cutout Weir	Internal Weir Wall	Overflow

STAGE-DISCHARGE RELATIONSHIP - SOUTH SWMF

Stage	Active Volume	Orifice 1			Orifice 2			Weir 1	Weir 2	Weir 3	Sub Total Flow	Total Flow	Comments
		Area	H_o	Flow	Area	H_o	Flow	Flow	Flow	Flow			
m	m^3	m^2	m	m^3/s	m^2	m	m^3/s	m^3/s	m^3/s	m^3/s		m^3/s	
340.70	0	0.00	0.00	0.0000	0.00	0.00	0.0000				0.0000	0.0000	Permanent Pool, Orifice 1 Starts
340.80	518	0.01	0.05	0.0068	0.00	0.00	0.0000				0.0068	0.0068	
340.90	1172	0.01	0.14	0.0136	0.00	0.00	0.0000	0.0000			0.0136	0.0136	Cutout Weir 1
341.00	1850	0.01	0.24	0.0180	0.00	0.00	0.0000	0.0187			0.0366	0.0366	
341.10	2552	0.01	0.34	0.0214	0.00	0.00	0.0000	0.0528			0.0743	0.0743	
341.20	3284	0.01	0.44	0.0244	0.00	0.00	0.0000	0.0970			0.1215	0.1215	
341.30	4043	0.01	0.54	0.0271	0.00	0.00	0.0000	0.1494			0.1765	0.1765	
341.40	4817	0.01	0.64	0.0295	0.00	0.00	0.0000	0.2088			0.2383	0.2383	
341.50	5602	0.01	0.74	0.0318	0.00	0.00	0.0000	0.2745			0.3062	0.3062	
341.60	6398	0.01	0.84	0.0338	0.00	0.00	0.0000	0.3459			0.3797	0.3797	
341.70	7205	0.01	0.94	0.0358	0.00	0.00	0.0000	0.4226			0.4584	0.4584	
341.80	8024	0.01	1.04	0.0377	0.00	0.00	0.0000	0.5043	0.0000		0.5419	0.5419	Internal Weir Wall
341.90	8854	0.01	1.14	0.0395	0.00	0.00	0.0000	0.5906	0.0654		0.6954	0.6954	
342.00	9696	0.01	1.24	0.0412	0.00	0.00	0.0000	0.6814	0.1849		0.9074	0.9074	
342.10	10549	0.01	1.34	0.0428	0.00	0.00	0.0000	0.7764	0.3397		1.1588	1.1588	
342.20	11414	0.01	1.44	0.0444	0.00	0.00	0.0000	0.8754	0.5229		1.4427	1.4427	
342.30	12290	0.01	1.54	0.0459	0.00	0.00	0.0000	0.9783	0.7308		1.7550	1.7550	
342.40	13178	0.01	1.64	0.0474	0.00	0.00	0.0000	1.0850	0.9607		2.0930	2.0930	
342.50	14078	0.01	1.74	0.0488	0.00	0.00	0.0000	1.1953	1.2106		2.4547	2.4547	
342.60	14989	0.01	1.84	0.0502	0.00	0.00	0.0000	1.3091	1.4791		2.8383	2.8383	
342.70	15912	0.01	1.94	0.0515	0.00	0.00	0.0000	1.4263	1.7649		3.2427	3.2427	
342.80	16847	0.01	2.04	0.0528	0.00	0.00	0.0000	1.5467	2.0671		3.6667	3.6667	
342.90	17800	0.01	2.14	0.0541	0.00	0.00	0.0000	1.6704	2.3848		4.1093	4.1093	
343.00	18776	0.01	2.24	0.0554	0.00	0.00	0.0000	1.7973	2.7172	0.0000	4.5699	4.5699	Emergency Overflow
343.10	19777	0.01	2.34	0.0566	0.00	0.00	0.0000	1.9272	3.0639	0.3082	5.3558	5.3558	
343.20	20804	0.01	2.44	0.0578	0.00	0.00	0.0000	2.0601	3.4241	1.0829	6.6249	6.6249	
343.30	21857	0.00	2.54	0.0000	0.00	0.00	0.0000	2.1959	3.7975	2.3776	8.3709	8.3709	

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FALLING HEAD DRAWDOWN CALCULATION - SOUTH SWMF
MOE SWM Planning and Design Manual, 2003

$$t = \frac{0.66C_2h^{1.5} + 2C_3h^{0.5}}{2.75A_O}$$ Equation 4.11

where

t =	93529.8716	*s*	
	26.0	*hr*	drawdown time
A_p =	6353.275	m^2	surface area of the pond
C =	0.63		discharge coefficient
d =	130	*mm*	diameter of the orifice
A_O =	0.01327323	m^2	cross-sectional area of the orifice
g =	9.81	m/s^2	gravitational acceleration constant
h_1 =	340.84	*m*	starting water elevation above the orifice
h_2 =	340.77	*m*	ending water elevation above the orifice
h =	0.075	*m*	maximum water elevation above the orifice
C_2 =	2393		slope coefficient from the area-depth linear regression
C_3 =	6173.8		intercept from the area-depth linear regression

	ELEVATION *m*	STAGE *m*	AREA m^2	COMMENTS
1	340.70	0	6175	Permanent pool
2	340.80	0.1	6412	
3	340.90	0.2	6651	Extended detention
4	341.00	0.3	6893	

DRAWDOWN TIME: 93530 *s*
26.0 *hr*

Regression Output:

m_1 =	2393.00	slope coefficient from the area-depth linear regression
b =	6173.80	intercept from the area-depth linear regression
se_1 =	7.94	standard error for coefficient m_1
se_b =	1.48	standard error for constant b
R^2 =	1.0000	coefficient of determination
se_y =	1.77	standard error of the *y* estimate
F =	90896.02	F statistic
df =	2	degrees of freedom
ss_{reg} =	286322	regression sum of squares
ss_{resid} =	6	residual sum of squares

Wilmot Woods

STORMWATER MANAGEMENT

New Hamburg, Ontario

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STAGE DISCHARGE DRAWDOWN CALCULATION (25mm-4hr) - SOUTH

Stage	Elevation *m*	Discharge m^3/s	Volume m^3	Comments
1	340.700	0.0000	0.0	
2	340.800	0.0068	518.0	
3	340.900	0.0136	1172.0	
4	341.000	0.0366	1850.0	
5	341.100	0.0743	2552.0	
6	341.200	0.1215	3284.0	
7	341.300	0.1765	4043.0	
8	341.400	0.2383	4817.0	
9	341.500	0.3062	5602.0	
10	341.600	0.3797	6398.0	
11	341.700	0.4584	7205.0	
12	341.800	0.5419	8024.0	
13	341.900	0.6954	8854.0	
14	342.000	0.9074	9696.0	
15	342.100	1.1588	10549.0	
16	342.200	1.4427	11414.0	
17	342.300	1.7550	12290.0	

h_1 =	341.05	*m*	starting elevation
h_2 =	340.70	*m*	bottom elevation
V =	2209	m^3	starting volume
t =	5.0	*min*	time step

Drawdown Time = 50.42 *hrs*

35 *mm* remaining
183.2 m^3 remaining

Remaining after:	m^3	*mm*
12 *hrs*	1084	187
24 *hrs*	641	119
36 *hrs*	364	70
48 *hrs*	206	40
72 *hrs*	66	13

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

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FOREBAY DESIGN CALCULATIONS - SOUTH SWMF

MOE SWM Planning and Design Manual, 2003

Forebay Design Flows

Flow into forebay during the 1:5-year return period event (STM Design Sheet)	2.510	m^3/s
Flow into forebay during the 25 mm - 4 hour design storm event	1.711	m^3/s
Peak flow from main pond outlet for the 25mm design storm (from SWMHYMO)	0.067	m^3/s

Forebay Characteristics

b =	15.0	*m*	bottom width
y =	1.5	*m*	depth
z =	3	:1	side slope
w =	19.5	*m*	average width
R =	1.19	*m*	hydraulic radius
A =	29.3	m^2	cross-sectional area

1. Length Calculation Based on Settling Velocity

L = forebay flow length *(m)*
r = length-to-width ratio
Q_p = peak flow rate through forebay (m^3/s)
v_s = settling velocity *(m/s)*

Equation 4.5: Forebay Settling Length

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

Q_p =	1.71	m^3/s	peak flow rate through forebay
v_s =	0.0055	*m/s*	settling velocity
r =	0.82		length-to-width ratio
L =	16.0	*m*	required settling length
L =	*16.0*	*m*	*trial length*

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

Q_p =	0.067	m^3/s	peak flow rate through forebay
v_s =	0.0003	*m/s*	settling velocity
r =	0.59		length-to-width ratio
L =	11.5	*m*	required settling length
L =	*11.5*	*m*	*trial length*

Table 1: Average settling velocities

	Mass Removed	Particle Size Range	Average Settling Velocity
	%	µm	m/s
	80 - 100	x ≤ 20	0.00000254
Enhanced:	70 - 80	20 < x ≤ 40	0.00001300
Normal:	60 - 70	40 < x ≤ 60	0.00002540
Basic:	40 - 60	60 < x ≤ 130	0.00012700
Medium Sand:	20 - 40	130 < x ≤ 400	0.00059267
Gross Grit:	0 - 20	400 < x ≤ 4000	0.00550333

2. Length Calculation Based on Flow Dispersion Length

Q =	2.51	m^3/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 =	26.8	m	required length of dispersion

Equation 4.6: Dispersion Length

3. Required Forebay Length

L =	**26.8**	***m***	**required design length**
L (actual) =	**75.0**	***m***	
r (actual) =	3.85		design length-to-width ratio (typical minimum of 2.0)

4. Scour Velocity

v_s =	0.15	*m/s*	scour velocity (typical value = 0.15 *m/s*)
v =	**0.086**	***m/s***	**actual velocity**

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

5. Weir Flow From Forebay

L =	5	*m*	length of crest of weir
α =	1.65		coefficient
H =	0.5	*m*	head
Q =	2.92	$\boldsymbol{m^3/s}$	**discharge**

Equation 4.4: Weir Flow

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

6. Estimated Cleanout Frequencies

a) Forebay

Forebay volume	2432	m^3
Estimated TSS removal efficiency	50%	
Impervious level	52.9%	
Estimated annual sediment loading	1.8	m^3/ha
Contributing area	9.15	*ha*
Annual sediment volume	8	m^3/yr
Cleanout frequency for 33% volume reduction	**97.5**	***years***
Cleanout Volume	**802.6**	$\boldsymbol{m^3}$

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) Stormwater Management Pond

Wetpond volume (excluding forebay)	4562	m^3
Estimated TSS removal efficiency	30%	
Impervious level	52.9%	
Estimated annual sediment loading	1.8	m^3/ha
Contributing area	9.15	*ha*
Annual sediment volume	5	m^3/yr
Cleanout frequency for 33% volume reduction	**304.7**	***years***

SWMF2 CN CULVERT BACKWATER CHECKS

Culvert Calculator Report
CN Culvert - Post-Dev 25mm Storm

Comments: Confirm Ponding Elevation in SWMF is higher than headwater elevation at CN Culvert to ensure no backwater effects 25mm4hr event

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	341.05	m	Headwater Depth/Height	0.24	
Computed Headwater Elev	339.72	m	Discharge	0.0740	m³/s
Inlet Control HW Elev.	339.70	m	Tailwater Elevation	339.35	m
Outlet Control HW Elev.	339.72	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.50	m	Downstream Invert	339.30	m
Length	19.70	m	Constructed Slope	0.010102	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.15	m
Slope Type	Mild		Normal Depth	0.17	m
Flow Regime	Subcritical		Critical Depth	0.15	m
Velocity Downstream	1.02	m/s	Critical Slope	0.014036	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	339.72	m	Upstream Velocity Head	0.04	m
Ke	0.20		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	339.70	m	Flow Control	N/A	
Inlet Type	Beveled ring, 45° (1:1) bevels		Area Full	0.7	m²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	A	
C	0.03000		Equation Form	1	
Y	0.74000				

Culvert Calculator Report
CN Culvert - Post-Dev 2yr

Comments: Confirm Ponding Elevation in SWMF is higher than headwater elevation at CN Culvert to ensure no backwater effects 2yr event

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	341.26	m	Headwater Depth/Height	0.33	
Computed Headwater Elev	339.81	m	Discharge	0.1410	m³/s
Inlet Control HW Elev.	339.79	m	Tailwater Elevation	339.39	m
Outlet Control HW Elev.	339.81	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.50	m	Downstream Invert	339.30	m
Length	19.70	m	Constructed Slope	0.010102	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.21	m
Slope Type	Mild		Normal Depth	0.23	m
Flow Regime	Subcritical		Critical Depth	0.21	m
Velocity Downstream	1.21	m/s	Critical Slope	0.013422	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	339.81	m	Upstream Velocity Head	0.06	m
Ke	0.20		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	339.79	m	Flow Control	N/A	
Inlet Type	Beveled ring, 45° (1:1) bevels		Area Full	0.7	m²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	A	
C	0.03000		Equation Form	1	
Y	0.74000				

Culvert Calculator Report
CN Culvert - Post-Dev 5yr

Comments: Confirm Ponding Elevation in SWMF is higher than headwater elevation at CN Culvert to ensure no backwater effects 5yr event

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	341.39	m	Headwater Depth/Height	0.48	
Computed Headwater Elev	339.94	m	Discharge	0.2850	m³/s
Inlet Control HW Elev.	339.92	m	Tailwater Elevation	339.49	m
Outlet Control HW Elev.	339.94	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.50	m	Downstream Invert	339.30	m
Length	19.70	m	Constructed Slope	0.010102	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.31	m
Slope Type	Mild		Normal Depth	0.33	m
Flow Regime	Subcritical		Critical Depth	0.31	m
Velocity Downstream	1.48	m/s	Critical Slope	0.013312	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	339.94	m	Upstream Velocity Head	0.09	m
Ke	0.20		Entrance Loss	0.02	m

Inlet Control Properties					
Inlet Control HW Elev.	339.92	m	Flow Control	N/A	
Inlet Type	Beveled ring, 45° (1:1) bevels		Area Full	0.7	m²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	A	
C	0.03000		Equation Form	1	
Y	0.74000				

Culvert Calculator Report
CN Culvert - Post-Dev 10yr

Comments: Confirm Ponding Elevation in SWMF is higher than headwater elevation at CN Culvert to ensure no backwater effects 10yr event

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	341.52	m	Headwater Depth/Height	0.59	
Computed Headwater Elev	340.04	m	Discharge	0.4100	m³/s
Inlet Control HW Elev.	340.01	m	Tailwater Elevation	339.55	m
Outlet Control HW Elev.	340.04	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.50	m	Downstream Invert	339.30	m
Length	19.70	m	Constructed Slope	0.010102	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.37	m
Slope Type	Mild		Normal Depth	0.40	m
Flow Regime	Subcritical		Critical Depth	0.37	m
Velocity Downstream	1.65	m/s	Critical Slope	0.013620	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	340.04	m	Upstream Velocity Head	0.11	m
Ke	0.20		Entrance Loss	0.02	m

Inlet Control Properties					
Inlet Control HW Elev.	340.01	m	Flow Control	N/A	
Inlet Type	Beveled ring, 45° (1:1) bevels		Area Full	0.7	m²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	A	
C	0.03000		Equation Form	1	
Y	0.74000				

Culvert Calculator Report
CN Culvert - Post-Dev 25yr

Comments: Confirm Ponding Elevation in SWMF is higher than headwater elevation at CN Culvert to ensure no backwater effects 25yr event

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	341.70	m	Headwater Depth/Height	0.72	
Computed Headwater Elev	340.16	m	Discharge	0.5870	m³/s
Inlet Control HW Elev.	340.12	m	Tailwater Elevation	339.66	m
Outlet Control HW Elev.	340.16	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.50	m	Downstream Invert	339.30	m
Length	19.70	m	Constructed Slope	0.010102	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.45	m
Slope Type	Mild		Normal Depth	0.50	m
Flow Regime	Subcritical		Critical Depth	0.45	m
Velocity Downstream	1.85	m/s	Critical Slope	0.014362	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	340.16	m	Upstream Velocity Head	0.13	m
Ke	0.20		Entrance Loss	0.03	m

Inlet Control Properties					
Inlet Control HW Elev.	340.12	m	Flow Control	N/A	
Inlet Type	Beveled ring, 45° (1:1) bevels		Area Full	0.7	m²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	A	
C	0.03000		Equation Form	1	
Y	0.74000				

Culvert Calculator Report
CN Culvert - Post-Dev 50yr

Comments: Confirm Ponding Elevation in SWMF is higher than headwater elevation at CN Culvert to ensure no backwater effects 50yr event

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	341.83	m	Headwater Depth/Height	0.83	
Computed Headwater Elev	340.26	m	Discharge	0.7540	m³/s
Inlet Control HW Elev.	340.22	m	Tailwater Elevation	339.76	m
Outlet Control HW Elev.	340.26	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.50	m	Downstream Invert	339.30	m
Length	19.70	m	Constructed Slope	0.010102	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.51	m
Slope Type	Mild		Normal Depth	0.58	m
Flow Regime	Subcritical		Critical Depth	0.51	m
Velocity Downstream	2.01	m/s	Critical Slope	0.015317	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	340.26	m	Upstream Velocity Head	0.15	m
Ke	0.20		Entrance Loss	0.03	m

Inlet Control Properties					
Inlet Control HW Elev.	340.22	m	Flow Control	N/A	
Inlet Type	Beveled ring, 45° (1:1) bevels		Area Full	0.7	m²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	A	
C	0.03000		Equation Form	1	
Y	0.74000				

Culvert Calculator Report
CN Culvert - Post-Dev 100yr

Comments: Confirm Ponding Elevation in SWMF is higher than headwater elevation at CN Culvert to ensure no backwater effects 100yr event

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	341.94	m	Headwater Depth/Height	1.03	
Computed Headwater Elev	340.45	m	Discharge	1.0470	m³/s
Inlet Control HW Elev.	340.39	m	Tailwater Elevation	339.88	m
Outlet Control HW Elev.	340.45	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.50	m	Downstream Invert	339.30	m
Length	19.70	m	Constructed Slope	0.010102	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.60	m
Slope Type	Mild		Normal Depth	0.77	m
Flow Regime	Subcritical		Critical Depth	0.60	m
Velocity Downstream	2.28	m/s	Critical Slope	0.017579	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	340.45	m	Upstream Velocity Head	0.18	m
Ke	0.20		Entrance Loss	0.04	m

Inlet Control Properties					
Inlet Control HW Elev.	340.39	m	Flow Control	N/A	
Inlet Type	Beveled ring, 45° (1:1) bevels		Area Full	0.7	m²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	A	
C	0.03000		Equation Form	1	
Y	0.74000				

Culvert Calculator Report
CN Culvert - Post-Dev Regional

Comments: Confirm Ponding Elevation in SWMF is higher than headwater elevation at CN Culvert to ensure no backwater effects Regional event

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	342.39	m	Headwater Depth/Height	2.95	
Computed Headwater Elev	342.20	m	Discharge	2.4640	m³/s
Inlet Control HW Elev.	341.56	m	Tailwater Elevation	340.10	m
Outlet Control HW Elev.	342.20	m	Control Type	Outlet Control	

Grades					
Upstream Invert	339.50	m	Downstream Invert	339.30	m
Length	19.70	m	Constructed Slope	0.010102	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.86	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.86	m
Velocity Downstream	3.84	m/s	Critical Slope	0.050150	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	342.20	m	Upstream Velocity Head	0.72	m
Ke	0.20		Entrance Loss	0.14	m

Inlet Control Properties					
Inlet Control HW Elev.	341.56	m	Flow Control	N/A	
Inlet Type	Beveled ring, 45° (1:1) bevels		Area Full	0.7	m²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	A	
C	0.03000		Equation Form	1	
Y	0.74000				

Drainage Area 202 OGS

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

02/06/2023

Province:	Ontario
City:	New Hamburg
Nearest Rainfall Station:	WATERLOO WELLINGTON AP
Climate Station Id:	6149387
Years of Rainfall Data:	34

Site Name:	202

Drainage Area (ha):	0.64
% Imperviousness:	70.00

Runoff Coefficient 'c': 0.72

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	50.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	17.46
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Wilmot Woods
Project Number:	35056-104
Designer Name:	Alex Cressman
Designer Company:	MTE Consultants Inc.
Designer Email:	acressman@mte85.com
Designer Phone:	519-743-6500
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	54
EFO6	61
EFO8	65
EFO10	67
EFO12	68

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 54

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	0.64	38.0	32.0	70	6.0	6.0
1	18.3	26.8	1.28	77.0	64.0	67	12.3	18.3
2	14.4	41.3	2.56	154.0	128.0	61	8.8	27.1
3	10.2	51.5	3.84	231.0	192.0	55	5.6	32.7
4	8.0	59.5	5.12	307.0	256.0	53	4.2	36.9
5	6.9	66.4	6.41	384.0	320.0	50	3.5	40.3
6	5.9	72.3	7.69	461.0	384.0	49	2.9	43.2
7	3.8	76.1	8.97	538.0	448.0	47	1.8	45.0
8	2.6	78.7	10.25	615.0	512.0	45	1.2	46.1
9	2.5	81.1	11.53	692.0	576.0	43	1.1	47.2
10	2.2	83.3	12.81	769.0	641.0	42	0.9	48.1
11	2.5	85.8	14.09	845.0	705.0	42	1.0	49.1
12	2.0	87.8	15.37	922.0	769.0	41	0.8	50.0
13	1.6	89.4	16.65	999.0	833.0	41	0.7	50.6
14	0.9	90.4	17.93	1076.0	897.0	41	0.4	51.0
15	1.6	91.9	19.22	1153.0	961.0	40	0.6	51.6
16	1.1	93.0	20.50	1230.0	1025.0	40	0.4	52.1
17	1.0	94.0	21.78	1307.0	1089.0	39	0.4	52.5
18	0.5	94.6	23.06	1384.0	1153.0	38	0.2	52.7
19	0.2	94.8	24.34	1460.0	1217.0	37	0.1	52.8
20	0.6	95.4	25.62	1537.0	1281.0	36	0.2	53.0
21	0.6	96.1	26.90	1614.0	1345.0	35	0.2	53.2
22	0.3	96.4	28.18	1691.0	1409.0	34	0.1	53.3
23	0.8	97.2	29.46	1768.0	1473.0	32	0.3	53.6
24	0.4	97.6	30.74	1845.0	1537.0	31	0.1	53.7
25	0.2	97.8	32.03	1922.0	1601.0	30	0.0	53.8
30	0.9	98.7	38.43	2306.0	1922.0	25	0.2	54.0
35	0.8	99.5	44.84	2690.0	2242.0	21	0.2	54.1
40	0.2	99.7	51.24	3074.0	2562.0	19	0.0	54.2
45	0.3	100.0	57.65	3459.0	2882.0	17	0.0	54.2
Estimated Net Annual Sediment (TSS) Load Reduction =								**54 %**

Climate Station ID: 6149387 *Years of Rainfall Data*: 34

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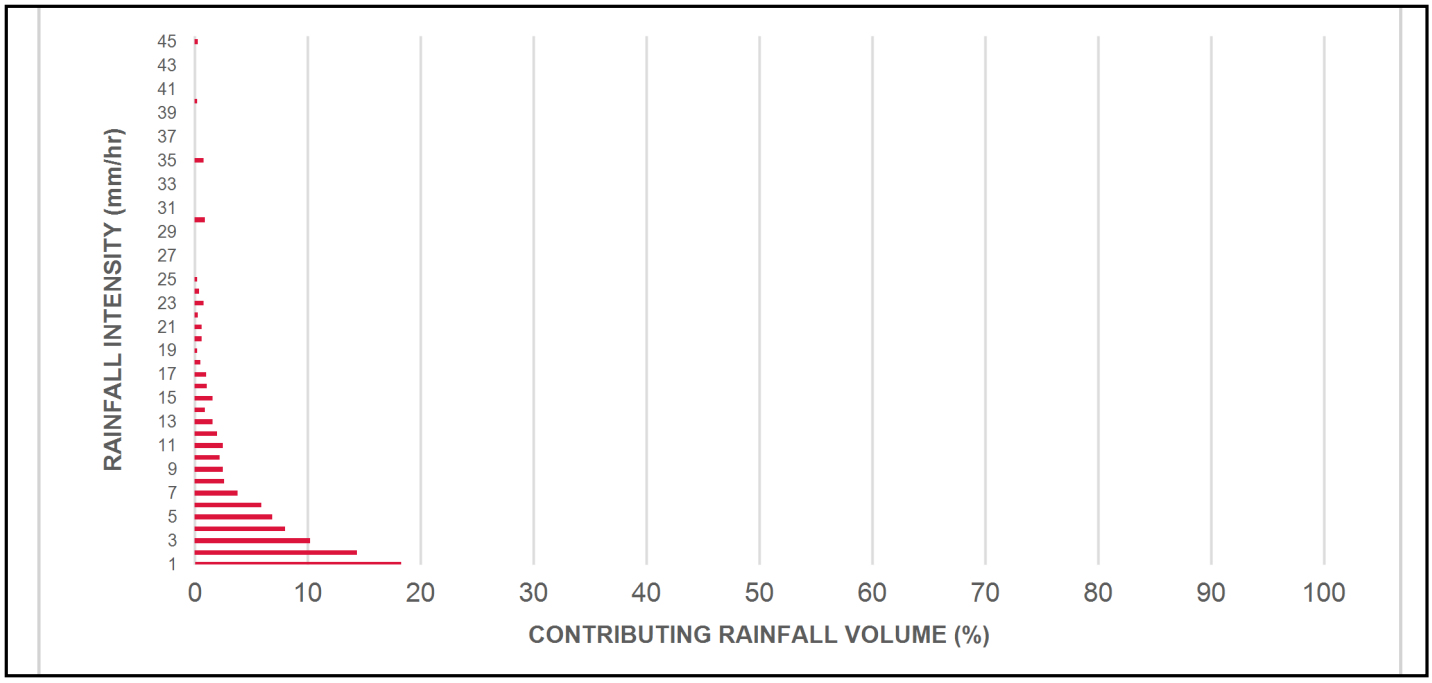
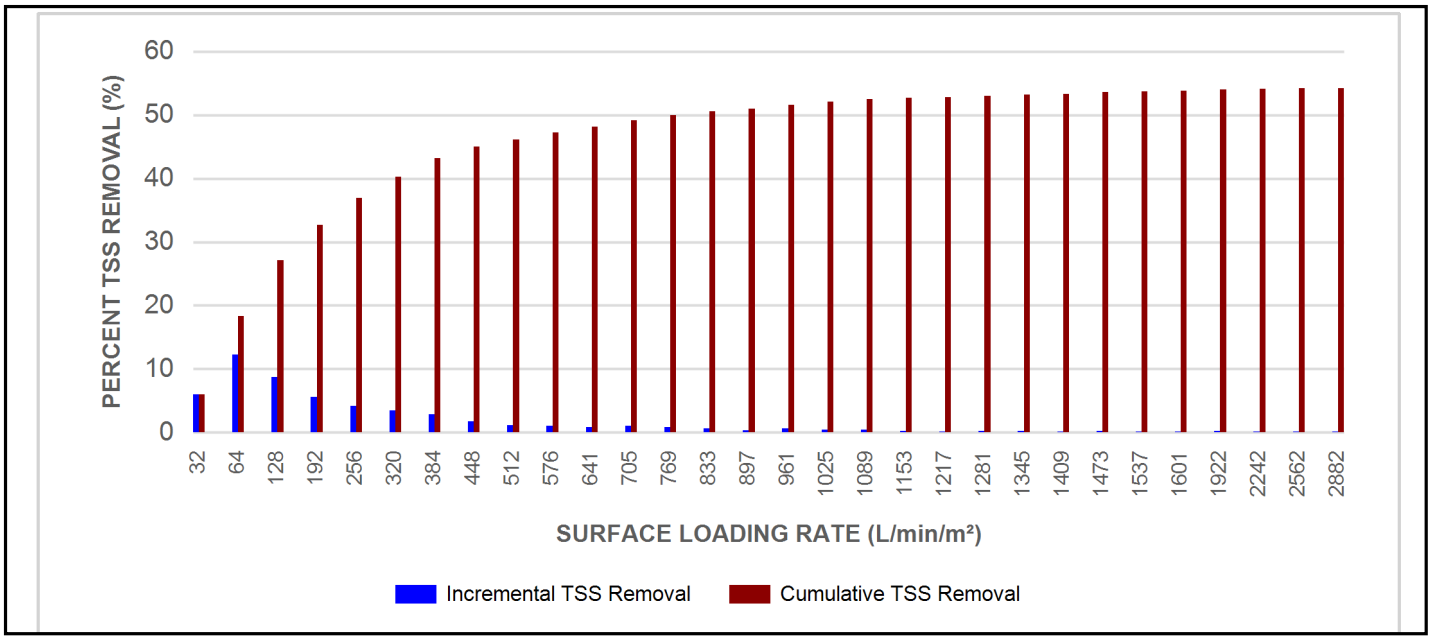
RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

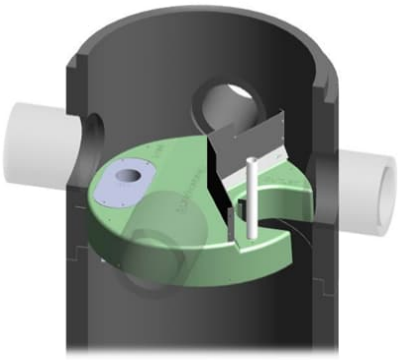
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

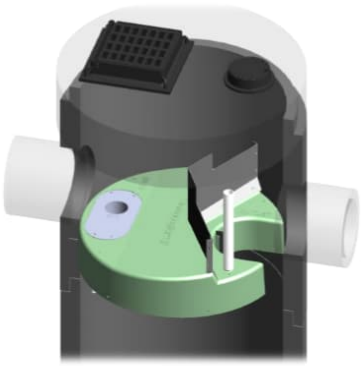
DESIGN FLEXIBILITY

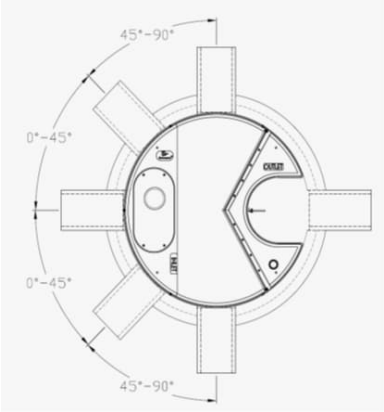
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24		

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Drainage Area 205 OGS + Infiltration Gallery

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                      Q:\35056\104\SWM\205 Gallery"
"                Output filename:                            25mm4hr205Infil.in"
"                Licensee name:                                              A"
"                Company                                                      "
"                Date & Time last used:                2/6/2023 at 3:03:18 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      509.000   Coefficient A"
"        6.000   Constant B"
"        0.799   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           71.966    mm/hr"
"             Total depth                 25.028    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   Catchment 205 to Infil"
"       70.000   % Impervious"
"        0.560   Total Area"
"       90.000   Flow length"
"        0.500   Overland Slope"
"        0.168   Pervious Area"
"       90.000   Pervious length"
"        0.500   Pervious slope"
"        0.392   Impervious Area"
"       90.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.142   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.806   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.053     0.000     0.000     0.000 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.168      0.392      0.560      hectare"
"             Time of concentration  97.354     7.757      14.063     minutes"
"             Time to Centroid       266.466    129.478    139.120    minutes"
"             Rainfall depth         25.028     25.028     25.028     mm"
"             Rainfall volume        42.05      98.11      140.15     c.m"
"             Rainfall losses        21.463     4.849      9.833      mm"
"             Runoff depth           3.565      20.179     15.195     mm"
"             Runoff volume          5.99       79.10      85.09      c.m"
"             Runoff coefficient     0.142      0.806      0.607      "
"             Maximum flow           0.000      0.053      0.053      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.053     0.053     0.000     0.000"
" 57          TRENCH Design d/s of 205"
"        0.053   Peak inflow"
"       85.090   Hydrograph volume"
"      340.200   Ground elevation"
"      338.000   Downstream trench invert"
"        1.000   Trench height"
"      337.000   Water table elevation"
"        4.000   Trench top width"
"        4.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       40.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"       35.000   Trench length"
"        1.000   Include base width"
"          21.   Number of stages"
"                  Level Discharge    Volume"
"                338.000     0.000       0.0"
"                338.110     0.000       6.2"
"                338.220     0.000      12.3"
"                338.330     0.000      18.5"
"                338.440     0.000      24.6"
"                338.550     0.000      30.8"
"                338.660     0.000      37.0"
"                338.770     0.000      43.1"
"                338.880     0.000      49.3"
"                338.990     0.000      55.4"
"                339.100     0.175      56.1"
"                339.210     0.175      56.2"
"                339.320     0.175      56.4"
"                339.430     0.175      56.5"
"                339.540     0.175      56.6"
"                339.650     0.175      56.7"
"                339.760     0.175      56.9"
"                339.870     0.175      57.0"
"                339.980     0.175      57.1"
"                340.090     0.175      57.2"
"                340.200     0.175      57.4"
"           1.   MANHOLE"
```

```
"                Access"
"              diameter"
"                 1.200"
"             Peak outflow                  0.000    c.m/sec"
"             Outflow volume                0.003    c.m"
"             Peak exfiltration             0.003    c.m/sec"
"             Exfiltration volume          85.077    c.m"
"             Maximum level               338.968    metre"
"             Maximum storage              54.204    c.m"
"             Centroidal lag                6.190   hours"
"             Infiltration area 2 sides    67.755   sq.metre"
"             Infiltration Base area      140.000   sq.metre"
"                  0.053     0.053     0.000     0.003 c.m/sec"
" 38          START/RE-START TOTALS 205"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.560    hectare"
"             Total Impervious area                     0.392    hectare"
"             Total % impervious                       70.000"
" 19          EXIT"
```

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

02/06/2023

Province:	Ontario
City:	New Hamburg
Nearest Rainfall Station:	WATERLOO WELLINGTON AP
Climate Station Id:	6149387
Years of Rainfall Data:	34

Site Name:	205

Drainage Area (ha):	0.56
% Imperviousness:	70.00

Runoff Coefficient 'c': 0.72

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	50.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	15.28
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Wilmot Woods
Project Number:	35056-104
Designer Name:	Alex Cressman
Designer Company:	MTE Consultants Inc.
Designer Email:	acressman@mte85.com
Designer Phone:	519-743-6500
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	56
EFO6	62
EFO8	66
EFO10	68
EFO12	69

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 56

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	0.56	34.0	28.0	70	6.0	6.0
1	18.3	26.8	1.12	67.0	56.0	69	12.6	18.6
2	14.4	41.3	2.24	135.0	112.0	62	8.9	27.5
3	10.2	51.5	3.36	202.0	168.0	57	5.9	33.3
4	8.0	59.5	4.48	269.0	224.0	53	4.3	37.6
5	6.9	66.4	5.60	336.0	280.0	52	3.6	41.2
6	5.9	72.3	6.73	404.0	336.0	50	2.9	44.1
7	3.8	76.1	7.85	471.0	392.0	48	1.8	45.9
8	2.6	78.7	8.97	538.0	448.0	47	1.2	47.2
9	2.5	81.1	10.09	605.0	504.0	45	1.1	48.3
10	2.2	83.3	11.21	673.0	560.0	43	0.9	49.2
11	2.5	85.8	12.33	740.0	616.0	42	1.0	50.3
12	2.0	87.8	13.45	807.0	673.0	42	0.8	51.1
13	1.6	89.4	14.57	874.0	729.0	41	0.7	51.8
14	0.9	90.4	15.69	942.0	785.0	41	0.4	52.1
15	1.6	91.9	16.81	1009.0	841.0	41	0.6	52.8
16	1.1	93.0	17.93	1076.0	897.0	41	0.4	53.2
17	1.0	94.0	19.06	1143.0	953.0	40	0.4	53.6
18	0.5	94.6	20.18	1211.0	1009.0	40	0.2	53.9
19	0.2	94.8	21.30	1278.0	1065.0	39	0.1	54.0
20	0.6	95.4	22.42	1345.0	1121.0	38	0.2	54.2
21	0.6	96.1	23.54	1412.0	1177.0	37	0.2	54.4
22	0.3	96.4	24.66	1480.0	1233.0	37	0.1	54.5
23	0.8	97.2	25.78	1547.0	1289.0	36	0.3	54.8
24	0.4	97.6	26.90	1614.0	1345.0	35	0.2	55.0
25	0.2	97.8	28.02	1681.0	1401.0	34	0.1	55.0
30	0.9	98.7	33.63	2018.0	1681.0	28	0.2	55.3
35	0.8	99.5	39.23	2354.0	1962.0	24	0.2	55.5
40	0.2	99.7	44.84	2690.0	2242.0	21	0.1	55.5
45	0.3	100.0	50.44	3026.0	2522.0	19	0.1	55.6
Estimated Net Annual Sediment (TSS) Load Reduction =								**56 %**

Climate Station ID: 6149387 *Years of Rainfall Data*: 34

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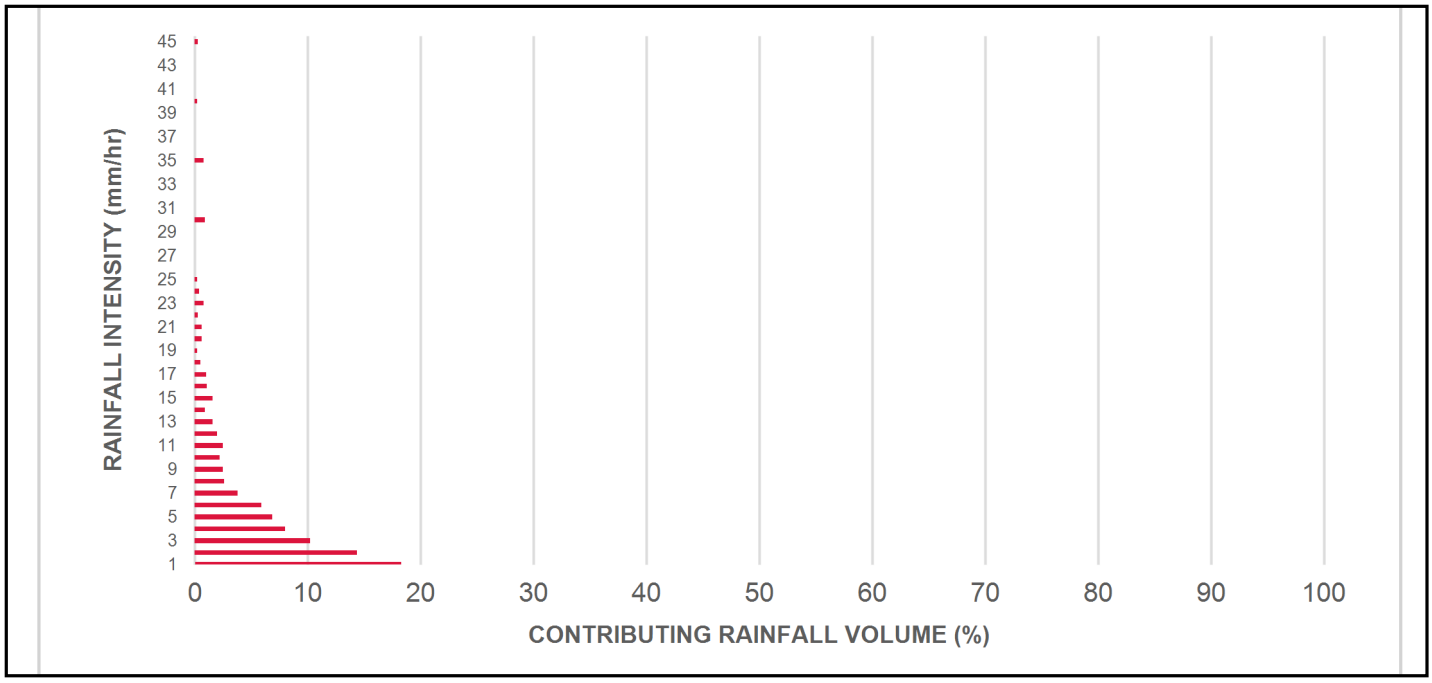
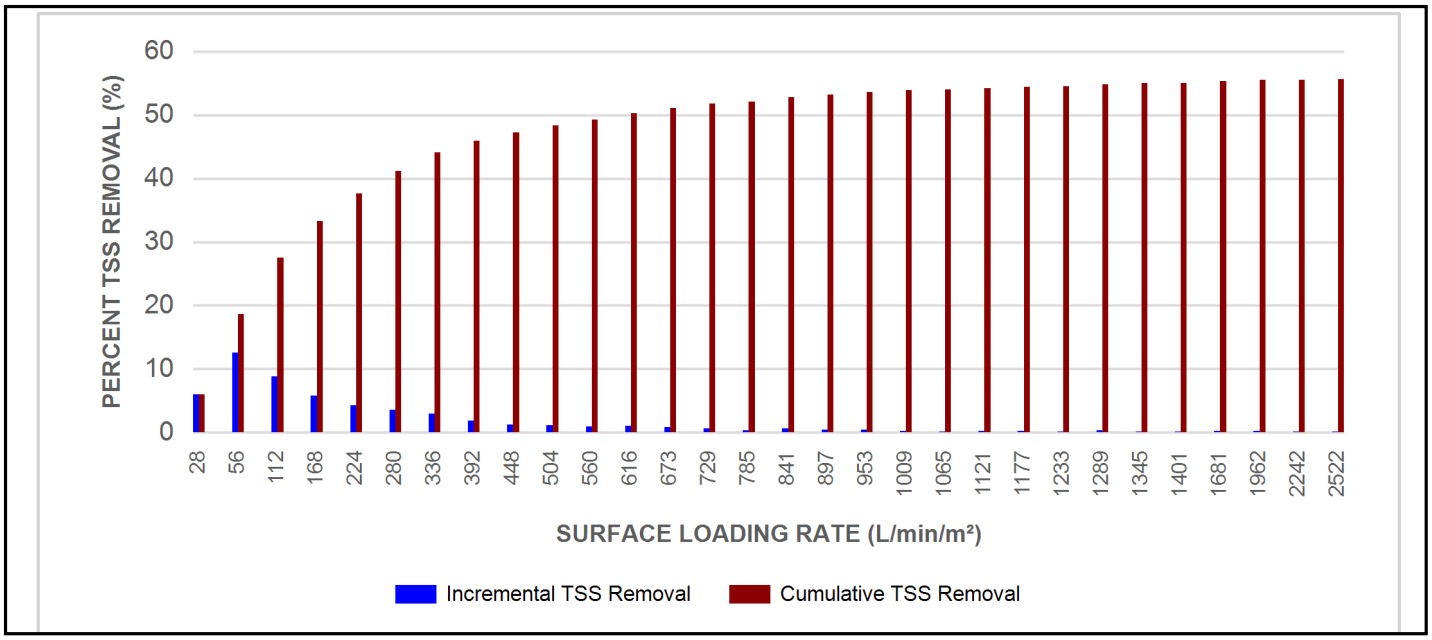
RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

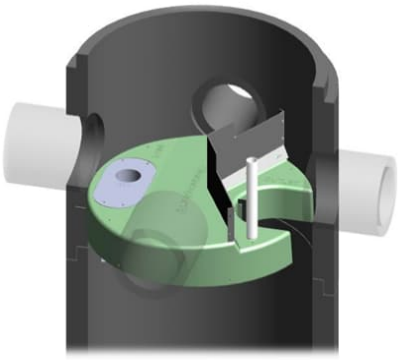
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

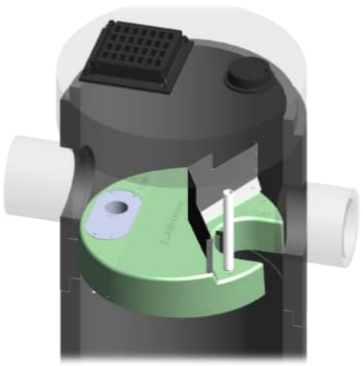
DESIGN FLEXIBILITY

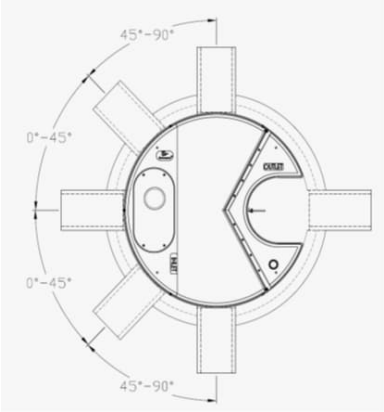
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24		

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

SC-740 Chamber

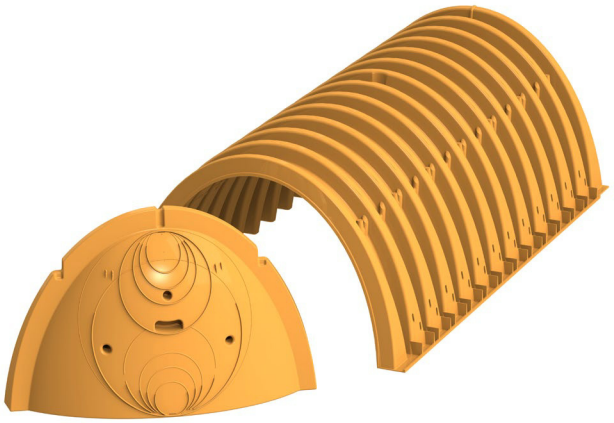
Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

StormTech SC-740 Chamber (not to scale)

Nominal Specifications

Size (Lx W x H)	85.4” x 51.0” x 30.0” (2,170 x 1,295 x 762 mm)
Chamber Storage	45.9 ft^3 (1.30 m^3)
Min. Installed Storage*	74.9 ft^3 (2.12 m^3)
Weight	74.0 lbs (33.6 kg)

*Assumes 6” (150 mm) stone above, below and between chambers and 40% stone porosity.

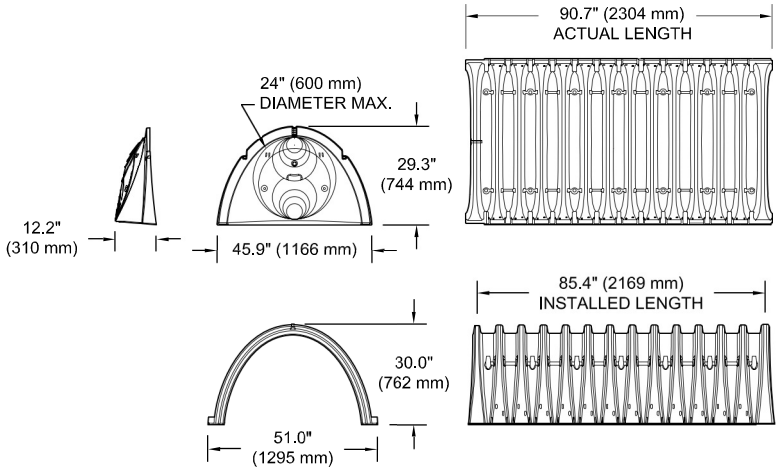


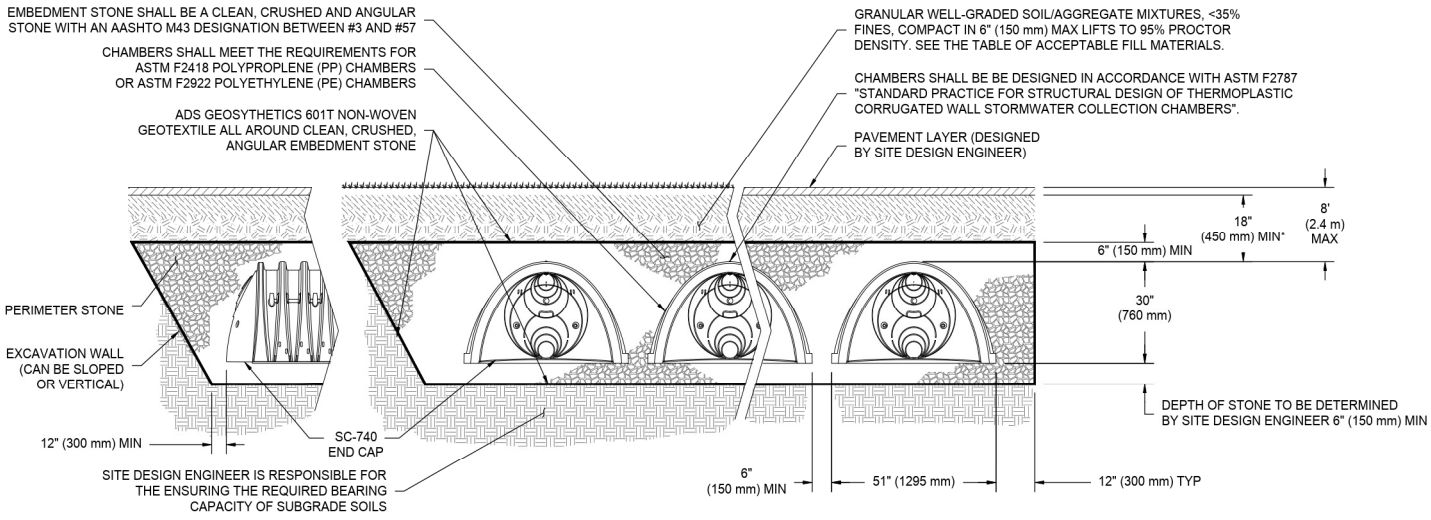
Shipping

30 chambers/pallet

60 end caps/pallet

12 pallets/truck





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

The installed chamber system shall provide the load factors specified in the aashto lrfd bridge design specifications section 12.12 for earth and live loads, with consideration for impact and multiple vehicle presences.

SC-740 Cumulative Storage Volumes per chamber
Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

Depth of Water in System in. (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
42 (1067)	45.90 (1.300)	74.90 (2.121)
41 (1041)	45.90 (1.300)	73.77 (2.089)
40 (1016)	45.90 (1.300)	72.64 (2.057)
39 (991)	45.90 (1.300)	71.52 (2.025)
38 (965)	45.90 (1.300)	70.39 (1.993)
37 (940)	45.90 (1.300)	69.26 (1.961)
36 (914)	45.90 (1.300)	68.14 (1.929)
35 (889)	45.85 (1.298)	66.98 (1.897)
34 (864)	45.69 (1.294)	65.75 (1.862)
33 (838)	45.41 (1.286)	64.46 (1.825)
32 (813)	44.81 (1.269)	62.97 (1.783)
31 (787)	44.01 (1.246)	w61.36 (1.737)
30 (762)	43.06 (1.219)	59.66 (1.689)
29 (737)	41.98 (1.189)	57.89 (1.639)
28 (711)	40.80 (1.155)	56.05 (1.587)
27 (686)	39.54 (1.120)	54.17 (1.534)
26 (660)	38.18 (1.081)	52.23 (1.479)
25 (635)	36.74 (1.040)	50.23 (1.422)
24 (610)	35.22 (0.977)	48.19 (1.365)
23 (584)	33.64 (0.953)	46.11 (1.306)
22 (559)	31.99 (0.906)	44.00 (1.246)
21 (533)	30.29 (0.858)	1.85 (1.185)
20 (508)	28.54 (0.808)	39.67 (1.123)
19 (483)	26.74 (0.757)	37.47 (1.061)
18 (457)	24.89 (0.705)	35.23 (0.997)
17 (432)	23.00 (0.651)	32.96 (0.939)
16 (406)	21.06 (0.596)	30.68 (0.869)
15 (381)	19.09 (0.541)	28.36 (0.803)
14 (356)	17.08 (0.484)	26.03 (0.737)
13 (330)	15.04 (0.426)	23.68 (0.670)
12 (305)	12.97 (0.367)	21.31 (0.608)
11 (279)	10.87 (0.309)	18.92 (0.535)
10 (254)	8.74 (0.247)	16.51 (0.468)
9 (229)	6.58 (0.186)	14.09 (0.399)
8 (203)	4.41 (0.125)	11.66 (0.330)
7 (178)	2.21 (0.063)	9.21 (0.264)
6 (152)	0 (0)	6.76 (0.191)
5 (127)	0 (0)	5.63 (0.160)
4 (102)	0 (0)	4.51 (0.128)
3 (76)	0 (0)	3.38 (0.096)
2 (51)	0 (0)	2.25 (0.064)
1 (25)	0 (0)	1.13 (0.032)

Stone Cover

Stone Foundation

Note: Add 1.13 ft³ (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber

ft³ (m³)	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
SC-740	45.9 (1.3)	74.9 (2.1)	81.7 (2.3)	88.4 (2.5)

Note: Assumes 6" (150 mm) stone above chambers, 6" (150 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

TONS (yds³)	Stone Foundation Depth		
	6	12	16
SC-740	3.8 (2.8)	4.6 (3.3)	5.5 (3.9)
KILOGRAMS (m³)	**150 mm**	**300 mm**	**450 mm**
SC-740	3,450 (2.1)	4,170 (2.5)	4,490 (3.0)

Note: Assumes 6" (150 mm) of stone above and between chambers.

Volume Excavation Per Chamber

yd³ (m³)	Stone Foundation Depth		
	6 (150)	12 (300)	18 (450)
SC-740	5.5 (4.2)	6.2 (4.7)	6.8 (5.2)

Note: Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. The volume of excavation will vary as depth of cover increases.

Appendix E

Ivan Gingerich Drain Flooplain Analysis Brief

Technical Memorandum

Project Name: Wilmot Woods Subdivision

MTE File No.: 35056-104

To: Trevor Heywood - GRCA

Date: October 28, 2022

cc: Paul Britton - MHBC
Jason Cabral - MTE

From: Alex Cressman, P. Eng.
Jeff Martens, P.Eng.

RE: WILMOT WOODS SUBDIVISION
Floodplain Analysis - Ivan Gingerich Municipal Drain

1.0 Introduction

MTE Consultants Inc. (MTE) was retained by Wilmot Woods Developments Inc. to complete a Stormwater Management (SWM) Report in support of a Plan of Subdivision application for a proposed residential subdivision in the Township of Wilmot. MTE prepared and submitted a SWM Report to the Township and the Grand River Conservation Authority (GRCA) in April, 2022. As part of the submission, a hydraulic model (HEC-RAS) was prepared of the Ivan Gingerich Municipal Drain (IGMD) to determine the regulatory floodplain and any impacts that the development may have on the floodplain.

Comments on the SWM submission were received from the GRCA on May 31, 2022. These comments indicated that a Floodplain Analysis Brief would be required for the subject lands, as a condition of approval and to support the delineation of the floodplain. This brief discusses the delineation of the floodplain in proximity to the subject lands, outlines constraints and boundary conditions, and summarizes impacts of the proposed development.

2.0 Background

2.1 Study Area

The Wilmot Woods subdivision lands, herein referred to as the ‘subject lands’, are located in the Town of New Hamburg. The lands are generally bounded by Waterloo Street to the north, agricultural lands to the east, the Canadian National (CN) railway corridor to the south, and the Forest Glen residential subdivision to the west. The IGMD bounds the northeastern limits of the subject lands. Refer to the Location Plan in **Figure 1.1**.

The IGMD is a municipal drainage channel located within the Town of New Hamburg. The drain begins east of Nafziger Road, flows west through agricultural lands (including the subject lands), and northwest under Waterloo Street. The IGMD ultimately outlets to the Nith River.

Generally, the study area consists of all lands that ultimately drain to the IGMD, from the lands east of Nafziger Road to the Nith River. The primary study area is the IGMD adjacent to the subject lands, between Waterloo Street and the eastern property boundary.

2.2 One-Zone Floodplain Policy

For the Grand River watershed, the Riverine Flooding Hazard is based on the greater of the Hurricane Hazel storm event (the Regional Storm) or the 100 year return period flood. The flood produces through these calculations is called the Regulatory Flood, the limits of which define the extend of the Riverine

Flooding Hazard. The GRCA has designated the Riverine Flooding Hazard associated with the IGMD as a One-Zone Policy area. Generally speaking, development will not be permitted within the Riverine Flooding Hazard for One-Zone Policy areas, however there are some exceptions.

Hydrologic and hydraulic analyses were carried out in this study to better determine the floodplain within the subject lands, following the *Technical Guide – River and Stream Systems: Flooding Hazard Limit* (MNR, 2002).

2.3 Evaluation of Road Alignment Alternatives through the IGMD Floodplain

The scale of the proposed subdivision including the size of the property and the total number of units warrants a minimum of two means of road access to satisfy emergency access policies and ensure appropriate distribution of traffic to the surrounding road network. Road access to Waterloo Street is available, however would require a road to be constructed within the floodplain associated with the IGMD. GRCA Policy 8.1.15 of O. Reg. 150/06, provides for consideration of public infrastructure (including roads) within a Riverine Flooding Hazard provided there is no feasible road alignment alternative located outside of the Riverine Flooding Hazard as determined through an Environmental Assessment of other “comprehensive plan” supported by the GRCA.

As such, a report titled *Evaluation of Road and Pedestrian Access Alternatives (*dated March 2022) was prepared and submitted as part of the complete subdivision application. The report evaluated five potential alignments of the proposed street through the IGMD floodplain to connect to Waterloo Street. Through this process, it was determined that the current proposed alignment (previously named Alternative 5), connecting Street Two to Waterloo Street at the extents of the floodplain, is the preferred alignment.

3.0 Hydrology

In order to generate flood elevations for the IGMD in the vicinity of the subject lands, design flow information is required via a hydrologic model of the IGMD watershed. As such, a separate hydrologic model (SWMMHYMO) was prepared.

3.1 Delineation of the Watershed

The delineation of the IGMD watershed was determined using GRCA mapping contours. The drainage areas are shown in **Appendix A**.

According to the MNR’s Technical Guide, future land use conditions need to be considered when establishing a floodplain. An ‘ultimate conditions’ land use and catchment area plan was prepared based on the current Township’s and Region’s Official Plan, and future planning and servicing scenarios. Typical residential and industrial land use hydrologic parameters were utilized for the determination of peak flow rates within the IGMD for a full development scenario of the contributing watershed.

It should be noted that per the current Region of Waterloo Official Plan, all upstream lands directed towards the IGMD are outside of the Township’s current Urban Boundary. For the purpose of this study, an average imperviousness of 60% is applied to these lands to reflect future potential residential land use. The existing Sir Adam Beck Public School was calculated to have an imperviousness of 28%, and it’s assumed that the imperviousness of the school block will be maintained. Following the Technical Guide, no stormwater management facilities were modelled in the hydrologic modelling in determining peak flow rates for the Regulatory flood event. Modelling parameters and the hydrologic model are provided in **Appendix A.**

3.2 Regulatory Flow Rates

The hydrologic model was run using both the 100-year and Regional storm events to determine the governing flow rates. The flows were confluenced at three locations to be implemented within the hydraulic model, located at the following stations:

- Station 2+241 – Section Q (uppermost reach of model)
- Station 1+625 – Section N (uppermost reach within subject lands)
- Station 0+760 – Downstream of Waterloo Street crossing

Table 3.1 below summarizes the hydrologic model's flows rates for various stations for both the 100-year and Regulatory events.

Table 3.1 – Hydrologic Modelling Peak Flow Summary

Section	Station (m)	Regional Storm Event Flow Rate (m^3/s)	100yr-12hr Storm Event Flow Rate (m^3/s)
Q	2+241	19.16	**29.53**
N	1+625	27.06	**36.82**
-	0+760	32.92	**41.16**

4.0 Hydraulics

Hydraulic modelling is a continuation of the ultimate goal of deriving flood elevations for a given area. The U.S. Army Corps of Engineers' River Analysis System (HEC-RAS) is software that allows for one-dimensional steady state and unsteady flow river hydraulics calculations. Once the flood discharge for the design storm has been determined (generated in the hydrologic analysis), the next step is to determine the profile of the water surface elevation along the channel. After the water surface elevations have been determined, the area covered by the floodplain is delineated. The lateral extent of the floodplain is determined by finding ground points on both sides of the creek that correspond to the flood profile (water surface elevations). The floodplain boundary is delineated by following the contour line that corresponds to the flood profile elevation for a particular area.

4.1 Study Area

The study area for the hydraulic analysis differs from that of the hydrologic study area. The hydraulic study area is only a portion of the hydrologic study area, in this case beginning at the confluence of the IGMD with the Nith River, and continuing upstream to the Nafziger Road crossing. Refer to **Figure 4.1.** The section of IGMD in the vicinity of the subject lands can be characterized by relatively flat sections, narrow channel widths, and typical agricultural vegetation in the floodplain.

4.2 Hydraulic Model

4.2.1 Cross Section Delineation

A total of 31 cross sections were modelled in the hydraulic analysis, including 17 primary channel sections labelled A to Q. A topographical survey of channel cross sections A to O was completed by MTE in January 2018, while the remaining cross section were interpolated using existing topographical

mapping. The most downstream section is located at Station 0+110, representing 110 m upstream of the confluence with the Nith River. The most upstream section Q is located at Station 2+241, representing the IGMD west of Nafziger Road. There are 4 culverts/crossings within the hydraulic model. These culverts/crossings were also a part of the topographical survey completed by MTE in 2018.

In addition to the lettered sections, 10 additional sections were added into the model generally consisting of stations adjacent to culverts in order to provide additional information. The location of all sections within the analysis is provided in **Figure 4.1**.

4.2.2 Crossing Locations and Culverts

The 4 culverts/crossings included within this analysis are as follows:

- Station 0+142.5 – 2.3m diameter corrugated metal pipe at Christner Road.
- Station 0+772.5 – 1.2m x 2.4 m concrete box culvert and 1.75m diameter corrugated metal pipe at Waterloo Street.
- Station 0+790 – 1.6m diameter corrugated metal pipe upstream of Waterloo Street (and ditch which outlets to concrete box culvert above).
- Station 1+377.5 – 1.8m diameter concrete pipe culvert at ex. agricultural laneway.

The top of roadway at the culvert crossings were modelled as broad-crested weirs when the flow rates caused the flood elevations to exceed these limits.

4.2.3 Boundary Conditions

The most recent version of the Nith River HEC-RAS model was provided by the GRCA on December 17, 2021.

In the hydraulic model, Section 65772 is located approximately 75m downstream of where the IGMD confluences with the Nith River. The Regional floodplain elevation at the Nith River at this section is 339.64m, and the 100-year elevation is 337.90m. For the purpose of this assessment, both of these elevations were used as starting water surface elevations to determine the governing floodplain elevations within the hydraulic study area of the IGMD.

4.2.4 Flow Change Locations

As previously stated in **Section 3.2**, 100-year and Regional storm event flow rates from the hydrologic model were confluenced at three locations to be implemented within the hydraulic model, located at the following stations:

- Station 2+241 – Section Q (uppermost reach of model)
- Station 1+625 – Section N (uppermost reach within subject lands)
- Station 0+760 – Downstream of Waterloo Street crossing

Two hydraulic models were prepared, one using the 100-year peak flow rates and the other using the Regional storm events flows. Since the Regional storm floodplain of the Nith River is significantly higher than the 100-year floodplain elevations, the Regional storm event based flood elevations between the Nith River and Waterloo Street (Stations 0+000 to 0+760) govern, and hence the Regulatory floodplain is based on the Regional storm event flows. As the culvert crossing of Waterloo Street does not have the capacity to pass either the 100-year or Regional flow rates by gravity, the roadway acts as an

overflow weir. This creates a backwater effect upstream and since the 100-year flow rates are greater than the Regional, the flood elevations based on the 100-year event governs. Therefore the Regulatory floodplain upstream of Waterloo Street is based on the 100-year storm event.

Table 4.1 below summarizes both the 100-year and Regional flow rates of the IGMD. Bolded flow rates are what govern the floodplain elevations.

Table 4.1 – IGMD Regulatory Flow Change Locations

Section	Station (m)	100yr-12hr Storm Event Flow Rate (m^3/s)	Regional Storm Event Flow Rate (m^3/s)
Q	2+241	**29.53**	19.16
N	1+625	**36.82**	27.06
-	0+760	41.16	**32.92**

4.3 Regulatory Floodplain

The limits of the Regulatory floodplain as it relates to the existing ground elevations are illustrated in **MTE Drawing 35056-104-EC1.1.** Refer to **Table 4.2** below for a summary of the Regulatory floodplain elevations and velocities at each section. The HEC-RAS modelling is provided in **Appendix B**.

Table 4.2 – Ivan Gingerich Floodplain Summary

Section	Station (m)	Floodplain Elevation (m)	Average Velocity (m/s)	Channel Velocity (m/s)
-	0+000	339.64	-	-
-	0+110	339.64	0.02	0.08
-	0+130	339.64	0.05	0.24
STA 0+142.5 – Christner Road culvert crossing				
-	0+155	339.64	0.06	0.28
-	0+190	339.64	0.06	0.26
A	0+330	339.64	0.08	0.35
B	0+545	339.65	0.18	0.76
-	0+725	339.67	0.19	0.63
-	0+760	339.62	2.34	2.63
STA 0+772.5 – Waterloo Street culvert crossing				
-	0+785	340.38	0.05	0.19
STA 0+790 – culvert upstream of Waterloo Street				
-	0+795	340.38	0.05	0.19
C	0+815	340.38	0.05	0.18
D	0+860	340.38	0.06	0.23

Section	Station (m)	Floodplain Elevation (m)	Average Velocity (m/s)	Channel Velocity (m/s)
E	0+895	340.38	0.06	0.25
F	0+950	340.39	0.14	0.63
G	1+005	340.40	0.14	0.63
H	1+085	340.44	0.25	1.05
I	1+140	340.54	0.72	2.49
J	1+240	341.08	0.71	2.14
K	1+340	341.51	0.97	2.57
-	1+370	341.88	0.36	1.30
STA 1+377.5 – agricultural road culvert crossing				
-	1+385	341.88	0.34	1.26
L	1+415	341.90	0.72	2.14
M	1+515	342.36	0.87	2.56
N	1+625	342.99	0.82	1.89
O	1+725	343.39	0.60	1.73
P	1+887	344.54	1.06	2.42
Q	2+241	346.82	0.61	1.61

It should be noted that the floodplain elevations for the sections upstream of the subject lands within the adjacent Cachet Lands (Sections P and Q) were delineated using the GRCA mapping contours.

4.4 Street Two and Impacts on Floodplain Elevation

An additional analysis of the Regulatory floodplain within the subject lands was performed to confirm that the development of the proposed Street Two within the floodplain does not significantly increase the floodplain elevation. **Table 4.3** below with a summary of the regulatory floodplain elevation changes as a result of Street Two and the subject lands' boundary grading.

Table 4.3 – Ivan Gingerich Floodplain Summary

Section	Station (m)	Regulatory Floodplain Elevation (m)	Floodplain Elevation with Street Two (m)	Difference (m)
-	0+000	339.64	339.64	0.00
-	0+110	339.64	339.64	0.00
-	0+130	339.64	339.64	0.00
STA 0+142.5 – Christner Road culvert crossing				
-	0+155	339.64	339.64	0.00

Section	Station (m)	Regulatory Floodplain Elevation (m)	Floodplain Elevation with Street Two (m)	Difference (m)
-	0+190	339.64	339.64	0.00
A	0+330	339.64	339.64	0.00
B	0+545	339.65	339.65	0.00
-	0+725	339.67	339.67	0.00
-	0+760	339.62	339.62	0.00
STA 0+772.5 – Waterloo Street culvert crossing				
-	0+785	340.38	340.39	+ 0.01
STA 0+790 – culvert upstream of Waterloo Street				
-	0+795	340.38	340.39	+ 0.01
C	0+815	340.38	340.39	+ 0.01
D	0+860	340.38	340.39	+ 0.01
E	0+895	340.38	340.39	+ 0.01
F	0+950	340.39	340.40	+ 0.01
G	1+005	340.40	340.41	+ 0.01
H	1+085	340.44	340.44	0.00
I	1+140	340.54	340.55	+ 0.01
J	1+240	341.08	341.07	- 0.01
K	1+340	341.51	341.51	0.00
-	1+370	341.88	341.88	0.00
STA 1+377.5 – agricultural road culvert crossing				
-	1+385	341.88	341.88	0.00
L	1+415	341.90	341.90	0.00
M	1+515	342.36	342.36	0.00
N	1+625	342.99	342.99	0.00
O	1+725	343.39	343.39	0.00
P	1+887	344.54	344.54	0.00
Q	2+241	346.82	346.82	0.00

The changes in floodplain elevations due to the construction of Street Two is considered negligible, with changes no more than 0.01 m in the impacted sections.

Refer to **Figure 4.2** for a depiction of the change in the regulatory floodplain as a result of development. Small amounts of ponding will occur within the Street Two and Charles Young Avenue right-of-ways,

generally adjacent to connections to the existing surrounding right-of-ways. Ponding in these areas are less than 0.15m above the centreline of the right-of-ways.

In order to mitigate the impact of construction and access floodplain storage as much as possible south of Street Two, an equalization culvert is proposed underneath Street Two. Details regarding the equalization culvert will be finalized during detailed design of Street Two.

It should be noted that during the regulatory event (100-year), the outlet channel conveying flows from SWM Facility 1 to the IGMD will be submerged, providing additional floodplain storage. No backwater effects will be present within SWMF1.

5.0 Summary

The hydraulic modelling associated with the Ivan Gingerich Municipal Drain illustrates that the inclusion of Street Two through the floodplain has a negligible impact on the flood elevations either upstream or downstream of the subject lands.

Appendix A

Hydrologic Model

Wilmot Woods
IGMD FLOODPLAIN MODELLING
New Hamburg, Ontario

Project Number: 35056-104
Date: August 22, 2022
Design By: CJC/AJC
File: Q:\35056\104\Floodplain\SWMHYMO\May 2021\Modelling Parameters.xlsx

HYDROLOGIC PARAMETERS
Post Development Conditions

*Horton's Equation

Sub-Catchment Number	Area (ha)	Pervious CN (AMC II)	Percent Impervious (TIMP) (%)	Directly Connected (XIMP) (%)	Overland Slope (%)	Overland Length (m)	Pervious IA (mm)	Impervious IA (mm)	Pervious Slope (%)	Impervious Slope (%)	Pervious Length (m)	Impervious Length (m)	Pervious Manning's n	Impervious Manning's n	Tp (hrs)	Fo (mm/hr)	Fc (mm/hr)	DCAY (hrs)	SWMHYMO COMMAND	Land Use	Comment
Catchments Draining to Ivan Gingerich Drain																					
Catchments Upstream of Nafziger Road																					
201	10.60	*	28	28			5.0	1.5	2.00	2.00	137	137	0.25	0.015		75.0	5.0	4.0	STAND	Institutional	Sir Adam Beck Public School
202	32.34	85.7	60	60			6.4	1.0	2.00	2.00	400	400	0.25	0.015					STAND	Residential	Area Q
203	16.10	84.2	60	60			7.2	1.0	2.00	2.00	400	400	0.25	0.015					STAND	Residential	Portion of Schmidt Lands (AA)
204	49.90	84.2	60	60			6.6	1.0	2.00	2.00	318	318	0.25	0.015					STAND	Residential	Areas W and X
Catchments Upstream of Wilmot Woods																					
205*	42.64	85.4	54	54			6.5	1.0	2.00	2.00	400	400	0.25	0.015					STAND	Residential	Cachet Lands (L and M)
Catchments Upstream of Waterloo Street																					
206*	21.64	77.6	33	33			7.3	1.0	2.00	2.00	500	500	0.25	0.015					STAND	Residential	Area G1 (NE part of Wilmot Woods)
207*	18.93	75.1	30	30			8.4	1.0	2.00	2.00	200	200	0.25	0.015					STAND	Residential	Area F1 (NW part of Wilmot Woods)
Catchments Upstream of Christner Street																					
208	28.78	60.7	14		2.3	107	16.6								0.23				NASH	Woodlot	Forest Glen Subdivision
209	1.51	71.6	95	95			10.1	1.0	3.61	3.61	600	600	0.25	0.015					STAND	Right-of-way	Waterloo Street
210	19.61	80.9	23	23			6.1	0.5	2.00	2.00	262	288	0.25	0.015					STAND	Residential	Sugarlane Ridge Subdivision
211	23.49	64.0	5		4.5	550	10.7								0.42				NASH	Agricultural	Existing Agricultural Fields
Catchments Upstream of Nith River																					
212	7.71	57.1	5		4	414	14.3								0.37				NASH	Agricultural	Existing Agricultural Fields / Woodlot
Total to Nith River	**273.25**		**40.0**																		

*Catchment areas 205, 206, and 207 include the Ivan Gingerich Drain Floodplain, which will remain undeveloped and is assumed to be 0% Impervious. The developable NH Properties Inc. lands are assumed to be 60% Impervious.

Time of concentration calculated using the Airport Method
tc = [3.26 * (1.1 - C) * L0.5] / Sw0.33, where
tc = time of concentration (min)
C = Runoff coefficient (assumed to be 0.2 for rural areas)
L = Overland Flow Length (m)
Sw = Catchment Slope
Tp = 0.6 * tc

IA = kS = k*((1000/CN)-10)*25.4
where k=0.075 for CN <=70
k=0.10 for 70<CN<=80
k=0.15 for 80<CN<=90
k=0.20 for CN >90

```
================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                        9   9  9   9   # 3053466
        StormWater Management HYdrologic Model           999    999    =========

 ****************************************************************************
 *************************** SWMHYMO Ver/4.05  **************************** 
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
 ****************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                   Ottawa,  Ontario: (613) 836-3884          *********
 *********                   Gatineau, Quebec: (819) 243-6858          *********
 *********                   E-Mail: swmhymo@jfsa.Com                  *********
 ****************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: MTE Consultants Inc.                        +++++++++
 +++++++++                Burlington            SERIAL#:3053466       +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ****************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10            *********
 *********           Max. number of rainfall points: 105408            *********
 *********           Max. number of flow points    : 105408            *********
 ****************************************************************************


 *********************   D E T A I L E D   O U T P U T   **********************
 ****************************************************************************
 *         DATE: 2021-05-28     TIME: 12:44:21     RUN COUNTER: 000030         *
 ****************************************************************************
 * Input   filename: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\prop12hr.dat  *
 * Output  filename: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\prop12hr.out  *
 * Summary filename: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\prop12hr.sum  *
 * User comments:                                                             *
 * 1:_____________________________________________________________________    *
 * 2:_____________________________________________________________________    *
 * 3:_____________________________________________________________________    *
 ****************************************************************************

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001:0001-------------------------------------------------------------------------
-
*#**************************************************************************
*#  Project Name: [NH Properties Inc.]    Project Number: [35056-104]
*#  Date        : 04-27-2021
*#  Modeller    : [CJC]
*#  Company     : MTE Consultants Inc.
*#  License #   : 3057174
*#**************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

--------------------  Rainfall dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=25mm.4hr
--------------------------------------------------------------------------------
-
001:0002-------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 25-mm, 4 hour Chicago Storm, (a=508.5, b
| Ptotal=  25.00 mm|    Comments: 25-mm, 4 hour Chicago Storm, (a=508.5, b
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   1.410 |   1.08   3.570 |   2.08   6.620 |   3.08   2.160
               .17   1.480 |   1.17   4.160 |   2.17   5.580 |   3.17   2.050
               .25   1.560 |   1.25   5.010 |   2.25   4.840 |   3.25   1.960
               .33   1.640 |   1.33   6.350 |   2.33   4.270 |   3.33   1.870
               .42   1.740 |   1.42   8.730 |   2.42   3.830 |   3.42   1.790
               .50   1.850 |   1.50  14.060 |   2.50   3.480 |   3.50   1.720
               .58   1.980 |   1.58  35.190 |   2.58   3.190 |   3.58   1.660
               .67   2.130 |   1.67  71.896 |   2.67   2.950 |   3.67   1.600
               .75   2.310 |   1.75  26.870 |   2.75   2.740 |   3.75   1.540
               .83   2.530 |   1.83  15.350 |   2.83   2.570 |   3.83   1.490
               .92   2.790 |   1.92  10.660 |   2.92   2.410 |   3.92   1.440
              1.00   3.130 |   2.00   8.160 |   3.00   2.280 |   4.00   1.400

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001:0003-------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   10.60
| 01:201    DT= 1.00 |   Total Imp(%)=   28.00   Dir. Conn.(%)=   28.00
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```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.97         7.63
     Dep. Storage     (mm)=       1.50         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     137.00       137.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      71.90        21.54
               over (min)        3.00        30.00
     Storage Coeff.  (min)=       3.12 (ii)   30.41 (ii)
     Unit Hyd. Tpeak (min)=       3.00        30.00
     Unit Hyd. peak  (cms)=        .37          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .49          .05          .499 (iii)
     TIME TO PEAK    (hrs)=       1.68         2.12         1.683
     RUNOFF VOLUME    (mm)=      23.50         1.80         7.873
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .94          .07          .315

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 75.00          K  (1/hr)=  4.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  1.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0004--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   32.34
| 02:202    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      19.40        12.94
     Dep. Storage     (mm)=       1.00         6.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      65.78        19.90
               over (min)        6.00        60.00
     Storage Coeff.  (min)=       6.14 (ii)   59.73 (ii)
     Unit Hyd. Tpeak (min)=       6.00        60.00
     Unit Hyd. peak  (cms)=        .19          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.47          .08          2.474 (iii)
     TIME TO PEAK    (hrs)=       1.72         2.82         1.717
     RUNOFF VOLUME    (mm)=      24.00         5.67        16.669
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .23          .667

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   16.10
| 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.66         6.44
     Dep. Storage     (mm)=       1.00         7.20
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      65.78        16.54
               over (min)        6.00        64.00
     Storage Coeff.  (min)=       6.14 (ii)   63.85 (ii)
     Unit Hyd. Tpeak (min)=       6.00        64.00
     Unit Hyd. peak  (cms)=        .19          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.23          .03          1.231 (iii)
     TIME TO PEAK    (hrs)=       1.72         2.93         1.717
     RUNOFF VOLUME    (mm)=      24.00         4.84        16.336
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .19          .653

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0006--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   49.90
| 04:204    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	29.94	19.96	
Dep. Storage	(mm)=	1.00	6.60	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	318.00	318.00	
Mannings n	=	.015	.250	
Max.eff.Inten.(mm/hr)=		71.90	17.75	
over (min)		5.00	54.00	
Storage Coeff.	(min)=	5.17 (ii)	54.06 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	54.00	
Unit Hyd. peak	(cms)=	.22	.02	
				TOTALS
PEAK FLOW	(cms)=	4.12	.12	4.120 (iii)
TIME TO PEAK	(hrs)=	1.70	2.72	1.700
RUNOFF VOLUME	(mm)=	24.00	5.12	16.450
TOTAL RAINFALL	(mm)=	25.00	25.00	25.000
RUNOFF COEFFICIENT	=	.96	.20	.658

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 84.2 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0007---

ADD HYD (NAFRD)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:201	10.60	.499	1.68	7.87	.000
	+ID2 02:202	32.34	2.474	1.72	16.67	.000
	+ID3 03:203	16.10	1.231	1.72	16.34	.000
	+ID4 04:204	49.90	4.120	1.70	16.45	.000
	SUM 05:NAFRD	108.94	8.214	1.72	15.66	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0008---

CALIB STANDHYD	01:205 DT= 1.00
Area (ha)=	42.64
Total Imp(%)=	54.00 Dir. Conn.(%)= 54.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	23.03	19.61	
Dep. Storage	(mm)=	1.00	6.50	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	400.00	400.00	
Mannings n	=	.015	.250	
Max.eff.Inten.(mm/hr)=		65.78	19.32	
over (min)		6.00	60.00	
Storage Coeff.	(min)=	6.14 (ii)	60.37 (ii)	
Unit Hyd. Tpeak	(min)=	6.00	60.00	
Unit Hyd. peak	(cms)=	.19	.02	
				TOTALS
PEAK FLOW	(cms)=	2.93	.12	2.937 (iii)
TIME TO PEAK	(hrs)=	1.72	2.83	1.717
RUNOFF VOLUME	(mm)=	24.00	5.53	15.502
TOTAL RAINFALL	(mm)=	25.00	25.00	25.000
RUNOFF COEFFICIENT	=	.96	.22	.620

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.4 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0009---

ADD HYD (USNHPR)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:205	42.64	2.937	1.72	15.50	.000
	+ID2 05:NAFRD	108.94	8.214	1.72	15.66	.000
	SUM 02:USNHPR	151.58	11.150	1.72	15.62	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0010---

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----------------------
| CALIB STANDHYD     |   Area    (ha)=   21.64
| 01:206    DT= 1.00 |   Total Imp(%)=   33.00   Dir. Conn.(%)=   33.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.14        14.50
     Dep. Storage     (mm)=       1.00         7.30
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     500.00       500.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      61.41        11.32
               over (min)        7.00        84.00
     Storage Coeff.  (min)=       7.22 (ii)   84.00 (ii)
     Unit Hyd. Tpeak (min)=       7.00        84.00
     Unit Hyd. peak  (cms)=        .16          .01
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .85          .04          .847 (iii)
     TIME TO PEAK    (hrs)=       1.75         3.35         1.750
     RUNOFF VOLUME    (mm)=      24.00         3.44        10.226
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .14          .409

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  77.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
001:0011---------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   18.93
| 03:207    DT= 1.00 |   Total Imp(%)=   30.00   Dir. Conn.(%)=   30.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.68        13.25
     Dep. Storage     (mm)=       1.00         8.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     200.00       200.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      71.90         8.49
               over (min)        4.00        54.00
     Storage Coeff.  (min)=       3.91 (ii)   53.63 (ii)
     Unit Hyd. Tpeak (min)=       4.00        54.00
     Unit Hyd. peak  (cms)=        .29          .02
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .87          .04          .869 (iii)
     TIME TO PEAK    (hrs)=       1.68         2.82         1.683
     RUNOFF VOLUME    (mm)=      24.00         2.73         9.113
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .11          .365

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.1    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
001:0012---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   28.78   Curve Number   (CN)=60.70
| 04:208    DT= 1.00 |   Ia      (mm)=  16.600   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .230

     Unit Hyd Qpeak  (cms)=    4.779

     PEAK FLOW       (cms)=     .018 (i)
     TIME TO PEAK    (hrs)=    2.517
     RUNOFF VOLUME    (mm)=     .408
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .016

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
001:0013---------------------------------------------------------------------
-
------------------------
| ADD HYD (WATST     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:206          21.64     .847    1.75  10.23    .000

                      +ID2 02:USNHPR       151.58   11.150    1.72  15.62    .000

                      +ID3 03:207          18.93     .869    1.68   9.11    .000

                      +ID4 04:208          28.78     .018    2.52    .41    .000

                       ========================================================
                       SUM 05:WATST        220.93   12.789    1.72  12.55    .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0014

| CALIB STANDHYD | 01:209 DT= 1.00 | Area (ha)= 1.51 Total Imp(%)= 95.00 Dir. Conn.(%)= 95.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.43	.08
Dep. Storage (mm)=	1.00	10.10
Average Slope (%)=	3.61	3.61
Length (m)=	600.00	600.00
Mannings n =	.015	.250
Max.eff.Inten.(mm/hr)=	61.41	5.08
over (min)	7.00	106.00
Storage Coeff. (min)=	6.74 (ii)	105.62 (ii)
Unit Hyd. Tpeak (min)=	7.00	106.00
Unit Hyd. peak (cms)=	.17	.01

			TOTALS
PEAK FLOW	(cms)=	.17	.00	.174 (iii)
TIME TO PEAK	(hrs)=	1.73	4.02	1.733
RUNOFF VOLUME	(mm)=	24.00	1.92	22.896
TOTAL RAINFALL	(mm)=	25.00	25.00	25.000
RUNOFF COEFFICIENT	=	.96	.08	.916

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.6 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0015

| CALIB STANDHYD | 02:210 DT= 1.00 | Area (ha)= 19.61 Total Imp(%)= 23.00 Dir. Conn.(%)= 23.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	4.51	15.10
Dep. Storage (mm)=	.50	6.10
Average Slope (%)=	2.00	2.00
Length (m)=	288.00	262.00
Mannings n =	.015	.250
Max.eff.Inten.(mm/hr)=	71.90	15.53
over (min)	5.00	51.00
Storage Coeff. (min)=	4.87 (ii)	50.78 (ii)
Unit Hyd. Tpeak (min)=	5.00	51.00
Unit Hyd. peak (cms)=	.23	.02

			TOTALS
PEAK FLOW	(cms)=	.63	.09	.636 (iii)
TIME TO PEAK	(hrs)=	1.70	2.67	1.700
RUNOFF VOLUME	(mm)=	24.50	4.53	9.122
TOTAL RAINFALL	(mm)=	25.00	25.00	25.000
RUNOFF COEFFICIENT	=	.98	.18	.365

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.9 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0016

| CALIB NASHYD | 03:211 DT= 1.00 | Area (ha)= 23.49 Curve Number (CN)=64.00 Ia (mm)= 10.700 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= .420

Unit Hyd Qpeak (cms)= 2.136

PEAK FLOW (cms)= .049 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 1.301
TOTAL RAINFALL (mm)= 25.000
RUNOFF COEFFICIENT = .052

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0017

| CALIB NASHYD | 04:212 DT= 1.00 | Area (ha)= 7.71 Curve Number (CN)=57.10 Ia (mm)= 14.300 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= .370

Unit Hyd Qpeak (cms)= .796

PEAK FLOW (cms)= .006 (i)
TIME TO PEAK (hrs)= 2.550

```
     RUNOFF VOLUME    (mm)=     .568
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .023

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0018--------------------------------------------------------------------------
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------------------------
| ADD HYD (NITH      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209           1.51     .174    1.73  22.90    .000

                     +ID2 02:210          19.61     .636    1.70   9.12    .000

                     +ID3 03:211          23.49     .049    2.42   1.30    .000

                     +ID4 04:212           7.71     .006    2.55    .57    .000

                     +ID5 05:WATST       220.93   12.789    1.72  12.55    .000

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                      SUM 06:NITH        273.25   13.594    1.72  11.06    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0019--------------------------------------------------------------------------
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  ** END OF RUN :   1

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| START            |  Project  dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

--------------------  Rainfall dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1

           #  1=watSCS2.12h
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002:0002--------------------------------------------------------------------------
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*#*****************************************************************************
*#  Project Name: [NH Properties Inc.]    Project Number: [35056-104]
*#  Date        : 04-27-2021
*#  Modeller    : [CJC]
*#  Company     : MTE Consultants Inc.
*#  License #   : 3057174
*#*****************************************************************************
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002:0002--------------------------------------------------------------------------
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| READ STORM       |    Filename: 2-year, 12 hour SCS Type II Storm, Regio
| Ptotal=  48.05 mm|    Comments: 2-year, 12 hour SCS Type II Storm, Regio
--------------------
             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .50    .960 |   3.50   1.920 |   6.50   8.650 |   9.50   1.920
             1.00    .960 |   4.00   1.920 |   7.00   3.850 |  10.00    .960
             1.50    .960 |   4.50   2.880 |   7.50   2.880 |  10.50    .960
             2.00    .960 |   5.00   3.850 |   8.00   2.880 |  11.00    .960
             2.50   1.920 |   5.50   5.770 |   8.50   1.920 |  11.50    .960
             3.00   1.920 |   6.00  43.260 |   9.00   1.920 |  12.00    .960

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002:0003--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   10.60
| 01:201    DT= 1.00 |   Total Imp(%)=   28.00   Dir. Conn.(%)=   28.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.97          7.63
     Dep. Storage     (mm)=       1.50          5.00
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     137.00        137.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      43.26         16.90
               over (min)        4.00         34.00
     Storage Coeff.  (min)=       3.82 (ii)    33.90 (ii)
     Unit Hyd. Tpeak (min)=       4.00         34.00
     Unit Hyd. peak  (cms)=        .29           .03
                                                          *TOTALS*
```

```
     PEAK FLOW       (cms)=        .36          .20          .433 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.42         6.001
     RUNOFF VOLUME    (mm)=      46.55        10.18        20.366
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
     RUNOFF COEFFICIENT   =        .97          .21          .424

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 75.00          K  (1/hr)=  4.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  1.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0004--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   32.34
| 02:202    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      19.40         12.94
     Dep. Storage     (mm)=       1.00          6.40
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     400.00        400.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      43.26         10.67
               over (min)        7.00         76.00
     Storage Coeff.  (min)=       7.26 (ii)    76.04 (ii)
     Unit Hyd. Tpeak (min)=       7.00         76.00
     Unit Hyd. peak  (cms)=        .16           .01
                                                    *TOTALS*
     PEAK FLOW       (cms)=       2.28           .22          2.320 (iii)
     TIME TO PEAK    (hrs)=       6.00          7.17          6.001
     RUNOFF VOLUME    (mm)=      47.04         20.63         36.487
     TOTAL RAINFALL   (mm)=      48.05         48.05         48.050
     RUNOFF COEFFICIENT   =        .98           .43           .759

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0005--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   16.10
| 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.66          6.44
     Dep. Storage     (mm)=       1.00          7.20
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     400.00        400.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      43.26          9.33
               over (min)        7.00         80.00
     Storage Coeff.  (min)=       7.26 (ii)    79.82 (ii)
     Unit Hyd. Tpeak (min)=       7.00         80.00
     Unit Hyd. peak  (cms)=        .16           .01
                                                    *TOTALS*
     PEAK FLOW       (cms)=       1.13           .10          1.150 (iii)
     TIME TO PEAK    (hrs)=       6.00          7.23          6.001
     RUNOFF VOLUME    (mm)=      47.05         18.84         35.771
     TOTAL RAINFALL   (mm)=      48.05         48.05         48.050
     RUNOFF COEFFICIENT   =        .98           .39           .744

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0006--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   49.90
| 04:204    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      29.94         19.96
     Dep. Storage     (mm)=       1.00          6.60
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     318.00        318.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      43.26         11.17
               over (min)        6.00         65.00
     Storage Coeff.  (min)=       6.33 (ii)    65.17 (ii)
     Unit Hyd. Tpeak (min)=       6.00         65.00
     Unit Hyd. peak  (cms)=        .18           .02
                                                    *TOTALS*
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     PEAK FLOW       (cms)=       3.55          .36          3.631 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.98          6.001
     RUNOFF VOLUME    (mm)=      47.05        19.27         35.942
     TOTAL RAINFALL   (mm)=      48.05        48.05         48.050
     RUNOFF COEFFICIENT   =        .98          .40           .748

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0007--------------------------------------------------------------------------
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------------------------
| ADD HYD (NAFRD     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                        ID1 01:201          10.60     .433    6.00  20.37    .000

                       +ID2 02:202          32.34    2.320    6.00  36.49    .000

                       +ID3 03:203          16.10    1.150    6.00  35.77    .000

                       +ID4 04:204          49.90    3.631    6.00  35.94    .000

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                        SUM 05:NAFRD       108.94    7.534    6.00  34.56    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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002:0008--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   42.64
| 01:205    DT= 1.00 |   Total Imp(%)=   54.00   Dir. Conn.(%)=   54.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      23.03         19.61
     Dep. Storage     (mm)=       1.00          6.50
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     400.00        400.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      43.26         10.39
               over (min)        7.00         77.00
```

```
     Storage Coeff.  (min)=       7.26 (ii)   76.78 (ii)
     Unit Hyd. Tpeak (min)=       7.00        77.00
     Unit Hyd. peak  (cms)=        .16          .01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.70          .33          2.763 (iii)
     TIME TO PEAK    (hrs)=       6.00         7.18          6.001
     RUNOFF VOLUME    (mm)=      47.05        20.30         34.753
     TOTAL RAINFALL   (mm)=      48.05        48.05         48.050
     RUNOFF COEFFICIENT   =        .98          .42           .723

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.4    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0009--------------------------------------------------------------------------
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------------------------
| ADD HYD (USNHPR    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                        ID1 01:205          42.64    2.763    6.00  34.75    .000

                       +ID2 05:NAFRD       108.94    7.534    6.00  34.56    .000

                        ========================================================
                        SUM 02:USNHPR       151.58   10.297    6.00  34.62    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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002:0010--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   21.64
| 01:206    DT= 1.00 |   Total Imp(%)=   33.00   Dir. Conn.(%)=   33.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.14         14.50
     Dep. Storage     (mm)=       1.00          7.30
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     500.00        500.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      43.26          5.59
               over (min)        8.00        110.00
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```
     Storage Coeff.  (min)=       8.30 (ii)  110.13 (ii)
     Unit Hyd. Tpeak (min)=       8.00       110.00
     Unit Hyd. peak  (cms)=        .14          .01
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .82          .13          .838 (iii)
     TIME TO PEAK    (hrs)=       6.00         7.77         6.001
     RUNOFF VOLUME    (mm)=      47.05        14.54        25.280
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
     RUNOFF COEFFICIENT   =        .98          .30          .526

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  77.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0011----------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   18.93
| 03:207    DT= 1.00 |   Total Imp(%)=   30.00   Dir. Conn.(%)=   30.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.68        13.25
     Dep. Storage     (mm)=       1.00         8.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     200.00       200.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      43.26         7.80
               over (min)        5.00        56.00
     Storage Coeff.  (min)=       4.79 (ii)   56.23 (ii)
     Unit Hyd. Tpeak (min)=       5.00        56.00
     Unit Hyd. peak  (cms)=        .23          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .68          .17          .716 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.85         6.001
     RUNOFF VOLUME    (mm)=      47.05        12.69        22.999
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
     RUNOFF COEFFICIENT   =        .98          .26          .479

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.1    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0012----------------------------------------------------------------------
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| CALIB NASHYD       |   Area    (ha)=   28.78   Curve Number   (CN)=60.70
| 04:208    DT= 1.00 |   Ia      (mm)=  16.600   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .230

     Unit Hyd Qpeak  (cms)=    4.779

     PEAK FLOW       (cms)=     .281 (i)
     TIME TO PEAK    (hrs)=    6.151
     RUNOFF VOLUME    (mm)=    5.049
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .105

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0013----------------------------------------------------------------------
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------------------------
| ADD HYD (WATST     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:206          21.64     .838    6.00  25.28    .000

                      +ID2 02:USNHPR       151.58   10.297    6.00  34.62    .000

                      +ID3 03:207          18.93     .716    6.00  23.00    .000

                      +ID4 04:208          28.78     .281    6.15   5.05    .000

                       ============================================================
                       SUM 05:WATST        220.93   12.041    6.00  28.85    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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002:0014----------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=    1.51
| 01:209    DT= 1.00 |   Total Imp(%)=   95.00   Dir. Conn.(%)=   95.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.43          .08
     Dep. Storage     (mm)=       1.00        10.10
```

```
     Average Slope     (%)=       3.61         3.61
     Length            (m)=     600.00       600.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      43.26         3.68
               over (min)        8.00       120.00
     Storage Coeff.  (min)=       7.76 (ii)  120.26 (ii)
     Unit Hyd. Tpeak (min)=       8.00       120.00
     Unit Hyd. peak  (cms)=        .14          .01
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .17          .00          .167 (iii)
     TIME TO PEAK    (hrs)=       6.00         7.97         6.001
     RUNOFF VOLUME    (mm)=      47.04        10.38        45.216
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
     RUNOFF COEFFICIENT   =        .98          .22          .941

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  71.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0015--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   19.61
| 02:210    DT= 1.00 |   Total Imp(%)=   23.00   Dir. Conn.(%)=   23.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.51        15.10
     Dep. Storage     (mm)=        .50         6.10
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     288.00       262.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      43.26        10.53
               over (min)        6.00        60.00
     Storage Coeff.  (min)=       5.96 (ii)   59.60 (ii)
     Unit Hyd. Tpeak (min)=       6.00        60.00
     Unit Hyd. peak  (cms)=        .19          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .54          .26          .598 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.90         6.001
     RUNOFF VOLUME    (mm)=      47.55        17.26        24.232
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
     RUNOFF COEFFICIENT   =        .99          .36          .504

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0016--------------------------------------------------------------------------
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| CALIB NASHYD       |   Area    (ha)=   23.49   Curve Number   (CN)=64.00
| 03:211    DT= 1.00 |   Ia      (mm)=  10.700   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .420

     Unit Hyd Qpeak  (cms)=    2.136

     PEAK FLOW       (cms)=     .276 (i)
     TIME TO PEAK    (hrs)=    6.351
     RUNOFF VOLUME    (mm)=    7.740
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .161

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0017--------------------------------------------------------------------------
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| CALIB NASHYD       |   Area    (ha)=    7.71   Curve Number   (CN)=57.10
| 04:212    DT= 1.00 |   Ia      (mm)=  14.300   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .370

     Unit Hyd Qpeak  (cms)=     .796

     PEAK FLOW       (cms)=     .059 (i)
     TIME TO PEAK    (hrs)=    6.334
     RUNOFF VOLUME    (mm)=    5.072
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .106

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0018--------------------------------------------------------------------------
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| ADD HYD (NITH      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
```

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                    ID1 01:209            1.51     .167    6.00  45.22    .000

                   +ID2 02:210           19.61     .598    6.00  24.23    .000

                   +ID3 03:211           23.49     .276    6.35   7.74    .000

                   +ID4 04:212            7.71     .059    6.33   5.07    .000

                   +ID5 05:WATST        220.93   12.041    6.00  28.85    .000

                    ============================================================
                    SUM 06:NITH         273.25   12.977    6.00  26.13    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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002:0019--------------------------------------------------------------------------
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002:0002--------------------------------------------------------------------------
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  ** END OF RUN :   2

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| START            |  Project  dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

--------------------  Rainfall dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 003
    NSTORM=   1
           #  1=watSCS5.12h
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003:0002--------------------------------------------------------------------------
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*#*****************************************************************************
*#  Project Name: [NH Properties Inc.]    Project Number: [35056-104]
*#  Date        : 04-27-2021
*#  Modeller    : [CJC]
*#  Company     : MTE Consultants Inc.
*#  License #   : 3057174
*#*****************************************************************************
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003:0002--------------------------------------------------------------------------
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--------------------
| READ STORM       |    Filename: 5-year, 12 hour SCS Type II Storm, Regio
| Ptotal=  66.06 mm|    Comments: 5-year, 12 hour SCS Type II Storm, Regio
--------------------
             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .50   1.320 |   3.50   2.640 |   6.50  11.890 |   9.50   2.640
             1.00   1.320 |   4.00   2.640 |   7.00   5.290 |  10.00   1.320
             1.50   1.320 |   4.50   3.960 |   7.50   3.960 |  10.50   1.320
             2.00   1.320 |   5.00   5.290 |   8.00   3.960 |  11.00   1.320
             2.50   2.640 |   5.50   7.930 |   8.50   2.640 |  11.50   1.320
             3.00   2.640 |   6.00  59.470 |   9.00   2.640 |  12.00   1.320

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003:0003--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   10.60
| 01:201    DT= 1.00 |   Total Imp(%)=   28.00   Dir. Conn.(%)=   28.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.97          7.63
     Dep. Storage     (mm)=       1.50          5.00
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     137.00        137.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      59.47         45.74
               over (min)        3.00         24.00
     Storage Coeff.  (min)=       3.36 (ii)    23.56 (ii)
     Unit Hyd. Tpeak (min)=       3.00         24.00
     Unit Hyd. peak  (cms)=        .35           .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .49           .58           .918 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.22          6.001
     RUNOFF VOLUME    (mm)=      64.55         24.33         35.590
     TOTAL RAINFALL   (mm)=      66.06         66.06         66.056
     RUNOFF COEFFICIENT   =        .98           .37           .539

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 75.00          K  (1/hr)=  4.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  1.00
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      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0004--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   32.34
| 02:202    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      19.40         12.94
     Dep. Storage     (mm)=       1.00          6.40
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     400.00        400.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      59.47         22.27
               over (min)        6.00         58.00
     Storage Coeff.  (min)=       6.39 (ii)   57.63 (ii)
     Unit Hyd. Tpeak (min)=       6.00         58.00
     Unit Hyd. peak  (cms)=        .18           .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       3.16           .47          3.303 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.83          6.001
     RUNOFF VOLUME    (mm)=      65.05         34.86         52.984
     TOTAL RAINFALL   (mm)=      66.06         66.06         66.056
     RUNOFF COEFFICIENT   =        .98           .53           .802

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0005--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   16.10
| 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.66          6.44
     Dep. Storage     (mm)=       1.00          7.20
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     400.00        400.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      59.47         20.52
               over (min)        6.00         59.00
     Storage Coeff.  (min)=       6.39 (ii)   59.33 (ii)
     Unit Hyd. Tpeak (min)=       6.00         59.00
     Unit Hyd. peak  (cms)=        .18           .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.58           .21          1.634 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.87          6.001
     RUNOFF VOLUME    (mm)=      65.05         32.50         52.041
     TOTAL RAINFALL   (mm)=      66.06         66.06         66.056
     RUNOFF COEFFICIENT   =        .98           .49           .788

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0006--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   49.90
| 04:204    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      29.94         19.96
     Dep. Storage     (mm)=       1.00          6.60
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     318.00        318.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      59.47         22.96
               over (min)        6.00         50.00
     Storage Coeff.  (min)=       5.57 (ii)   49.68 (ii)
     Unit Hyd. Tpeak (min)=       6.00         50.00
     Unit Hyd. peak  (cms)=        .20           .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       4.91           .76          5.166 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.70          6.001
     RUNOFF VOLUME    (mm)=      65.05         32.99         52.234
     TOTAL RAINFALL   (mm)=      66.06         66.06         66.056
     RUNOFF COEFFICIENT   =        .98           .50           .791

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

003:0007---

ADD HYD (NAFRD)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:201	10.60	.918	6.00	35.59	.000
	+ID2 02:202	32.34	3.303	6.00	52.98	.000
	+ID3 03:203	16.10	1.634	6.00	52.04	.000
	+ID4 04:204	49.90	5.166	6.00	52.23	.000
	SUM 05:NAFRD	108.94	11.021	6.00	50.81	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

003:0008---

CALIB STANDHYD 01:205 DT= 1.00	Area (ha)= 42.64	Total Imp(%)= 54.00	Dir. Conn.(%)= 54.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	23.03	19.61	
Dep. Storage	(mm)=	1.00	6.50	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	400.00	400.00	
Mannings n	=	.015	.250	
Max.eff.Inten.(mm/hr)=		59.47	21.98	
over (min)		6.00	58.00	
Storage Coeff.	(min)=	6.39 (ii)	57.90 (ii)	
Unit Hyd. Tpeak	(min)=	6.00	58.00	
Unit Hyd. peak	(cms)=	.18	.02	
				TOTALS
PEAK FLOW	(cms)=	3.76	.70	3.960 (iii)
TIME TO PEAK	(hrs)=	6.00	6.83	6.001
RUNOFF VOLUME	(mm)=	65.05	34.43	50.973
TOTAL RAINFALL	(mm)=	66.06	66.06	66.056
RUNOFF COEFFICIENT	=	.98	.52	.772

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.4 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

003:0009---

ADD HYD (USNHPR)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:205	42.64	3.960	6.00	50.97	.000
	+ID2 05:NAFRD	108.94	11.021	6.00	50.81	.000
	SUM 02:USNHPR	151.58	14.981	6.00	50.85	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

003:0010---

CALIB STANDHYD 01:206 DT= 1.00	Area (ha)= 21.64	Total Imp(%)= 33.00	Dir. Conn.(%)= 33.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	7.14	14.50	
Dep. Storage	(mm)=	1.00	7.30	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	500.00	500.00	
Mannings n	=	.015	.250	
Max.eff.Inten.(mm/hr)=		59.47	12.84	
over (min)		7.00	80.00	
Storage Coeff.	(min)=	7.31 (ii)	80.33 (ii)	
Unit Hyd. Tpeak	(min)=	7.00	80.00	
Unit Hyd. peak	(cms)=	.16	.01	
				TOTALS
PEAK FLOW	(cms)=	1.15	.30	1.207 (iii)
TIME TO PEAK	(hrs)=	6.00	7.23	6.001
RUNOFF VOLUME	(mm)=	65.05	26.12	38.981
TOTAL RAINFALL	(mm)=	66.06	66.06	66.056
RUNOFF COEFFICIENT	=	.98	.40	.590

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       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  77.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0011---------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   18.93
| 03:207    DT= 1.00 |   Total Imp(%)=   30.00   Dir. Conn.(%)=   30.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.68        13.25
     Dep. Storage     (mm)=       1.00         8.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     200.00       200.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      59.47        17.83
               over (min)        4.00        41.00
     Storage Coeff.  (min)=       4.22 (ii)   41.17 (ii)
     Unit Hyd. Tpeak (min)=       4.00        41.00
     Unit Hyd. peak  (cms)=        .27          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .94          .39         1.082 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.57         6.001
     RUNOFF VOLUME    (mm)=      65.05        23.42        35.918
     TOTAL RAINFALL   (mm)=      66.06        66.06        66.056
     RUNOFF COEFFICIENT   =        .98          .35          .544

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.1    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0012---------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=   28.78   Curve Number   (CN)=60.70
| 04:208    DT= 1.00 |   Ia      (mm)=  16.600   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .230

     Unit Hyd Qpeak  (cms)=    4.779

     PEAK FLOW       (cms)=     .724 (i)
     TIME TO PEAK    (hrs)=    6.134
     RUNOFF VOLUME    (mm)=   11.434
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .173

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0013---------------------------------------------------------------------
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------------------------
| ADD HYD (WATST     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:206          21.64    1.207    6.00  38.98    .000

                      +ID2 02:USNHPR       151.58   14.981    6.00  50.85    .000

                      +ID3 03:207          18.93    1.082    6.00  35.92    .000

                      +ID4 04:208          28.78     .724    6.13  11.43    .000

                       ========================================================
                       SUM 05:WATST        220.93   17.840    6.00  43.28    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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003:0014---------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.51
| 01:209    DT= 1.00 |   Total Imp(%)=   95.00   Dir. Conn.(%)=   95.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.43          .08
     Dep. Storage     (mm)=       1.00        10.10
     Average Slope     (%)=       3.61         3.61
     Length            (m)=     600.00       600.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      59.47         9.36
               over (min)        7.00        84.00
     Storage Coeff.  (min)=       6.83 (ii)   84.27 (ii)
     Unit Hyd. Tpeak (min)=       7.00        84.00
     Unit Hyd. peak  (cms)=        .16          .01
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                                                        *TOTALS*
     PEAK FLOW       (cms)=        .23          .00           .233 (iii)
     TIME TO PEAK    (hrs)=       6.00         7.32          6.001
     RUNOFF VOLUME    (mm)=      65.05        19.97         62.802
     TOTAL RAINFALL   (mm)=      66.06        66.06         66.056
     RUNOFF COEFFICIENT   =        .98          .30           .951

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  71.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0015---------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   19.61
| 02:210    DT= 1.00 |   Total Imp(%)=   23.00   Dir. Conn.(%)=   23.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.51        15.10
     Dep. Storage     (mm)=        .50         6.10
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     288.00       262.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      59.47        21.99
                 over (min)       5.00        45.00
     Storage Coeff.  (min)=       5.25 (ii)   45.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=        .22          .03
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .74          .55           .945 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.62          6.001
     RUNOFF VOLUME    (mm)=      65.55        29.96         38.158
     TOTAL RAINFALL   (mm)=      66.06        66.06         66.056
     RUNOFF COEFFICIENT   =        .99          .45           .578

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0016---------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=   23.49   Curve Number   (CN)=64.00
| 03:211    DT= 1.00 |   Ia      (mm)=  10.700   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .420

     Unit Hyd Qpeak  (cms)=    2.136

     PEAK FLOW       (cms)=     .582 (i)
     TIME TO PEAK    (hrs)=    6.334
     RUNOFF VOLUME    (mm)=   15.458
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .234

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0017---------------------------------------------------------------------------
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| CALIB NASHYD       |   Area    (ha)=    7.71   Curve Number   (CN)=57.10
| 04:212    DT= 1.00 |   Ia      (mm)=  14.300   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .370

     Unit Hyd Qpeak  (cms)=     .796

     PEAK FLOW       (cms)=     .141 (i)
     TIME TO PEAK    (hrs)=    6.284
     RUNOFF VOLUME    (mm)=   11.042
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .167

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0018---------------------------------------------------------------------------
-
------------------------
| ADD HYD (NITH      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209           1.51     .233    6.00  62.80    .000

                     +ID2 02:210          19.61     .945    6.00  38.16    .000

                     +ID3 03:211          23.49     .582    6.33  15.46    .000

                     +ID4 04:212           7.71     .141    6.28  11.04    .000

                     +ID5 05:WATST       220.93   17.840    6.00  43.28    .000
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                    ============================================================
                    SUM 06:NITH         273.25   19.441    6.00  39.72    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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003:0019--------------------------------------------------------------------------
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003:0002--------------------------------------------------------------------------
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003:0002--------------------------------------------------------------------------
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  ** END OF RUN :   3

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| START            |  Project  dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

--------------------  Rainfall dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 004
    NSTORM=   1
           #  1=watSCS10.12h
--------------------------------------------------------------------------------
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004:0002--------------------------------------------------------------------------
-
*#****************************************************************************
*#  Project Name: [NH Properties Inc.]    Project Number: [35056-104]
*#  Date        : 04-27-2021
*#  Modeller    : [CJC]
*#  Company     : MTE Consultants Inc.
*#  License #   : 3057174
*#****************************************************************************
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004:0002--------------------------------------------------------------------------
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| READ STORM       |    Filename: 10-year, 12 hour SCS Type II Storm, Regi
| Ptotal=  78.19 mm|    Comments: 10-year, 12 hour SCS Type II Storm, Regi
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   1.560 |   3.50   3.130 |   6.50  14.080 |   9.50   3.130
              1.00   1.560 |   4.00   3.130 |   7.00   6.260 |  10.00   1.560
              1.50   1.560 |   4.50   4.690 |   7.50   4.690 |  10.50   1.560
              2.00   1.560 |   5.00   6.260 |   8.00   4.690 |  11.00   1.560
              2.50   3.130 |   5.50   9.380 |   8.50   3.130 |  11.50   1.560
              3.00   3.130 |   6.00  70.380 |   9.00   3.130 |  12.00   1.560

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004:0003--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   10.60
| 01:201    DT= 1.00 |   Total Imp(%)=   28.00   Dir. Conn.(%)=   28.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.97         7.63
     Dep. Storage     (mm)=       1.50         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     137.00       137.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=      70.38        59.94
               over (min)        3.00        21.00
     Storage Coeff.  (min)=       3.14 (ii)   21.27 (ii)
     Unit Hyd. Tpeak (min)=       3.00        21.00
     Unit Hyd. peak  (cms)=        .36          .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .58          .81          1.259 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.17          6.001
     RUNOFF VOLUME    (mm)=      76.69        33.26         45.423
     TOTAL RAINFALL   (mm)=      78.19        78.19         78.190
     RUNOFF COEFFICIENT   =        .98          .43           .581

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 75.00          K  (1/hr)=  4.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  1.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0004-------------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   32.34
| 02:202    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      19.40        12.94
     Dep. Storage     (mm)=       1.00         6.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=      70.38        31.23
               over (min)        6.00        51.00
     Storage Coeff.  (min)=       5.98 (ii)   50.73 (ii)
     Unit Hyd. Tpeak (min)=       6.00        51.00
     Unit Hyd. peak  (cms)=        .19          .02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       3.76          .67          3.994 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.70          6.001
     RUNOFF VOLUME    (mm)=      77.18        45.12         64.370
     TOTAL RAINFALL   (mm)=      78.19        78.19         78.190
     RUNOFF COEFFICIENT   =        .99          .58           .823

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0005-------------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   16.10
| 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
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                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.66         6.44
     Dep. Storage     (mm)=       1.00         7.20
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=      70.38        29.00
               over (min)        6.00        52.00
     Storage Coeff.  (min)=       5.98 (ii)   52.08 (ii)
     Unit Hyd. Tpeak (min)=       6.00        52.00
     Unit Hyd. peak  (cms)=        .19          .02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.87          .31          1.973 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.73          6.001
     RUNOFF VOLUME    (mm)=      77.18        42.45         63.303
     TOTAL RAINFALL   (mm)=      78.19        78.19         78.190
     RUNOFF COEFFICIENT   =        .99          .54           .810

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0006-------------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   49.90
| 04:204    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
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                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      29.94        19.96
     Dep. Storage     (mm)=       1.00         6.60
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     318.00       318.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=      70.38        33.13
               over (min)        5.00        43.00
     Storage Coeff.  (min)=       5.21 (ii)   43.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00        43.00
     Unit Hyd. peak  (cms)=        .22          .03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       5.83         1.09          6.277 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.58          6.001
     RUNOFF VOLUME    (mm)=      77.18        42.96         63.505
     TOTAL RAINFALL   (mm)=      78.19        78.19         78.190
     RUNOFF COEFFICIENT   =        .99          .55           .812

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0007----------
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ADD HYD (NAFRD)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:201	10.60	1.259	6.00	45.42	.000
	+ID2 02:202	32.34	3.994	6.00	64.37	.000
	+ID3 03:203	16.10	1.973	6.00	63.30	.000
	+ID4 04:204	49.90	6.277	6.00	63.50	.000
	SUM 05:NAFRD	108.94	13.504	6.00	61.97	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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004:0008----------
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CALIB STANDHYD 01:205 DT= 1.00	Area (ha)= 42.64	Total Imp(%)= 54.00	Dir. Conn.(%)= 54.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	23.03	19.61	
Dep. Storage	(mm)=	1.00	6.50	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	400.00	400.00	
Mannings n	=	.015	.250	
Max.eff.Inten.(mm/hr)=		70.38	30.88	
over (min)		6.00	51.00	
Storage Coeff.	(min)=	5.98 (ii)	50.93 (ii)	
Unit Hyd. Tpeak	(min)=	6.00	51.00	
Unit Hyd. peak	(cms)=	.19	.02	
				TOTALS
PEAK FLOW	(cms)=	4.46	1.00	4.811 (iii)
TIME TO PEAK	(hrs)=	6.00	6.70	6.001
RUNOFF VOLUME	(mm)=	77.18	44.62	62.220
TOTAL RAINFALL	(mm)=	78.19	78.19	78.190
RUNOFF COEFFICIENT	=	.99	.57	.796

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.4 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0009----------
-
ADD HYD (USNHPR)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:205	42.64	4.811	6.00	62.22	.000
	+ID2 05:NAFRD	108.94	13.504	6.00	61.97	.000
	SUM 02:USNHPR	151.58	18.315	6.00	62.04	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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004:0010----------
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CALIB STANDHYD 01:206 DT= 1.00	Area (ha)= 21.64	Total Imp(%)= 33.00	Dir. Conn.(%)= 33.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	7.14	14.50	
Dep. Storage	(mm)=	1.00	7.30	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	500.00	500.00	
Mannings n	=	.015	.250	
Max.eff.Inten.(mm/hr)=		70.38	19.22	
over (min)		7.00	69.00	
Storage Coeff.	(min)=	6.83 (ii)	68.97 (ii)	
Unit Hyd. Tpeak	(min)=	7.00	69.00	
Unit Hyd. peak	(cms)=	.16	.02	
				TOTALS
PEAK FLOW	(cms)=	1.37	.46	1.477 (iii)
TIME TO PEAK	(hrs)=	6.00	7.03	6.001
RUNOFF VOLUME	(mm)=	77.19	34.82	48.821
TOTAL RAINFALL	(mm)=	78.19	78.19	78.190
RUNOFF COEFFICIENT	=	.99	.45	.624

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 77.6 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

004:0011---

CALIB STANDHYD	03:207 DT= 1.00	Area (ha)= 18.93 Total Imp(%)= 30.00 Dir. Conn.(%)= 30.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	5.68	13.25	
Dep. Storage	(mm)=	1.00	8.40	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	200.00	200.00	
Mannings n	=	.015	.250	
Max.eff.Inten.(mm/hr)=	over (min)	70.38	27.14	
	over (min)	4.00	35.00	
Storage Coeff.	(min)=	3.94 (ii)	35.18 (ii)	
Unit Hyd. Tpeak	(min)=	4.00	35.00	
Unit Hyd. peak	(cms)=	.28	.03	
				TOTALS
PEAK FLOW	(cms)=	1.11	.59	1.386 (iii)
TIME TO PEAK	(hrs)=	6.00	6.47	6.001
RUNOFF VOLUME	(mm)=	77.18	31.61	45.295
TOTAL RAINFALL	(mm)=	78.19	78.19	78.190
RUNOFF COEFFICIENT	=	.99	.40	.579

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.1 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

004:0012---

CALIB NASHYD	04:208 DT= 1.00	Area (ha)= 28.78 Curve Number (CN)=60.70 Ia (mm)= 16.600 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= .230

Unit Hyd Qpeak	(cms)=	4.779
PEAK FLOW	(cms)=	1.103 (i)
TIME TO PEAK	(hrs)=	6.118
RUNOFF VOLUME	(mm)=	16.781
TOTAL RAINFALL	(mm)=	78.190
RUNOFF COEFFICIENT	=	.215

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

004:0013---

ADD HYD (WATST)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1	01:206	21.64	1.477	6.00	48.82	.000
+ID2	02:USNHPR	151.58	18.315	6.00	62.04	.000
+ID3	03:207	18.93	1.386	6.00	45.30	.000
+ID4	04:208	28.78	1.103	6.12	16.78	.000
SUM	05:WATST	220.93	22.085	6.00	53.42	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

004:0014---

CALIB STANDHYD	01:209 DT= 1.00	Area (ha)= 1.51 Total Imp(%)= 95.00 Dir. Conn.(%)= 95.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.43	.08	
Dep. Storage	(mm)=	1.00	10.10	
Average Slope	(%)=	3.61	3.61	
Length	(m)=	600.00	600.00	
Mannings n	=	.015	.250	
Max.eff.Inten.(mm/hr)=	over (min)	70.38	14.67	
	over (min)	6.00	71.00	
Storage Coeff.	(min)=	6.39 (ii)	71.07 (ii)	
Unit Hyd. Tpeak	(min)=	6.00	71.00	
Unit Hyd. peak	(cms)=	.18	.02	
				TOTALS
PEAK FLOW	(cms)=	.28	.00	.277 (iii)
TIME TO PEAK	(hrs)=	6.00	7.08	6.001
RUNOFF VOLUME	(mm)=	77.19	27.45	74.703
TOTAL RAINFALL	(mm)=	78.19	78.19	78.190

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     RUNOFF COEFFICIENT   =        .99          .35           .955

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  71.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0015---------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   19.61
| 02:210    DT= 1.00 |   Total Imp(%)=   23.00   Dir. Conn.(%)=   23.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.51        15.10
     Dep. Storage     (mm)=        .50         6.10
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     288.00       262.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      70.38        32.00
               over (min)        5.00        39.00
     Storage Coeff.  (min)=       4.91 (ii)   39.29 (ii)
     Unit Hyd. Tpeak (min)=       5.00        39.00
     Unit Hyd. peak  (cms)=        .23          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .88          .80          1.237 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.52          6.018
     RUNOFF VOLUME    (mm)=      77.69        39.34         48.171
     TOTAL RAINFALL   (mm)=      78.19        78.19         78.190
     RUNOFF COEFFICIENT   =        .99          .50           .616

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0016---------------------------------------------------------------------------
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| CALIB NASHYD       |   Area    (ha)=   23.49   Curve Number   (CN)=64.00
| 03:211    DT= 1.00 |   Ia      (mm)=  10.700   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .420

     Unit Hyd Qpeak  (cms)=    2.136

     PEAK FLOW       (cms)=     .832 (i)
     TIME TO PEAK    (hrs)=    6.318
     RUNOFF VOLUME    (mm)=   21.652
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .277

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0017---------------------------------------------------------------------------
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| CALIB NASHYD       |   Area    (ha)=    7.71   Curve Number   (CN)=57.10
| 04:212    DT= 1.00 |   Ia      (mm)=  14.300   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .370

     Unit Hyd Qpeak  (cms)=     .796

     PEAK FLOW       (cms)=     .212 (i)
     TIME TO PEAK    (hrs)=    6.268
     RUNOFF VOLUME    (mm)=   16.025
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .205

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0018---------------------------------------------------------------------------
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| ADD HYD (NITH      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                        ID1 01:209          1.51     .277    6.00  74.70    .000

                       +ID2 02:210         19.61    1.237    6.02  48.17    .000

                       +ID3 03:211         23.49     .832    6.32  21.65    .000

                       +ID4 04:212          7.71     .212    6.27  16.02    .000

                       +ID5 05:WATST      220.93   22.085    6.00  53.42    .000

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                        SUM 06:NITH        273.25   24.237    6.00  49.37    .000
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   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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004:0019--------------------------------------------------------------------------
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004:0002--------------------------------------------------------------------------
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004:0002--------------------------------------------------------------------------
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004:0002--------------------------------------------------------------------------
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  ** END OF RUN :   4

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| START            |  Project  dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

--------------------  Rainfall dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=watSCS25.12h
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005:0002--------------------------------------------------------------------------
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*#*****************************************************************************
*#  Project Name: [NH Properties Inc.]    Project Number: [35056-104]
*#  Date        : 04-27-2021
*#  Modeller    : [CJC]
*#  Company     : MTE Consultants Inc.
*#  License #   : 3057174
*#*****************************************************************************
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005:0002--------------------------------------------------------------------------
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| READ STORM       |    Filename: 25-year, 12 hour SCS Type II Storm, Regi
| Ptotal=  93.08 mm|    Comments: 25-year, 12 hour SCS Type II Storm, Regi
--------------------
             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .50   1.860 |   3.50   3.720 |   6.50  16.760 |   9.50   3.720
             1.00   1.860 |   4.00   3.720 |   7.00   7.450 |  10.00   1.860
             1.50   1.860 |   4.50   5.590 |   7.50   5.590 |  10.50   1.860
             2.00   1.860 |   5.00   7.450 |   8.00   5.590 |  11.00   1.860
             2.50   3.720 |   5.50  11.170 |   8.50   3.720 |  11.50   1.860
             3.00   3.720 |   6.00  83.780 |   9.00   3.720 |  12.00   1.860

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005:0003--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   10.60
| 01:201    DT= 1.00 |   Total Imp(%)=   28.00   Dir. Conn.(%)=   28.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.97         7.63
     Dep. Storage     (mm)=       1.50         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     137.00       137.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      83.78        75.37
               over (min)        3.00        19.00
     Storage Coeff.  (min)=       2.93 (ii)   19.47 (ii)
     Unit Hyd. Tpeak (min)=       3.00        19.00
     Unit Hyd. peak  (cms)=        .38          .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .69         1.09          1.658 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.13          6.001
     RUNOFF VOLUME    (mm)=      91.58        43.96         57.292
     TOTAL RAINFALL   (mm)=      93.08        93.08         93.080
     RUNOFF COEFFICIENT   =        .98          .47           .616

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 75.00          K  (1/hr)=  4.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  1.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0004-------------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   32.34
| 02:202    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      19.40        12.94
     Dep. Storage     (mm)=       1.00         6.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=      83.78        43.75
               over (min)        6.00        45.00
     Storage Coeff.  (min)=       5.58 (ii)   44.68 (ii)
     Unit Hyd. Tpeak (min)=       6.00        45.00
     Unit Hyd. peak  (cms)=        .20          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       4.48          .95          4.879 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.60          6.001
     RUNOFF VOLUME    (mm)=      92.07        58.19         78.534
     TOTAL RAINFALL   (mm)=      93.08        93.08         93.080
     RUNOFF COEFFICIENT   =        .99          .63           .844

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0005-------------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   16.10
| 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.66         6.44
     Dep. Storage     (mm)=       1.00         7.20
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=      83.78        40.89
               over (min)        6.00        46.00
     Storage Coeff.  (min)=       5.58 (ii)   45.76 (ii)
     Unit Hyd. Tpeak (min)=       6.00        46.00
     Unit Hyd. peak  (cms)=        .20          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.23          .44          2.407 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.62          6.001
     RUNOFF VOLUME    (mm)=      92.07        55.21         77.340
     TOTAL RAINFALL   (mm)=      93.08        93.08         93.080
     RUNOFF COEFFICIENT   =        .99          .59           .831

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0006-------------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   49.90
| 04:204    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      29.94        19.96
     Dep. Storage     (mm)=       1.00         6.60
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     318.00       318.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=      83.78        46.98
               over (min)        5.00        38.00
     Storage Coeff.  (min)=       4.86 (ii)   37.98 (ii)
     Unit Hyd. Tpeak (min)=       5.00        38.00
     Unit Hyd. peak  (cms)=        .23          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       6.95         1.55          7.697 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.48          6.001
     RUNOFF VOLUME    (mm)=      92.08        55.74         77.549
     TOTAL RAINFALL   (mm)=      93.08        93.08         93.080
     RUNOFF COEFFICIENT   =        .99          .60           .833

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0007-------------------------------------------------------------------------------
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| ADD HYD (NAFRD     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:201          10.60    1.658    6.00  57.29    .000

                    +ID2 02:202          32.34    4.879    6.00  78.53    .000

                    +ID3 03:203          16.10    2.407    6.00  77.34    .000

                    +ID4 04:204          49.90    7.697    6.00  77.55    .000

                     ========================================================
                     SUM 05:NAFRD       108.94   16.640    6.00  75.84    .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------------------------------------------------------------------
-
005:0008----------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   42.64
| 01:205    DT= 1.00 |   Total Imp(%)=   54.00   Dir. Conn.(%)=   54.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      23.03        19.61
     Dep. Storage     (mm)=       1.00         6.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      83.78        43.33
               over (min)        6.00        45.00
     Storage Coeff.  (min)=       5.58 (ii)   44.84 (ii)
     Unit Hyd. Tpeak (min)=       6.00        45.00
     Unit Hyd. peak  (cms)=        .20          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       5.32         1.42         5.909 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.60         6.001
     RUNOFF VOLUME    (mm)=      92.08        57.64        76.247
     TOTAL RAINFALL   (mm)=      93.08        93.08        93.080
     RUNOFF COEFFICIENT   =        .99          .62          .819

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.4    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
-
005:0009----------------------------------------------------------------------
-
------------------------
| ADD HYD (USNHPR    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:205          42.64    5.909    6.00  76.25    .000

                    +ID2 05:NAFRD       108.94   16.640    6.00  75.84    .000

                     ========================================================
                     SUM 02:USNHPR      151.58   22.550    6.00  75.95    .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------------------------------------------------------------------
-
005:0010----------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   21.64
| 01:206    DT= 1.00 |   Total Imp(%)=   33.00   Dir. Conn.(%)=   33.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.14        14.50
     Dep. Storage     (mm)=       1.00         7.30
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     500.00       500.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      83.78        28.86
               over (min)        6.00        59.00
     Storage Coeff.  (min)=       6.37 (ii)   59.18 (ii)
     Unit Hyd. Tpeak (min)=       6.00        59.00
     Unit Hyd. peak  (cms)=        .18          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.64          .68         1.840 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.85         6.001
     RUNOFF VOLUME    (mm)=      92.07        46.23        61.373
     TOTAL RAINFALL   (mm)=      93.08        93.08        93.080
     RUNOFF COEFFICIENT   =        .99          .50          .659

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  77.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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005:0011----------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   18.93
| 03:207    DT= 1.00 |   Total Imp(%)=   30.00   Dir. Conn.(%)=   30.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.68        13.25
     Dep. Storage     (mm)=       1.00         8.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     200.00       200.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=      83.78        41.24
               over (min)        4.00        30.00
     Storage Coeff.  (min)=       3.68 (ii)   30.10 (ii)
     Unit Hyd. Tpeak (min)=       4.00        30.00
     Unit Hyd. peak  (cms)=        .30          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.32          .88          1.831 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.37          6.001
     RUNOFF VOLUME    (mm)=      92.07        42.44         57.344
     TOTAL RAINFALL   (mm)=      93.08        93.08         93.080
     RUNOFF COEFFICIENT   =        .99          .46           .616

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.1    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0012----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   28.78   Curve Number   (CN)=60.70
| 04:208    DT= 1.00 |   Ia      (mm)=  16.600   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .230

     Unit Hyd Qpeak  (cms)=    4.779

     PEAK FLOW       (cms)=    1.637 (i)
     TIME TO PEAK    (hrs)=    6.118
     RUNOFF VOLUME    (mm)=   24.277
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .261

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
005:0013----------------------------------------------------------------------
-
------------------------
| ADD HYD (WATST     ) | ID: NHYD          AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                        ID1 01:206          21.64    1.840    6.00  61.37    .000

                       +ID2 02:USNHPR       151.58   22.550    6.00  75.95    .000

                       +ID3 03:207          18.93    1.831    6.00  57.34    .000

                       +ID4 04:208          28.78    1.637    6.12  24.28    .000

                        ========================================================
                        SUM 05:WATST        220.93   27.611    6.00  66.20    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
005:0014----------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.51
| 01:209    DT= 1.00 |   Total Imp(%)=   95.00   Dir. Conn.(%)=   95.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.43          .08
     Dep. Storage     (mm)=       1.00        10.10
     Average Slope     (%)=       3.61         3.61
     Length            (m)=     600.00       600.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=      83.78        22.99
               over (min)        6.00        60.00
     Storage Coeff.  (min)=       5.96 (ii)   60.00 (ii)
     Unit Hyd. Tpeak (min)=       6.00        60.00
     Unit Hyd. peak  (cms)=        .19          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .33          .00           .331 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.88          6.001
     RUNOFF VOLUME    (mm)=      92.08        37.47         89.350
     TOTAL RAINFALL   (mm)=      93.08        93.08         93.080
     RUNOFF COEFFICIENT   =        .99          .40           .960
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       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  71.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0015---------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   19.61
| 02:210    DT= 1.00 |   Total Imp(%)=   23.00   Dir. Conn.(%)=   23.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.51        15.10
     Dep. Storage     (mm)=        .50         6.10
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     288.00       262.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      83.78        46.44
               over (min)        5.00        34.00
     Storage Coeff.  (min)=       4.58 (ii)   34.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        34.00
     Unit Hyd. peak  (cms)=        .24          .03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.05         1.14          1.669 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.42          6.018
     RUNOFF VOLUME    (mm)=      92.58        51.47         60.936
     TOTAL RAINFALL   (mm)=      93.08        93.08         93.080
     RUNOFF COEFFICIENT   =        .99          .55           .655

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0016---------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=   23.49   Curve Number   (CN)=64.00
| 03:211    DT= 1.00 |   Ia      (mm)=  10.700   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .420

     Unit Hyd Qpeak  (cms)=    2.136

     PEAK FLOW       (cms)=    1.177 (i)
     TIME TO PEAK    (hrs)=    6.301
     RUNOFF VOLUME    (mm)=   30.128
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .324

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0017---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    7.71   Curve Number   (CN)=57.10
| 04:212    DT= 1.00 |   Ia      (mm)=  14.300   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .370

     Unit Hyd Qpeak  (cms)=     .796

     PEAK FLOW       (cms)=     .311 (i)
     TIME TO PEAK    (hrs)=    6.268
     RUNOFF VOLUME    (mm)=   23.019
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .247

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0018---------------------------------------------------------------------
-
------------------------
| ADD HYD (NITH      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:209           1.51     .331    6.00  89.35    .000

                      +ID2 02:210          19.61    1.669    6.02  60.94    .000

                      +ID3 03:211          23.49    1.177    6.30  30.13    .000

                      +ID4 04:212           7.71     .311    6.27  23.02    .000

                      +ID5 05:WATST       220.93   27.611    6.00  66.20    .000

                       ============================================================
                       SUM 06:NITH        273.25   30.546    6.00  61.63    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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005:0019--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
-
  ** END OF RUN :   5

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

--------------------  Rainfall dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 006
    NSTORM=   1
           #  1=watSCS50.12h
--------------------------------------------------------------------------------
-
006:0002--------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [NH Properties Inc.]    Project Number: [35056-104]
*#  Date        : 04-27-2021
*#  Modeller    : [CJC]
*#  Company     : MTE Consultants Inc.
*#  License #   : 3057174
*#*****************************************************************************
```

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006:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 50-year, 12 hour SCS Type II Storm, Regi
| Ptotal= 104.85 mm|    Comments: 50-year, 12 hour SCS Type II Storm, Regi
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.50	2.100	3.50	4.190	6.50	18.870	9.50	4.190
1.00	2.100	4.00	4.190	7.00	8.390	10.00	2.100
1.50	2.100	4.50	6.290	7.50	6.290	10.50	2.100
2.00	2.100	5.00	8.390	8.00	6.290	11.00	2.100
2.50	4.190	5.50	12.580	8.50	4.190	11.50	2.100
3.00	4.190	6.00	94.370	9.00	4.190	12.00	2.100

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006:0003--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   10.60
| 01:201    DT= 1.00 |   Total Imp(%)=   28.00   Dir. Conn.(%)=   28.00
----------------------
```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.97	7.63	
Dep. Storage	(mm)=	1.50	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	137.00	137.00	
Mannings n	=	.015	.250	
Max.eff.Inten.	(mm/hr)=	94.37	88.78	
over	(min)	3.00	18.00	
Storage Coeff.	(min)=	2.80 (ii)	18.29 (ii)	
Unit Hyd. Tpeak	(min)=	3.00	18.00	
Unit Hyd. peak	(cms)=	.39	.06	
				TOTALS
PEAK FLOW	(cms)=	.78	1.36	2.033 (iii)
TIME TO PEAK	(hrs)=	6.00	6.12	6.001
RUNOFF VOLUME	(mm)=	103.35	55.01	68.550
TOTAL RAINFALL	(mm)=	104.85	104.85	104.851
RUNOFF COEFFICIENT	=	.99	.52	.654

```
  (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
       Fo   (mm/hr)= 75.00          K  (1/hr)=  4.00
       Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  1.00
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
      THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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006:0004----------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   32.34
| 02:202    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      19.40         12.94
     Dep. Storage     (mm)=       1.00          6.40
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     400.00        400.00
     Mannings n            =       .015          .250

     Max.eff.Inten.(mm/hr)=      94.37         55.14
               over (min)        5.00         41.00
     Storage Coeff.  (min)=       5.32 (ii)   40.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00         41.00
     Unit Hyd. peak  (cms)=        .22           .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       5.06          1.19          5.615 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.53          6.001
     RUNOFF VOLUME    (mm)=     103.85         68.80         89.840
     TOTAL RAINFALL   (mm)=     104.85        104.85        104.851
     RUNOFF COEFFICIENT   =        .99           .66           .857

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0005----------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   16.10
| 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.66          6.44
     Dep. Storage     (mm)=       1.00          7.20
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     400.00        400.00
     Mannings n            =       .015          .250

     Max.eff.Inten.(mm/hr)=      94.37         51.71
               over (min)        5.00         42.00
     Storage Coeff.  (min)=       5.32 (ii)   41.90 (ii)
     Unit Hyd. Tpeak (min)=       5.00         42.00
     Unit Hyd. peak  (cms)=        .22           .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.52          .55          2.767 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.55          6.001
     RUNOFF VOLUME    (mm)=     103.84         65.59         88.559
     TOTAL RAINFALL   (mm)=     104.85        104.85        104.851
     RUNOFF COEFFICIENT   =        .99           .63           .845

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0006----------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   49.90
| 04:204    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      29.94         19.96
     Dep. Storage     (mm)=       1.00          6.60
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     318.00        318.00
     Mannings n            =       .015          .250

     Max.eff.Inten.(mm/hr)=      94.37         59.26
               over (min)        5.00         35.00
     Storage Coeff.  (min)=       4.63 (ii)   34.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00         35.00
     Unit Hyd. peak  (cms)=        .24           .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       7.83          1.94          8.874 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.42          6.001
     RUNOFF VOLUME    (mm)=     103.84         66.14         88.773
     TOTAL RAINFALL   (mm)=     104.85        104.85        104.851
     RUNOFF COEFFICIENT   =        .99           .63           .847

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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006:0007--------------------------------------------------------------------------
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------------------------
| ADD HYD (NAFRD     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201           10.60    2.033    6.00  68.55    .000

                     +ID2 02:202           32.34    5.615    6.00  89.84    .000

                     +ID3 03:203           16.10    2.767    6.00  88.56    .000

                     +ID4 04:204           49.90    8.874    6.00  88.77    .000

                      ============================================================
                      SUM 05:NAFRD        108.94   19.289    6.00  87.09    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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006:0008--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   42.64
| 01:205    DT= 1.00 |   Total Imp(%)=   54.00   Dir. Conn.(%)=   54.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      23.03         19.61
     Dep. Storage     (mm)=       1.00          6.50
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     400.00        400.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      94.37         54.66
               over (min)        5.00         41.00
     Storage Coeff.  (min)=       5.32 (ii)    41.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00         41.00
     Unit Hyd. peak  (cms)=        .22           .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       6.01          1.78          6.833 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.53          6.001
     RUNOFF VOLUME    (mm)=     103.85         68.21         87.464
     TOTAL RAINFALL   (mm)=     104.85        104.85        104.851
     RUNOFF COEFFICIENT   =        .99           .65           .834

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.4    Ia = Dep. Storage  (Above)
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      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0009--------------------------------------------------------------------------
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------------------------
| ADD HYD (USNHPR    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:205           42.64    6.833    6.00  87.46    .000

                     +ID2 05:NAFRD        108.94   19.289    6.00  87.09    .000

                      ============================================================
                      SUM 02:USNHPR       151.58   26.122    6.00  87.20    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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006:0010--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   21.64
| 01:206    DT= 1.00 |   Total Imp(%)=   33.00   Dir. Conn.(%)=   33.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.14         14.50
     Dep. Storage     (mm)=       1.00          7.30
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     500.00        500.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      94.37         36.69
               over (min)        6.00         54.00
     Storage Coeff.  (min)=       6.08 (ii)    54.05 (ii)
     Unit Hyd. Tpeak (min)=       6.00         54.00
     Unit Hyd. peak  (cms)=        .19           .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.85           .88          2.142 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.77          6.001
     RUNOFF VOLUME    (mm)=     103.84         55.66         71.584
     TOTAL RAINFALL   (mm)=     104.85        104.85        104.851
     RUNOFF COEFFICIENT   =        .99           .53           .683

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  77.6    Ia = Dep. Storage  (Above)
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      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0011--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   18.93
| 03:207    DT= 1.00 |   Total Imp(%)=   30.00   Dir. Conn.(%)=   30.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.68        13.25
     Dep. Storage     (mm)=       1.00         8.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     200.00       200.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      94.37        51.72
               over (min)        4.00        28.00
     Storage Coeff.  (min)=       3.51 (ii)   27.64 (ii)
     Unit Hyd. Tpeak (min)=       4.00        28.00
     Unit Hyd. peak  (cms)=        .31          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.49         1.13         2.206 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.32         6.001
     RUNOFF VOLUME    (mm)=     103.85        51.48        67.199
     TOTAL RAINFALL   (mm)=     104.85       104.85       104.851
     RUNOFF COEFFICIENT   =        .99          .49          .641

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.1    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0012--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=   28.78   Curve Number   (CN)=60.70
| 04:208    DT= 1.00 |   Ia      (mm)=  16.600   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .230

     Unit Hyd Qpeak  (cms)=    4.779

     PEAK FLOW       (cms)=    2.104 (i)
     TIME TO PEAK    (hrs)=    6.101
     RUNOFF VOLUME    (mm)=   30.820
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .294

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0013--------------------------------------------------------------------------
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------------------------
| ADD HYD (WATST     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:206          21.64    2.142    6.00  71.58    .000

                      +ID2 02:USNHPR      151.58   26.122    6.00  87.20    .000

                      +ID3 03:207          18.93    2.206    6.00  67.20    .000

                      +ID4 04:208          28.78    2.104    6.10  30.82    .000

                       ============================================================
                       SUM 05:WATST       220.93   32.287    6.00  76.61    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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006:0014--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.51
| 01:209    DT= 1.00 |   Total Imp(%)=   95.00   Dir. Conn.(%)=   95.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.43          .08
     Dep. Storage     (mm)=       1.00        10.10
     Average Slope     (%)=       3.61         3.61
     Length            (m)=     600.00       600.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      94.37        30.03
               over (min)        6.00        54.00
     Storage Coeff.  (min)=       5.68 (ii)   54.25 (ii)
     Unit Hyd. Tpeak (min)=       6.00        54.00
     Unit Hyd. peak  (cms)=        .20          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .37          .00          .374 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.78         6.001
```

```
     RUNOFF VOLUME    (mm)=     103.84        45.90        100.954
     TOTAL RAINFALL   (mm)=     104.85       104.85        104.851
     RUNOFF COEFFICIENT   =        .99          .44           .963

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  71.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0015----------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   19.61
| 02:210    DT= 1.00 |   Total Imp(%)=   23.00   Dir. Conn.(%)=   23.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.51        15.10
     Dep. Storage     (mm)=        .50         6.10
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     288.00       262.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      94.37        59.57
               over (min)        4.00        31.00
     Storage Coeff.  (min)=       4.37 (ii)   31.18 (ii)
     Unit Hyd. Tpeak (min)=       4.00        31.00
     Unit Hyd. peak  (cms)=        .27          .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.18         1.45          2.061 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.37          6.018
     RUNOFF VOLUME    (mm)=     104.34        61.42         71.310
     TOTAL RAINFALL   (mm)=     104.85       104.85        104.851
     RUNOFF COEFFICIENT   =       1.00          .59           .680

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0016----------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=   23.49   Curve Number   (CN)=64.00
| 03:211    DT= 1.00 |   Ia      (mm)=  10.700   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .420

     Unit Hyd Qpeak  (cms)=    2.136

     PEAK FLOW       (cms)=    1.474 (i)
     TIME TO PEAK    (hrs)=    6.301
     RUNOFF VOLUME    (mm)=   37.398
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .357

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0017----------------------------------------------------------------------
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| CALIB NASHYD       |   Area    (ha)=    7.71   Curve Number   (CN)=57.10
| 04:212    DT= 1.00 |   Ia      (mm)=  14.300   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .370

     Unit Hyd Qpeak  (cms)=     .796

     PEAK FLOW       (cms)=     .400 (i)
     TIME TO PEAK    (hrs)=    6.251
     RUNOFF VOLUME    (mm)=   29.140
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .278

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0018----------------------------------------------------------------------
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------------------------
| ADD HYD (NITH      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                        ID1 01:209          1.51     .374    6.00 100.95    .000

                       +ID2 02:210         19.61    2.061    6.02  71.31    .000

                       +ID3 03:211         23.49    1.474    6.30  37.40    .000

                       +ID4 04:212          7.71     .400    6.25  29.14    .000

                       +ID5 05:WATST      220.93   32.287    6.00  76.61    .000

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                        SUM 06:NITH       273.25   35.927    6.00  71.65    .000
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   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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006:0019--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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  ** END OF RUN :   6

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| START            |  Project  dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

--------------------  Rainfall dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 007
    NSTORM=   1
           #  1=watSC100.12h
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007:0002--------------------------------------------------------------------------
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```
*#*************************************************************************
*#  Project Name: [NH Properties Inc.]    Project Number: [35056-104]
*#  Date        : 04-27-2021
*#  Modeller    : [CJC]
*#  Company     : MTE Consultants Inc.
*#  License #   : 3057174
*#*************************************************************************
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007:0002--------------------------------------------------------------------------
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--------------------
| READ STORM       |    Filename: 100-year, 12 hour SCS Type II Storm, Reg
| Ptotal= 115.84 mm|    Comments: 100-year, 12 hour SCS Type II Storm, Reg
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   2.320 |   3.50   4.630 |   6.50  20.850 |   9.50   4.630
              1.00   2.320 |   4.00   4.630 |   7.00   9.270 |  10.00   2.320
              1.50   2.320 |   4.50   6.950 |   7.50   6.950 |  10.50   2.320
              2.00   2.320 |   5.00   9.270 |   8.00   6.950 |  11.00   2.320
              2.50   4.630 |   5.50  13.900 |   8.50   4.630 |  11.50   2.320
              3.00   4.630 |   6.00 104.250 |   9.00   4.630 |  12.00   2.320

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007:0003--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   10.60
| 01:201    DT= 1.00 |   Total Imp(%)=   28.00   Dir. Conn.(%)=   28.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.97          7.63
     Dep. Storage     (mm)=       1.50          5.00
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     137.00        137.00
     Mannings n            =       .015          .250

     Max.eff.Inten.(mm/hr)=     104.25         99.00
               over (min)         3.00         18.00
     Storage Coeff.  (min)=       2.69 (ii)    17.52 (ii)
     Unit Hyd. Tpeak (min)=       3.00         18.00
     Unit Hyd. peak  (cms)=        .40           .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .86          1.56          2.314 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.10          6.001
     RUNOFF VOLUME    (mm)=     114.34         64.33         78.335
     TOTAL RAINFALL   (mm)=     115.84        115.84        115.841
     RUNOFF COEFFICIENT   =        .99           .56           .676
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       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 75.00          K  (1/hr)=  4.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  1.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0004--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   32.34
| 02:202    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      19.40        12.94
     Dep. Storage     (mm)=       1.00         6.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     104.25        66.68
               over (min)        5.00        38.00
     Storage Coeff.  (min)=       5.11 (ii)   38.15 (ii)
     Unit Hyd. Tpeak (min)=       5.00        38.00
     Unit Hyd. peak  (cms)=        .22          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       5.60         1.42         6.322 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.47         6.001
     RUNOFF VOLUME    (mm)=     114.83        78.86        100.461
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =        .99          .68           .867

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0005--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   16.10
| 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.66         6.44
     Dep. Storage     (mm)=       1.00         7.20
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     104.25        62.69
               over (min)        5.00        39.00
     Storage Coeff.  (min)=       5.11 (ii)   38.98 (ii)
     Unit Hyd. Tpeak (min)=       5.00        39.00
     Unit Hyd. peak  (cms)=        .22          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.79          .67         3.112 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.50         6.001
     RUNOFF VOLUME    (mm)=     114.83        75.48        99.110
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =        .99          .65           .856

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0006--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   49.90
| 04:204    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      29.94        19.96
     Dep. Storage     (mm)=       1.00         6.60
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     318.00       318.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     104.25        72.88
               over (min)        4.00        32.00
     Storage Coeff.  (min)=       4.45 (ii)   32.24 (ii)
     Unit Hyd. Tpeak (min)=       4.00        32.00
     Unit Hyd. peak  (cms)=        .26          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       8.66         2.35        10.057 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.37         6.001
     RUNOFF VOLUME    (mm)=     114.84        76.03        99.328
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =        .99          .66           .857
```

```
      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  84.2    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0007---------------------------------------------------------------------------
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------------------------
| ADD HYD (NAFRD     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 01:201           10.60    2.314    6.00  78.34    .000

                   +ID2 02:202           32.34    6.322    6.00 100.46    .000

                   +ID3 03:203           16.10    3.112    6.00  99.11    .000

                   +ID4 04:204           49.90   10.057    6.00  99.33    .000

                    ============================================================
                    SUM 05:NAFRD        108.94   21.805    6.00  97.59    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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007:0008---------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   42.64
| 01:205    DT= 1.00 |   Total Imp(%)=   54.00   Dir. Conn.(%)=   54.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      23.03        19.61
     Dep. Storage     (mm)=       1.00         6.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=     104.25        66.15
               over (min)        5.00        38.00
     Storage Coeff.  (min)=       5.11 (ii)   38.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00        38.00
     Unit Hyd. peak  (cms)=        .22          .03
                                                    *TOTALS*
     PEAK FLOW       (cms)=       6.64         2.14          7.727 (iii)
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```
     TIME TO PEAK    (hrs)=       6.00         6.47          6.001
     RUNOFF VOLUME    (mm)=     114.84        78.23         98.014
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =        .99          .68           .846

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.4    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0009---------------------------------------------------------------------------
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------------------------
| ADD HYD (USNHPR    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 01:205           42.64    7.727    6.00  98.01    .000

                   +ID2 05:NAFRD        108.94   21.805    6.00  97.59    .000

                    ============================================================
                    SUM 02:USNHPR       151.58   29.532    6.00  97.71    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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007:0010---------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   21.64
| 01:206    DT= 1.00 |   Total Imp(%)=   33.00   Dir. Conn.(%)=   33.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.14        14.50
     Dep. Storage     (mm)=       1.00         7.30
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     500.00       500.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=     104.25        44.85
               over (min)        6.00        50.00
     Storage Coeff.  (min)=       5.84 (ii)   50.11 (ii)
     Unit Hyd. Tpeak (min)=       6.00        50.00
     Unit Hyd. peak  (cms)=        .19          .02
                                                    *TOTALS*
     PEAK FLOW       (cms)=       2.05         1.08          2.443 (iii)
```

```
     TIME TO PEAK    (hrs)=       6.00         6.68          6.001
     RUNOFF VOLUME    (mm)=     114.83        64.75         81.301
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =        .99          .56           .702

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  77.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0011----------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   18.93
| 03:207    DT= 1.00 |   Total Imp(%)=   30.00   Dir. Conn.(%)=   30.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.68        13.25
     Dep. Storage     (mm)=       1.00         8.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     200.00       200.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=     104.25        62.07
                over (min)        3.00        26.00
     Storage Coeff.  (min)=       3.37 (ii)   25.80 (ii)
     Unit Hyd. Tpeak (min)=       3.00        26.00
     Unit Hyd. peak  (cms)=        .35          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.64         1.38          2.596 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.28          6.001
     RUNOFF VOLUME    (mm)=     114.84        60.21         76.613
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =        .99          .52           .661

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.1    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0012----------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=   28.78   Curve Number   (CN)=60.70
| 04:208    DT= 1.00 |   Ia      (mm)=  16.600   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .230

     Unit Hyd Qpeak  (cms)=    4.779

     PEAK FLOW       (cms)=    2.573 (i)
     TIME TO PEAK    (hrs)=    6.101
     RUNOFF VOLUME    (mm)=   37.349
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .322

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0013----------------------------------------------------------------------------
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------------------------
| ADD HYD (WATST     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:206          21.64    2.443    6.00  81.30    .000

                      +ID2 02:USNHPR       151.58   29.532    6.00  97.71    .000

                      +ID3 03:207          18.93    2.596    6.00  76.61    .000

                      +ID4 04:208          28.78    2.573    6.10  37.35    .000

                       ============================================================
                       SUM 05:WATST        220.93   36.817    6.00  86.43    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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007:0014----------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=    1.51
| 01:209    DT= 1.00 |   Total Imp(%)=   95.00   Dir. Conn.(%)=   95.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.43          .08
     Dep. Storage     (mm)=       1.00        10.10
     Average Slope     (%)=       3.61         3.61
     Length            (m)=     600.00       600.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=     104.25        37.22
```

```
               over (min)        5.00        50.00
     Storage Coeff.  (min)=       5.46 (ii)   50.03 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=        .21          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .41          .00          .415 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.70         6.001
     RUNOFF VOLUME    (mm)=     114.84        54.13        111.806
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =        .99          .47          .965

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  71.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0015---------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   19.61
| 02:210    DT= 1.00 |   Total Imp(%)=   23.00   Dir. Conn.(%)=   23.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.51        15.10
     Dep. Storage     (mm)=        .50         6.10
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     288.00       262.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     104.25        71.40
               over (min)        4.00        29.00
     Storage Coeff.  (min)=       4.19 (ii)   29.14 (ii)
     Unit Hyd. Tpeak (min)=       4.00        29.00
     Unit Hyd. peak  (cms)=        .27          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.30         1.75         2.456 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.32         6.018
     RUNOFF VOLUME    (mm)=     115.34        70.94        81.170
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =       1.00          .61          .701

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0016---------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=   23.49   Curve Number   (CN)=64.00
| 03:211    DT= 1.00 |   Ia      (mm)=  10.700   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .420

     Unit Hyd Qpeak  (cms)=    2.136

     PEAK FLOW       (cms)=    1.768 (i)
     TIME TO PEAK    (hrs)=    6.301
     RUNOFF VOLUME    (mm)=   44.572
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .385

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0017---------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    7.71   Curve Number   (CN)=57.10
| 04:212    DT= 1.00 |   Ia      (mm)=  14.300   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .370

     Unit Hyd Qpeak  (cms)=     .796

     PEAK FLOW       (cms)=     .488 (i)
     TIME TO PEAK    (hrs)=    6.251
     RUNOFF VOLUME    (mm)=   35.265
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .304

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0018---------------------------------------------------------------------------
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------------------------
| ADD HYD (NITH      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                        ID1 01:209          1.51     .415    6.00 111.81    .000

                       +ID2 02:210         19.61    2.456    6.02  81.17    .000

                       +ID3 03:211         23.49    1.768    6.30  44.57    .000
```

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                    +ID4 04:212            7.71     .488    6.25  35.26    .000

                    +ID5 05:WATST        220.93   36.817    6.00  86.43    .000

                     ============================================================
                     SUM 06:NITH         273.25   41.161    6.00  81.15    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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007:0019---------------------------------------------------------------------------
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007:0002---------------------------------------------------------------------------
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007:0002---------------------------------------------------------------------------
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007:0002---------------------------------------------------------------------------
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007:0002---------------------------------------------------------------------------
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007:0002---------------------------------------------------------------------------
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      FINISH
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-
********************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2021-05-28     at 12:44:24
================================================================================
=
```

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================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                        9   9  9   9   # 3053466
        StormWater Management HYdrologic Model           999    999    =========

 ****************************************************************************
 *************************** SWMHYMO Ver/4.05  **************************** 
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
 ****************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                   Ottawa,  Ontario: (613) 836-3884          *********
 *********                   Gatineau, Quebec: (819) 243-6858          *********
 *********                   E-Mail: swmhymo@jfsa.Com                  *********
 ****************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: MTE Consultants Inc.                        +++++++++
 +++++++++                Burlington            SERIAL#:3053466       +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ****************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10            *********
 *********           Max. number of rainfall points: 105408            *********
 *********           Max. number of flow points    : 105408            *********
 ****************************************************************************


 *********************   D E T A I L E D   O U T P U T   *********************
 ****************************************************************************
 *         DATE: 2021-05-28     TIME: 12:44:30     RUN COUNTER: 000031        *
 ****************************************************************************
 * Input   filename: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\propreg2.dat  *
 * Output  filename: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\propreg2.out  *
 * Summary filename: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\propreg2.sum  *
 * User comments:                                                             *
 * 1:_____________________________________________________________________    *
 * 2:_____________________________________________________________________    *
 * 3:_____________________________________________________________________    *
 ****************************************************************************

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001:0001-------------------------------------------------------------------------
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*#**************************************************************************
*#  Project Name: [NH Properties Inc.]    Project Number: [35056-104]
*#  Date        : 04-27-2021
*#  Modeller    : [CJC]
*#  Company     : MTE Consultants Inc.
*#  License #   : 3057174
*#**************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

--------------------  Rainfall dir.: Q:\35056\104\SWMHYMO\MAY202~1\POST\WITHRE~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=regAMC2.48h
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001:0002-------------------------------------------------------------------------
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--------------------
| READ STORM       |    Filename: Regional Storm Zone 1, AMC II Conditions
| Ptotal= 285.08 mm|    Comments: Regional Storm Zone 1, AMC II Conditions
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              1.00   2.030 |  13.00   2.030 |  25.00   2.030 |  37.00   6.000
              2.00   2.030 |  14.00   2.030 |  26.00   2.030 |  38.00   4.000
              3.00   2.030 |  15.00   2.030 |  27.00   2.030 |  39.00   6.000
              4.00   2.030 |  16.00   2.030 |  28.00   2.030 |  40.00  13.000
              5.00   2.030 |  17.00   2.030 |  29.00   2.030 |  41.00  17.000
              6.00   2.030 |  18.00   2.030 |  30.00   2.030 |  42.00  13.000
              7.00   2.030 |  19.00   2.030 |  31.00   2.030 |  43.00  23.000
              8.00   2.030 |  20.00   2.030 |  32.00   2.030 |  44.00  13.000
              9.00   2.030 |  21.00   2.030 |  33.00   2.030 |  45.00  13.000
             10.00   2.030 |  22.00   2.030 |  34.00   2.030 |  46.00  53.000
             11.00   2.030 |  23.00   2.030 |  35.00   2.030 |  47.00  38.000
             12.00   2.030 |  24.00   2.030 |  36.00   2.030 |  48.00  13.000

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001:0003-------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   10.60
| 01:201    DT= 1.00 |   Total Imp(%)=   28.00   Dir. Conn.(%)=   28.00
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                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.97         7.63
     Dep. Storage     (mm)=       1.50         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     137.00       137.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      53.00        48.00
               over (min)        4.00        23.00
     Storage Coeff.  (min)=       3.52 (ii)   23.33 (ii)
     Unit Hyd. Tpeak (min)=       4.00        23.00
     Unit Hyd. peak  (cms)=        .31          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .44          .92         1.341 (iii)
     TIME TO PEAK    (hrs)=      45.93        46.13        46.000
     RUNOFF VOLUME    (mm)=     283.57       152.98       189.557
     TOTAL RAINFALL   (mm)=     285.08       285.08       285.082
     RUNOFF COEFFICIENT   =        .99          .54          .665

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 75.00          K  (1/hr)=  4.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  1.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0004--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   32.34
| 02:202    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      19.40        12.94
     Dep. Storage     (mm)=       1.00         6.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      53.00        51.48
               over (min)        7.00        43.00
     Storage Coeff.  (min)=       6.70 (ii)   43.34 (ii)
     Unit Hyd. Tpeak (min)=       7.00        43.00
     Unit Hyd. peak  (cms)=        .17          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.86         1.46         4.086 (iii)
     TIME TO PEAK    (hrs)=      46.00        46.58        46.017
     RUNOFF VOLUME    (mm)=     284.06       241.74       267.206
     TOTAL RAINFALL   (mm)=     285.08       285.08       285.082
     RUNOFF COEFFICIENT   =       1.00          .85          .937

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0005--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   16.10
| 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.66         6.44
     Dep. Storage     (mm)=       1.00         7.20
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     400.00       400.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      53.00        51.15
               over (min)        7.00        43.00
     Storage Coeff.  (min)=       6.70 (ii)   43.44 (ii)
     Unit Hyd. Tpeak (min)=       7.00        43.00
     Unit Hyd. peak  (cms)=        .17          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.42          .72         2.029 (iii)
     TIME TO PEAK    (hrs)=      46.00        46.58        46.017
     RUNOFF VOLUME    (mm)=     284.06       237.06       265.328
     TOTAL RAINFALL   (mm)=     285.08       285.08       285.082
     RUNOFF COEFFICIENT   =       1.00          .83          .931

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0006--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   49.90
| 04:204    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
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                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       29.94         19.96
     Dep. Storage     (mm)=        1.00          6.60
     Average Slope     (%)=        2.00          2.00
     Length            (m)=      318.00        318.00
     Mannings n           =        .015          .250

     Max.eff.Inten.(mm/hr)=       53.00         51.19
               over (min)         6.00         38.00
     Storage Coeff.  (min)=       5.84 (ii)    37.84 (ii)
     Unit Hyd. Tpeak (min)=       6.00         38.00
     Unit Hyd. peak  (cms)=        .19           .03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       4.41          2.31          6.453 (iii)
     TIME TO PEAK    (hrs)=      46.00         46.45         46.000
     RUNOFF VOLUME    (mm)=     284.05        237.67        265.562
     TOTAL RAINFALL   (mm)=     285.08        285.08        285.082
     RUNOFF COEFFICIENT   =       1.00           .83           .932

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  84.2    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0007--------------------------------------------------------------------------
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------------------------
| ADD HYD (NAFRD     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                        ID1 01:201          10.60    1.341   46.00 189.56    .000

                       +ID2 02:202          32.34    4.086   46.02 267.21    .000

                       +ID3 03:203          16.10    2.029   46.02 265.33    .000

                       +ID4 04:204          49.90    6.453   46.00 265.56    .000

                        ========================================================
                        SUM 05:NAFRD       108.94   13.906   46.00 258.62    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0008--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   42.64
| 01:205    DT= 1.00 |   Total Imp(%)=   54.00   Dir. Conn.(%)=   54.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       23.03         19.61
     Dep. Storage     (mm)=        1.00          6.50
     Average Slope     (%)=        2.00          2.00
     Length            (m)=      400.00        400.00
     Mannings n           =        .015          .250

     Max.eff.Inten.(mm/hr)=       53.00         51.42
               over (min)         7.00         43.00
     Storage Coeff.  (min)=       6.70 (ii)    43.36 (ii)
     Unit Hyd. Tpeak (min)=       7.00         43.00
     Unit Hyd. peak  (cms)=        .17           .03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       3.39          2.21          5.255 (iii)
     TIME TO PEAK    (hrs)=      46.00         46.58         46.017
     RUNOFF VOLUME    (mm)=     284.02        240.88        264.270
     TOTAL RAINFALL   (mm)=     285.08        285.08        285.082
     RUNOFF COEFFICIENT   =       1.00           .84           .927

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.4    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0009--------------------------------------------------------------------------
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------------------------
| ADD HYD (USNHPR    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                        ID1 01:205          42.64    5.255   46.02 264.27    .000

                       +ID2 05:NAFRD       108.94   13.906   46.00 258.62    .000

                        ========================================================
                        SUM 02:USNHPR       151.58   19.161   46.02 260.21    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0010--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=   21.64
| 01:206    DT= 1.00 |   Total Imp(%)=   33.00   Dir. Conn.(%)=   33.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.14        14.50
     Dep. Storage     (mm)=       1.00         7.30
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     500.00       500.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      53.00        49.29
               over (min)        8.00        50.00
     Storage Coeff.  (min)=       7.66 (ii)   50.29 (ii)
     Unit Hyd. Tpeak (min)=       8.00        50.00
     Unit Hyd. peak  (cms)=        .15          .02
                                                    *TOTALS*
     PEAK FLOW       (cms)=       1.05         1.51          2.262 (iii)
     TIME TO PEAK    (hrs)=      46.00        46.75         46.750
     RUNOFF VOLUME    (mm)=     284.04       219.63        240.994
     TOTAL RAINFALL   (mm)=     285.08       285.08        285.082
     RUNOFF COEFFICIENT   =       1.00          .77           .845

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  77.6    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0011---------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   18.93
| 03:207    DT= 1.00 |   Total Imp(%)=   30.00   Dir. Conn.(%)=   30.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.68        13.25
     Dep. Storage     (mm)=       1.00         8.40
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     200.00       200.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      53.00        48.73
               over (min)        4.00        29.00
     Storage Coeff.  (min)=       4.42 (ii)   29.13 (ii)
     Unit Hyd. Tpeak (min)=       4.00        29.00
     Unit Hyd. peak  (cms)=        .26          .04
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .84         1.55          2.308 (iii)
     TIME TO PEAK    (hrs)=      46.00        46.27         46.017
     RUNOFF VOLUME    (mm)=     284.07       212.05        233.707
     TOTAL RAINFALL   (mm)=     285.08       285.08        285.082
     RUNOFF COEFFICIENT   =       1.00          .74           .820

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.1    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0012---------------------------------------------------------------------------
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| CALIB NASHYD       |   Area    (ha)=   28.78   Curve Number   (CN)=60.70
| 04:208    DT= 1.00 |   Ia      (mm)=  16.600   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .230

     Unit Hyd Qpeak  (cms)=    4.779

     PEAK FLOW       (cms)=    3.362 (i)
     TIME TO PEAK    (hrs)=   46.033
     RUNOFF VOLUME    (mm)=  166.497
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .584

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0013---------------------------------------------------------------------------
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------------------------
| ADD HYD (WATST     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:206          21.64    2.262   46.75 240.99    .000

                      +ID2 02:USNHPR       151.58   19.161   46.02 260.21    .000

                      +ID3 03:207          18.93    2.308   46.02 233.71    .000

                      +ID4 04:208          28.78    3.362   46.03 166.50    .000

                       ========================================================
                       SUM 05:WATST        220.93   27.064   46.02 243.85    .000
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NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0014----------
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| CALIB STANDHYD | Area (ha)= 1.51
| 01:209 DT= 1.00 | Total Imp(%)= 95.00 Dir. Conn.(%)= 95.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.43	.08
Dep. Storage	(mm)=	1.00	10.10
Average Slope	(%)=	3.61	3.61
Length	(m)=	600.00	600.00
Mannings n	=	.015	.250
Max.eff.Inten.(mm/hr)=		53.00	47.13
over (min)		7.00	48.00
Storage Coeff. (min)=		7.15 (ii)	47.71 (ii)
Unit Hyd. Tpeak (min)=		7.00	48.00
Unit Hyd. peak (cms)=		.16	.02

		TOTALS
PEAK FLOW	(cms)=	.21 .01 .217 (iii)
TIME TO PEAK	(hrs)=	46.00 46.72 46.000
RUNOFF VOLUME	(mm)=	284.05 201.16 279.939
TOTAL RAINFALL	(mm)=	285.08 285.08 285.082
RUNOFF COEFFICIENT	=	1.00 .71 .982

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.6 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-
001:0015----------
-

| CALIB STANDHYD | Area (ha)= 19.61
| 02:210 DT= 1.00 | Total Imp(%)= 23.00 Dir. Conn.(%)= 23.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	4.51	15.10
Dep. Storage	(mm)=	.50	6.10
Average Slope	(%)=	2.00	2.00
Length	(m)=	288.00	262.00
Mannings n	=	.015	.250
Max.eff.Inten.(mm/hr)=		53.00	50.43
over (min)		5.00	34.00
Storage Coeff. (min)=		5.50 (ii)	34.16 (ii)
Unit Hyd. Tpeak (min)=		5.00	34.00
Unit Hyd. peak (cms)=		.21	.03

		TOTALS
PEAK FLOW	(cms)=	.66 1.77 2.292 (iii)
TIME TO PEAK	(hrs)=	46.00 46.37 46.033
RUNOFF VOLUME	(mm)=	284.57 229.51 242.264
TOTAL RAINFALL	(mm)=	285.08 285.08 285.082
RUNOFF COEFFICIENT	=	1.00 .81 .850

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.9 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-
001:0016----------
-

| CALIB NASHYD | Area (ha)= 23.49 Curve Number (CN)=64.00
| 03:211 DT= 1.00 | Ia (mm)= 10.700 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= .420

Unit Hyd Qpeak (cms)= 2.136

PEAK FLOW (cms)= 2.645 (i)
TIME TO PEAK (hrs)= 46.200
RUNOFF VOLUME (mm)= 180.429
TOTAL RAINFALL (mm)= 285.082
RUNOFF COEFFICIENT = .633

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-
001:0017----------
-

| CALIB NASHYD | Area (ha)= 7.71 Curve Number (CN)=57.10
| 04:212 DT= 1.00 | Ia (mm)= 14.300 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= .370

Unit Hyd Qpeak (cms)= .796

PEAK FLOW (cms)= .818 (i)
TIME TO PEAK (hrs)= 46.133

```
     RUNOFF VOLUME    (mm)=  158.839
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .557

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
001:0018--------------------------------------------------------------------------
-
------------------------
| ADD HYD (NITH      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209            1.51     .217   46.00 279.94    .000

                     +ID2 02:210           19.61    2.292   46.03 242.26    .000

                     +ID3 03:211           23.49    2.645   46.20 180.43    .000

                     +ID4 04:212            7.71     .818   46.13 158.84    .000

                     +ID5 05:WATST        220.93   27.064   46.02 243.85    .000

                      ============================================================
                      SUM 06:NITH         273.25   32.922   46.02 236.08    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
-
001:0019--------------------------------------------------------------------------
-
      FINISH
--------------------------------------------------------------------------------
-
********************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2021-05-28     at 12:44:31
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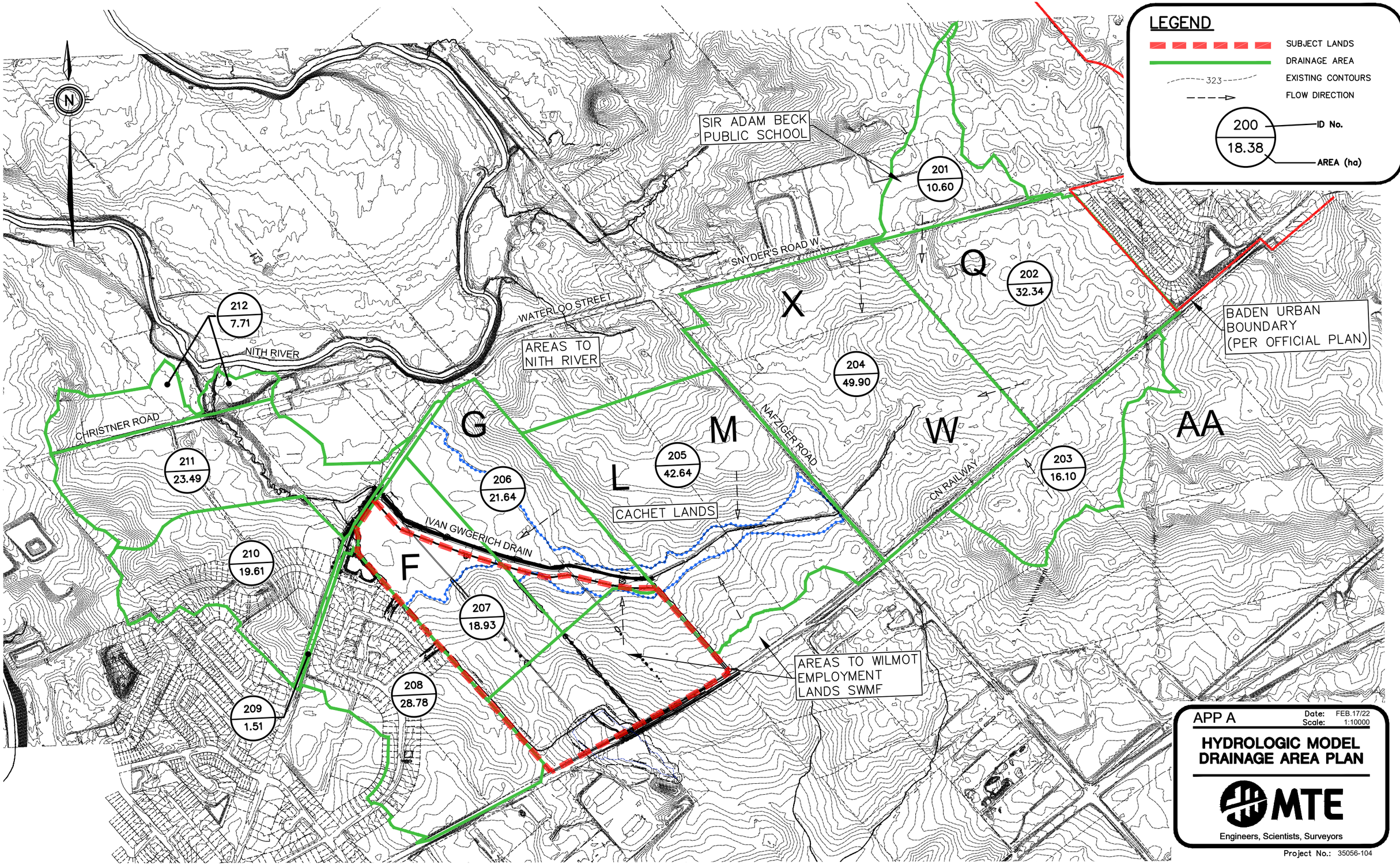

September 27, 2022 12:19 p.m. Plotted By: acressman

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Appendix B

HEC-RAS Model

35056-104 Wilmot Woods Subdivision

Ivan Gingerich Municipal Drain HEC-RAS Model

Floodplain Mapping

Proposed Flow – Ultimate Conditions

(cms)

Flow Change Location				Profile Names and Flow Rates	
	River	Reach	RS	Regional	100 yr 12hr
1	Drain	1	2241	19.16	29.53
2	Drain	1	1625	27.06	36.82
3	Drain	1	760	32.92	41.16

PRE-CONSTRUCTION MODEL RESULTS

HEC-RAS Plan: Plan 05 River: Drain Reach: 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	2241	Regional	19.16	346.00	346.68	346.41	346.73	0.004671	1.44	31.51	87.41	0.58
1	2241	100 yr 12hr	29.53	346.00	346.82	346.64	346.88	0.004493	1.61	44.76	101.32	0.58
1	1887	Regional	19.16	343.49	344.40	344.40	344.58	0.008124	2.13	18.03	59.84	0.78
1	1887	100 yr 12hr	29.53	343.49	344.54	344.54	344.75	0.008382	2.42	27.24	71.75	0.82
1	1725	Regional	19.16	341.30	343.27	343.07	343.33	0.002312	1.40	32.19	75.28	0.41
1	1725	100 yr 12hr	29.53	341.30	343.39	343.21	343.48	0.003114	1.73	41.95	83.09	0.49
1	1625	Regional	27.06	341.09	342.86	342.78	342.98	0.004970	1.83	32.93	97.55	0.61
1	1625	100 yr 12hr	36.82	341.09	342.99		343.10	0.004447	1.89	46.08	105.36	0.59
1	1515	Regional	27.06	340.27	342.24		342.38	0.006205	2.32	31.16	69.89	0.68
1	1515	100 yr 12hr	36.82	340.27	342.36		342.52	0.006600	2.56	40.64	82.56	0.71
1	1415	Regional	27.06	339.77	341.76		341.89	0.003984	2.06	37.73	92.57	0.55
1	1415	100 yr 12hr	36.82	339.77	341.90		342.01	0.003815	2.14	51.20	102.52	0.55
1	1385	Regional	27.06	339.10	341.74	341.35	341.77	0.000793	1.14	78.79	136.03	0.26
1	1385	100 yr 12hr	36.82	339.10	341.88	341.48	341.91	0.000879	1.26	97.74	145.46	0.28
1	1377.5		Culvert									
1	1370	Regional	27.06	338.80	341.74	341.40	341.77	0.001152	1.20	74.84	128.71	0.27
1	1370	100 yr 12hr	36.82	338.80	341.88	341.51	341.90	0.001235	1.30	92.65	137.89	0.28
1	1340	Regional	27.06	339.24	341.39	341.37	341.58	0.006232	2.39	28.03	77.10	0.68
1	1340	100 yr 12hr	36.82	339.24	341.51	341.49	341.71	0.006364	2.57	38.32	88.55	0.70
1	1240	Regional	27.06	339.00	340.95		341.08	0.003975	2.04	38.25	113.86	0.55
1	1240	100 yr 12hr	36.82	339.00	341.08	340.99	341.21	0.003884	2.14	56.14	168.18	0.56
1	1140	Regional	27.06	338.44	340.47	340.47	340.62	0.005422	2.20	37.33	126.33	0.62
1	1140	100 yr 12hr	36.82	338.44	340.54	340.54	340.71	0.006496	2.49	47.44	176.43	0.69
1	1085	Regional	27.06	338.32	340.37	340.17	340.38	0.001124	0.97	108.33	310.62	0.27
1	1085	100 yr 12hr	36.82	338.32	340.44	340.23	340.45	0.001227	1.05	130.94	317.23	0.29
1	1005	Regional	27.06	338.04	340.34		340.34	0.000267	0.54	194.58	412.81	0.14
1	1005	100 yr 12hr	36.82	338.04	340.40		340.41	0.000348	0.63	221.93	430.17	0.16
1	950	Regional	27.06	337.64	340.33		340.33	0.000222	0.53	197.86	400.82	0.13
1	950	100 yr 12hr	36.82	337.64	340.39		340.39	0.000300	0.63	222.31	410.45	0.15
1	895	Regional	27.06	337.73	340.33		340.33	0.000025	0.20	432.85	495.51	0.05
1	895	100 yr 12hr	36.82	337.73	340.38		340.39	0.000038	0.25	462.31	498.99	0.06
1	860	Regional	27.06	337.70	340.32		340.32	0.000016	0.17	491.97	506.29	0.04
1	860	100 yr 12hr	36.82	337.70	340.38		340.38	0.000026	0.23	521.94	510.85	0.05
1	815	Regional	27.06	337.45	340.32		340.32	0.000011	0.14	566.67	517.16	0.03
1	815	100 yr 12hr	36.82	337.45	340.38		340.38	0.000017	0.18	597.20	523.15	0.04
1	795	Regional	27.06	337.54	340.32	339.32	340.32	0.000014	0.15	532.23	517.06	0.04
1	795	100 yr 12hr	36.82	337.54	340.38	339.35	340.38	0.000022	0.19	562.58	521.30	0.04
1	790		Culvert									
1	785	Regional	27.06	337.51	340.32	339.84	340.32	0.000017	0.15	511.36	522.59	0.04
1	785	100 yr 12hr	36.82	337.51	340.38	340.16	340.38	0.000027	0.19	541.58	525.44	0.04
1	772.5		Culvert									
1	760	Regional	32.92	337.50	339.62	339.16	339.96	0.003822	2.63	14.05	282.19	0.61
1	760	100 yr 12hr	41.16	337.50	339.36	339.36	340.10	0.010185	3.88	11.75	142.96	0.97
1	725	Regional	32.92	337.42	339.67		339.68	0.000200	0.63	177.82	230.18	0.14
1	725	100 yr 12hr	41.16	337.42	339.08	338.84	339.13	0.001969	1.55	80.38	138.45	0.42
1	545	Regional	32.92	336.30	339.65		339.66	0.000192	0.76	187.83	242.96	0.14
1	545	100 yr 12hr	41.16	336.30	338.24	338.24	338.58	0.010220	3.72	29.97	44.25	0.92
1	330	Regional	32.92	334.42	339.64		339.64	0.000026	0.35	401.79	327.17	0.05
1	330	100 yr 12hr	41.16	334.42	338.12	336.49	338.14	0.000327	0.98	102.89	62.17	0.17
1	190	Regional	32.92	333.00	339.64		339.64	0.000007	0.26	561.32	359.14	0.03
1	190	100 yr 12hr	41.16	333.00	338.13		338.13	0.000030	0.45	255.17	102.71	0.06
1	155	Regional	32.92	333.20	339.64	335.07	339.64	0.000008	0.28	576.79	349.70	0.04

HEC-RAS Plan: Plan 05 River: Drain Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	155	100 yr 12hr	41.16	333.20	338.12	335.31	338.13	0.000089	0.75	214.39	159.41	0.11
1	142.5		Culvert									
1	130	Regional	32.92	333.10	339.64	335.00	339.64	0.000006	0.24	699.82	461.89	0.03
1	130	100 yr 12hr	41.16	333.10	337.90	335.24	337.91	0.000094	0.75	178.28	93.38	0.11
1	110	Regional	32.92	332.75	339.64	333.85	339.64	0.000001	0.08	1531.08	591.10	0.01
1	110	100 yr 12hr	41.16	332.75	337.90	333.89	337.90	0.000006	0.20	633.57	409.23	0.03

POST CONSTRUCTION MODEL RESULTS

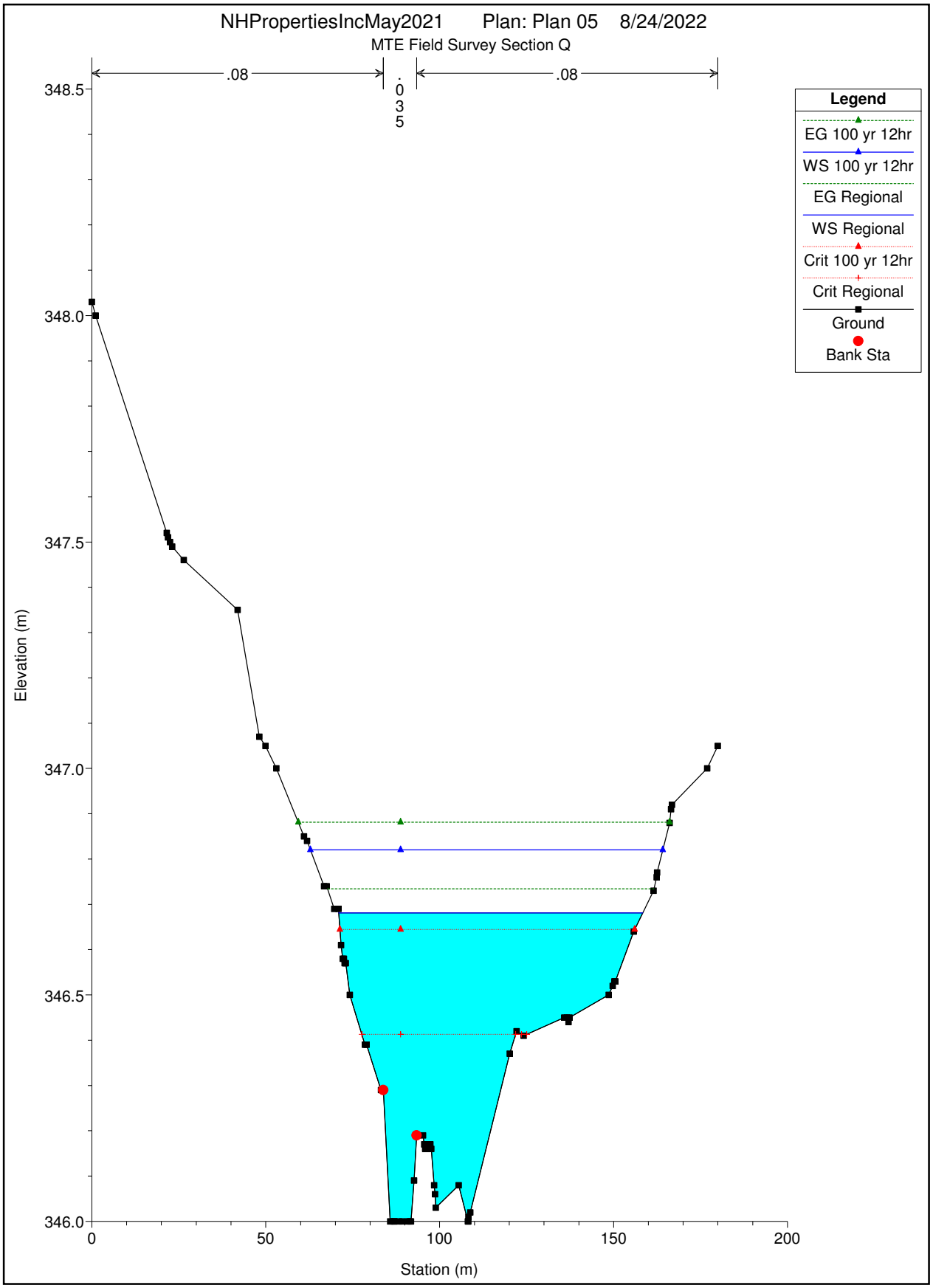
HEC-RAS Plan: Plan 05 River: Drain Reach: 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	2241	Regional	19.16	346.00	346.68	346.41	346.73	0.004671	1.44	31.51	87.41	0.58
1	2241	100 yr 12hr	29.53	346.00	346.82	346.64	346.88	0.004493	1.61	44.76	101.32	0.58
1	1887	Regional	19.16	343.49	344.40	344.40	344.58	0.008124	2.13	18.03	59.84	0.78
1	1887	100 yr 12hr	29.53	343.49	344.54	344.54	344.75	0.008382	2.42	27.24	71.75	0.82
1	1725	Regional	19.16	341.30	343.27	343.07	343.33	0.002312	1.40	32.19	75.28	0.41
1	1725	100 yr 12hr	29.53	341.30	343.39	343.21	343.48	0.003117	1.73	41.93	83.08	0.49
1	1625	Regional	27.06	341.09	342.86	342.78	342.98	0.004969	1.83	32.93	97.56	0.61
1	1625	100 yr 12hr	36.82	341.09	342.99		343.10	0.004440	1.89	46.12	105.38	0.59
1	1515	Regional	27.06	340.27	342.24		342.38	0.006206	2.32	31.16	69.88	0.68
1	1515	100 yr 12hr	36.82	340.27	342.36		342.52	0.006622	2.56	40.58	82.51	0.71
1	1415	Regional	27.06	339.77	341.76		341.89	0.003984	2.06	37.73	92.57	0.55
1	1415	100 yr 12hr	36.82	339.77	341.90		342.01	0.003821	2.14	51.15	102.43	0.55
1	1385	Regional	27.06	339.10	341.74	341.35	341.77	0.000793	1.14	78.79	136.03	0.26
1	1385	100 yr 12hr	36.82	339.10	341.88	341.48	341.91	0.000880	1.26	97.66	145.42	0.28
1	1377.5		Culvert									
1	1370	Regional	27.06	338.80	341.74	341.40	341.77	0.001152	1.20	74.84	128.71	0.27
1	1370	100 yr 12hr	36.82	338.80	341.88	341.51	341.90	0.001242	1.30	92.46	137.79	0.28
1	1340	Regional	27.06	339.24	341.39	341.37	341.58	0.006232	2.39	28.03	77.10	0.68
1	1340	100 yr 12hr	36.82	339.24	341.51	341.49	341.71	0.006296	2.56	38.52	88.73	0.70
1	1240	Regional	27.06	339.00	340.95		341.08	0.003975	2.04	38.25	113.86	0.55
1	1240	100 yr 12hr	36.82	339.00	341.07	341.00	341.21	0.004036	2.18	54.39	159.79	0.57
1	1140	Regional	27.06	338.44	340.47	340.47	340.62	0.005425	2.20	36.83	121.87	0.62
1	1140	100 yr 12hr	36.82	338.44	340.55	340.55	340.71	0.006096	2.43	48.52	182.81	0.67
1	1085	Regional	27.06	338.32	340.37	340.17	340.38	0.001116	0.96	103.53	270.37	0.27
1	1085	100 yr 12hr	36.82	338.32	340.44	340.23	340.46	0.001215	1.05	124.73	275.31	0.28
1	1005	Regional	27.06	338.04	340.34		340.34	0.000270	0.54	180.89	353.91	0.14
1	1005	100 yr 12hr	36.82	338.04	340.41		340.42	0.000339	0.62	206.35	357.73	0.16
1	950	Regional	27.06	337.64	340.33		340.33	0.000211	0.52	195.15	375.87	0.13
1	950	100 yr 12hr	36.82	337.64	340.40		340.40	0.000275	0.61	220.95	381.91	0.15
1	895	Regional	27.06	337.73	340.33		340.33	0.000028	0.21	403.26	461.83	0.05
1	895	100 yr 12hr	36.82	337.73	340.39		340.39	0.000042	0.27	434.32	466.41	0.06
1	860	Regional	27.06	337.70	340.33		340.33	0.000017	0.18	468.57	483.34	0.04
1	860	100 yr 12hr	36.82	337.70	340.39		340.39	0.000028	0.24	500.97	492.60	0.05
1	815	Regional	27.06	337.45	340.33		340.33	0.000011	0.14	545.95	505.24	0.03
1	815	100 yr 12hr	36.82	337.45	340.39		340.39	0.000017	0.18	579.78	515.59	0.04
1	795	Regional	27.06	337.54	340.32	339.32	340.32	0.000016	0.16	505.56	512.00	0.04
1	795	100 yr 12hr	36.82	337.54	340.39	339.35	340.39	0.000025	0.21	539.71	522.10	0.05
1	790		Culvert									
1	785	Regional	27.06	337.51	340.32	339.84	340.32	0.000020	0.16	486.23	516.25	0.04
1	785	100 yr 12hr	36.82	337.51	340.39	340.16	340.39	0.000029	0.20	520.21	524.47	0.05
1	772.5		Culvert									
1	760	Regional	32.92	337.50	339.62	339.16	339.96	0.003822	2.63	14.05	282.19	0.61
1	760	100 yr 12hr	41.16	337.50	339.36	339.36	340.10	0.010185	3.88	11.75	142.96	0.97
1	725	Regional	32.92	337.42	339.67		339.68	0.000200	0.63	177.82	230.18	0.14
1	725	100 yr 12hr	41.16	337.42	339.08	338.84	339.13	0.001969	1.55	80.38	138.45	0.42
1	545	Regional	32.92	336.30	339.65		339.66	0.000192	0.76	187.83	242.96	0.14
1	545	100 yr 12hr	41.16	336.30	338.24	338.24	338.58	0.010220	3.72	29.97	44.25	0.92
1	330	Regional	32.92	334.42	339.64		339.64	0.000026	0.35	401.79	327.17	0.05
1	330	100 yr 12hr	41.16	334.42	338.12	336.49	338.14	0.000327	0.98	102.89	62.17	0.17
1	190	Regional	32.92	333.00	339.64		339.64	0.000007	0.26	561.32	359.14	0.03
1	190	100 yr 12hr	41.16	333.00	338.13		338.13	0.000030	0.45	255.17	102.71	0.06
1	155	Regional	32.92	333.20	339.64	335.07	339.64	0.000008	0.28	576.79	349.70	0.04

HEC-RAS Plan: Plan 05 River: Drain Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	155	100 yr 12hr	41.16	333.20	338.12	335.31	338.13	0.000089	0.75	214.39	159.41	0.11
1	142.5		Culvert									
1	130	Regional	32.92	333.10	339.64	335.00	339.64	0.000006	0.24	699.82	461.89	0.03
1	130	100 yr 12hr	41.16	333.10	337.90	335.24	337.91	0.000094	0.75	178.28	93.38	0.11
1	110	Regional	32.92	332.75	339.64	333.85	339.64	0.000001	0.08	1531.08	591.10	0.01
1	110	100 yr 12hr	41.16	332.75	337.90	333.89	337.90	0.000006	0.20	633.57	409.23	0.03

PRE-CONSTRUCTION SECTIONS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.08
Legend
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WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
Ground
Bank Sta
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150
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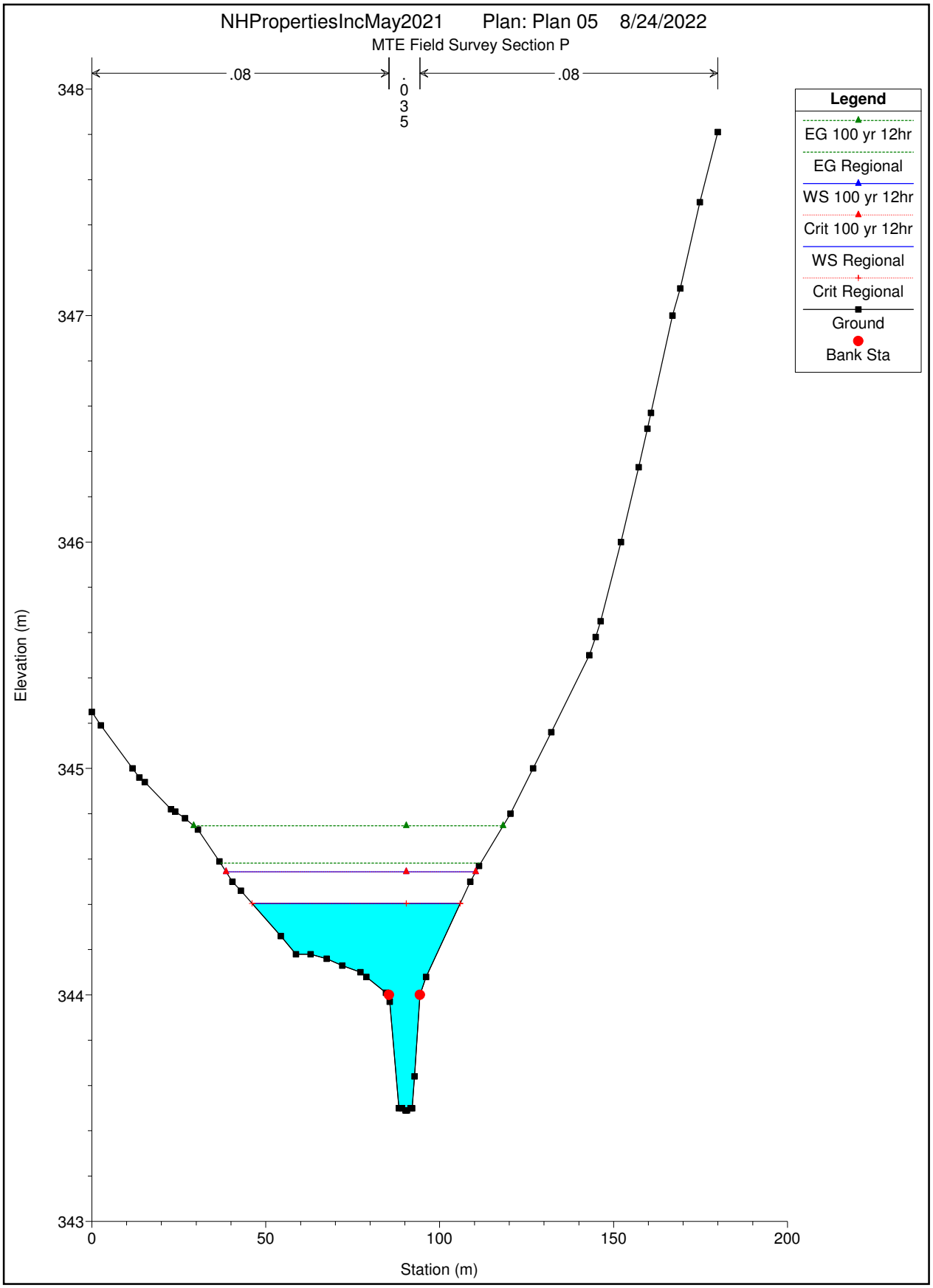
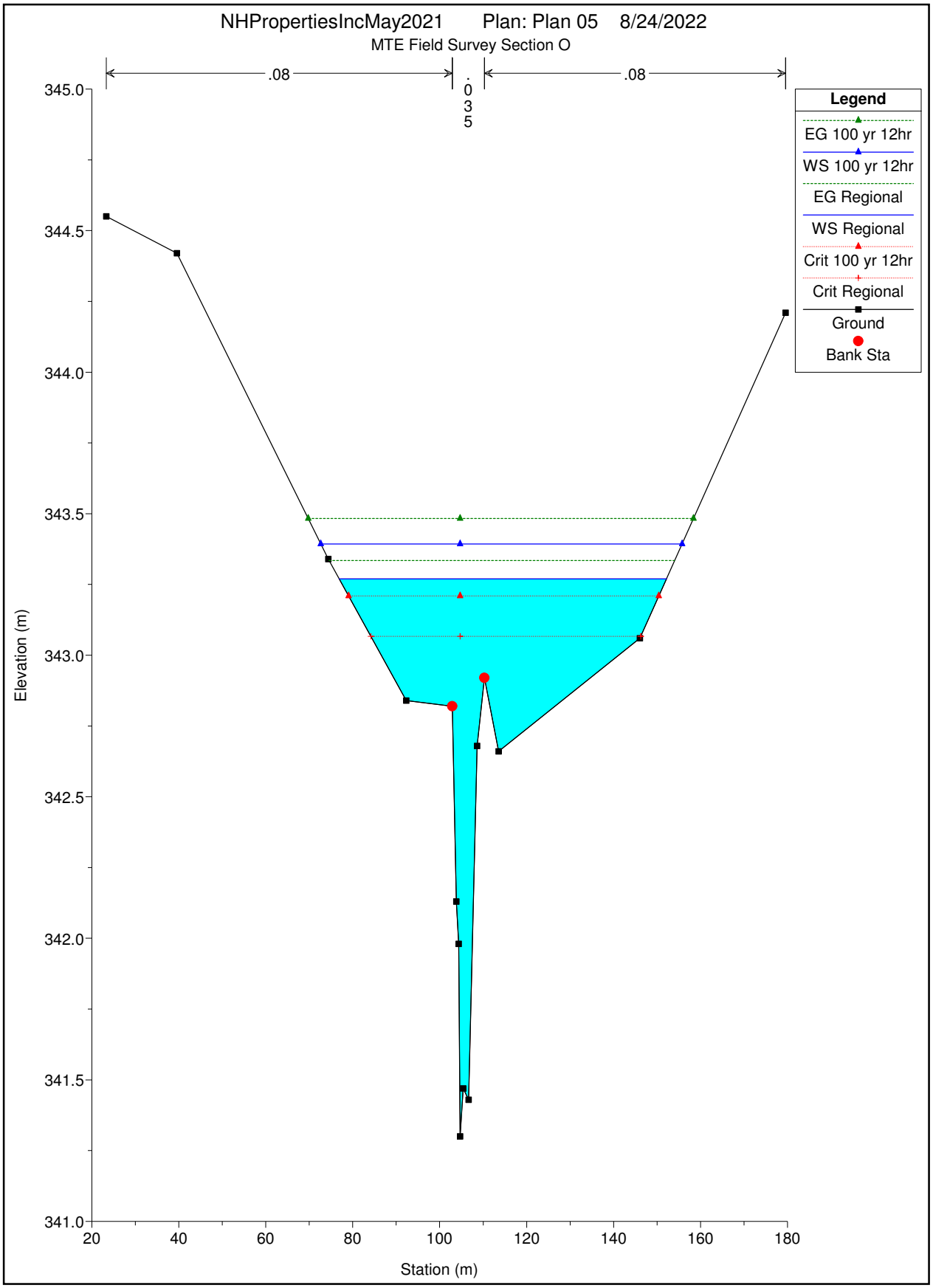
Station (m)


NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section P
.08
.035
.08
Legend
EG 100 yr 12hr
EG Regional
WS 100 yr 12hr
Crit 100 yr 12hr
WS Regional
Crit Regional
Ground
Bank Sta
Elevation (m)
348
347
346
345
344
343
0
50
100
150
200
Station (m)


NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section O
.08
.035
.08
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
Ground
Bank Sta
Elevation (m)
Station (m)
345.0
344.5
344.0
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342.5
342.0
341.5
341.0
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160
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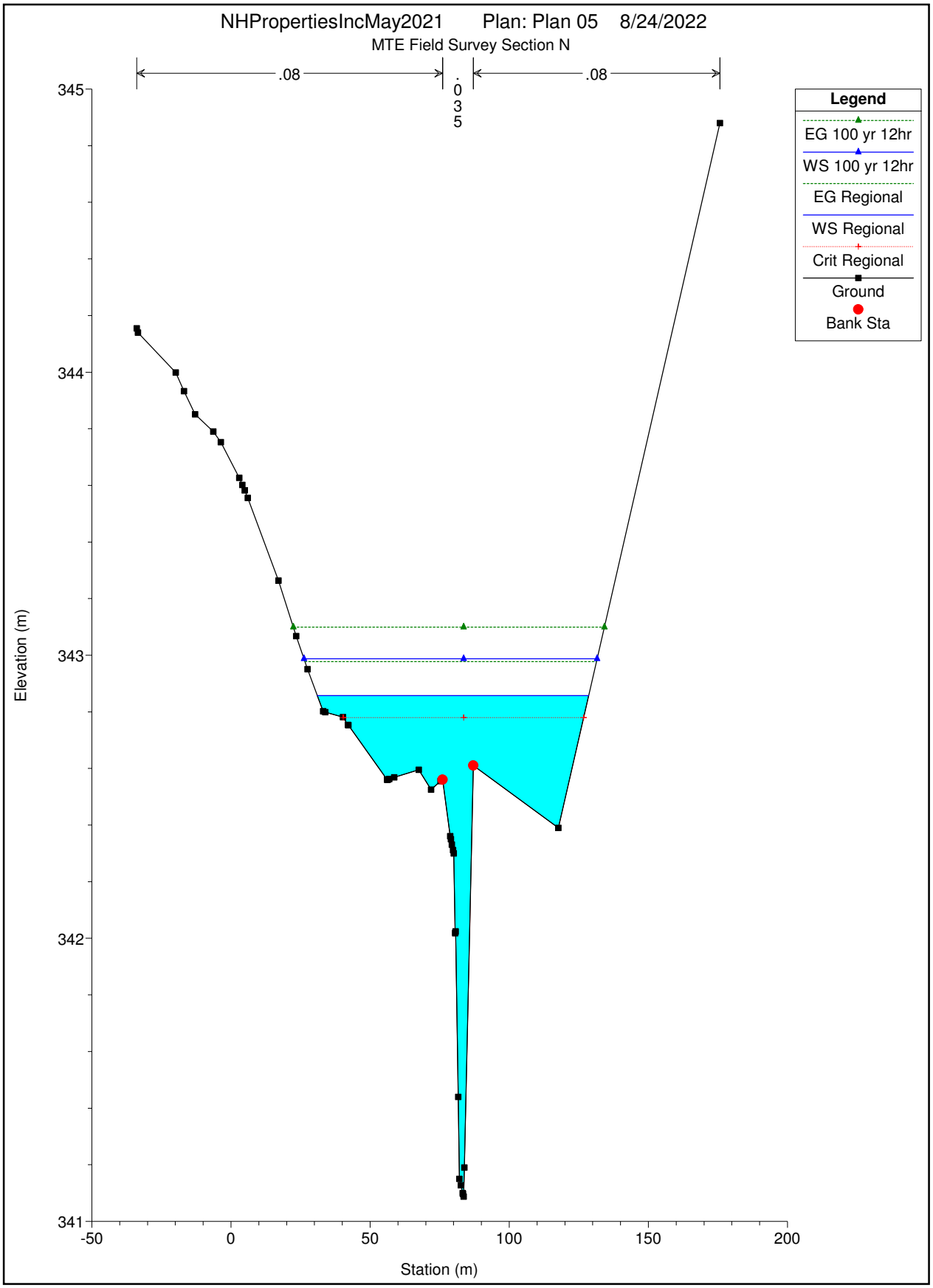
NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section N
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Legend
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WS 100 yr 12hr
EG Regional
WS Regional
Crit Regional
Ground
Bank Sta
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Elevation (m)
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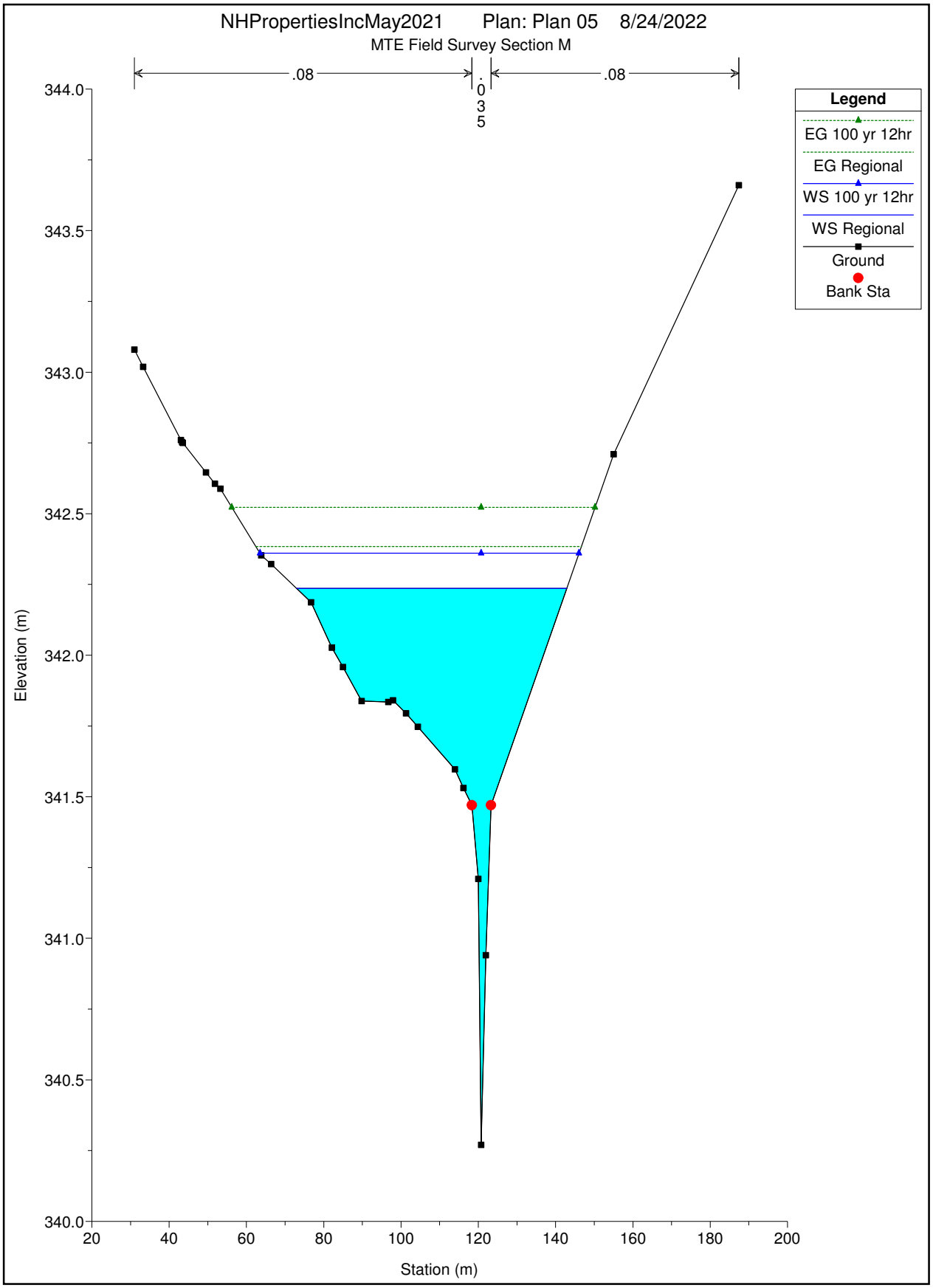
100
150
200
Station (m)


NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section M
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Legend
EG 100 yr 12hr
EG Regional
WS 100 yr 12hr
WS Regional
Ground
Bank Sta
Elevation (m)
Station (m)
344.0
343.5
343.0
342.5
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341.0
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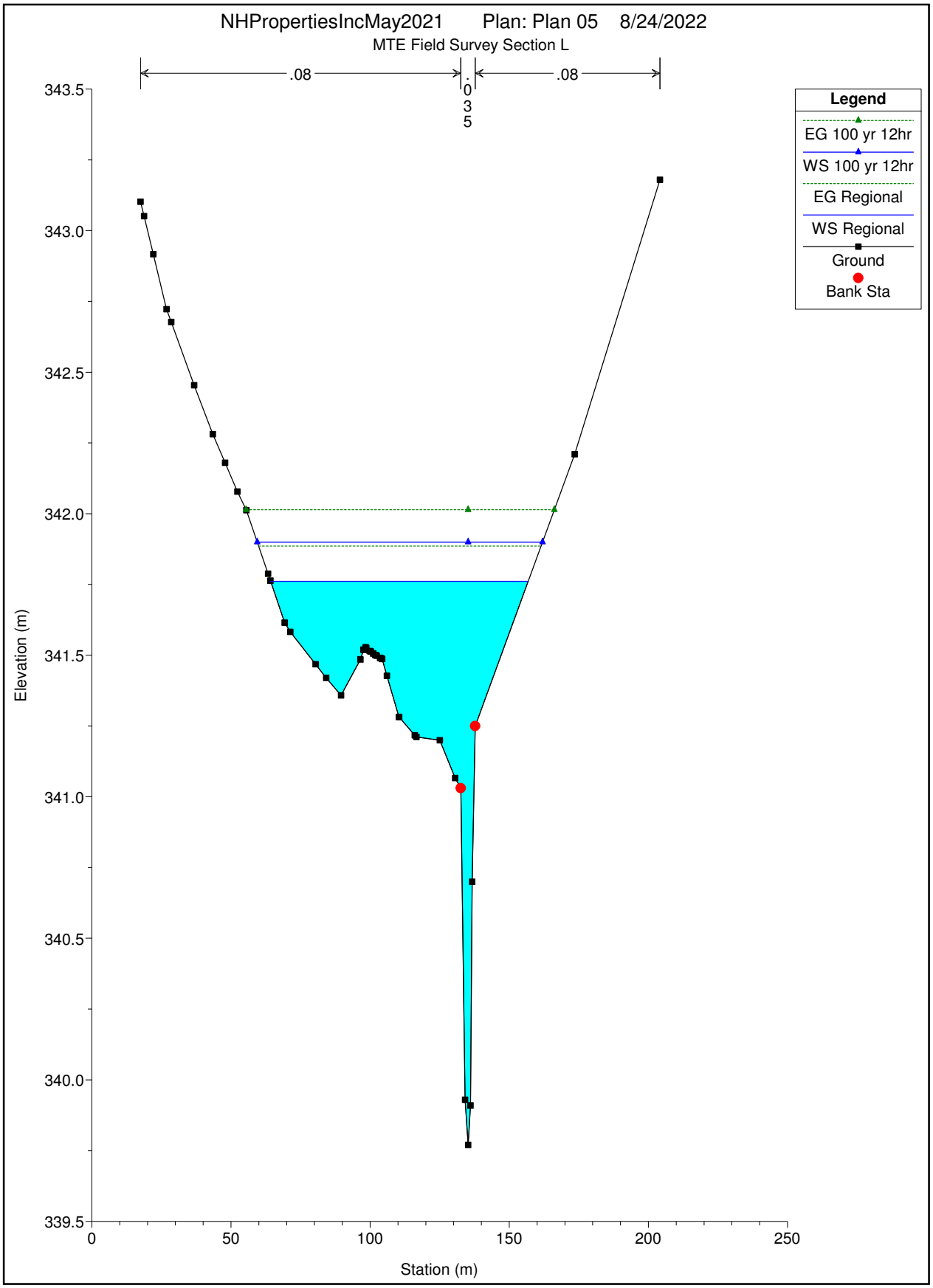
200


NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section L
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.035
.08
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Ground
Bank Sta
Elevation (m)
Station (m)
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342.0
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341.0
340.5
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339.5
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200
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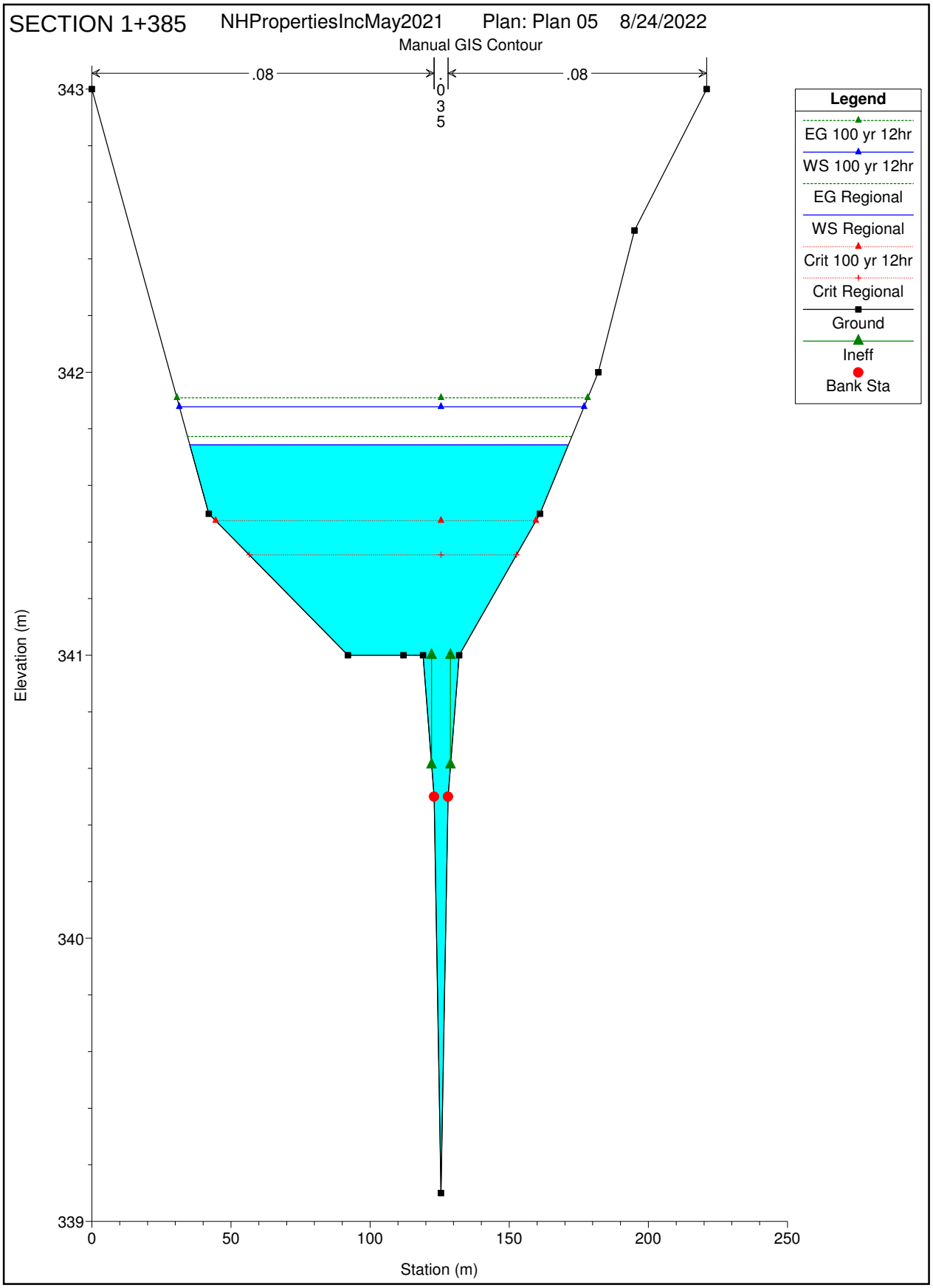
SECTION 1+385
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Plan: Plan 05
8/24/2022
Manual GIS Contour
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Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
Ground
Ineff
Bank Sta
Elevation (m)
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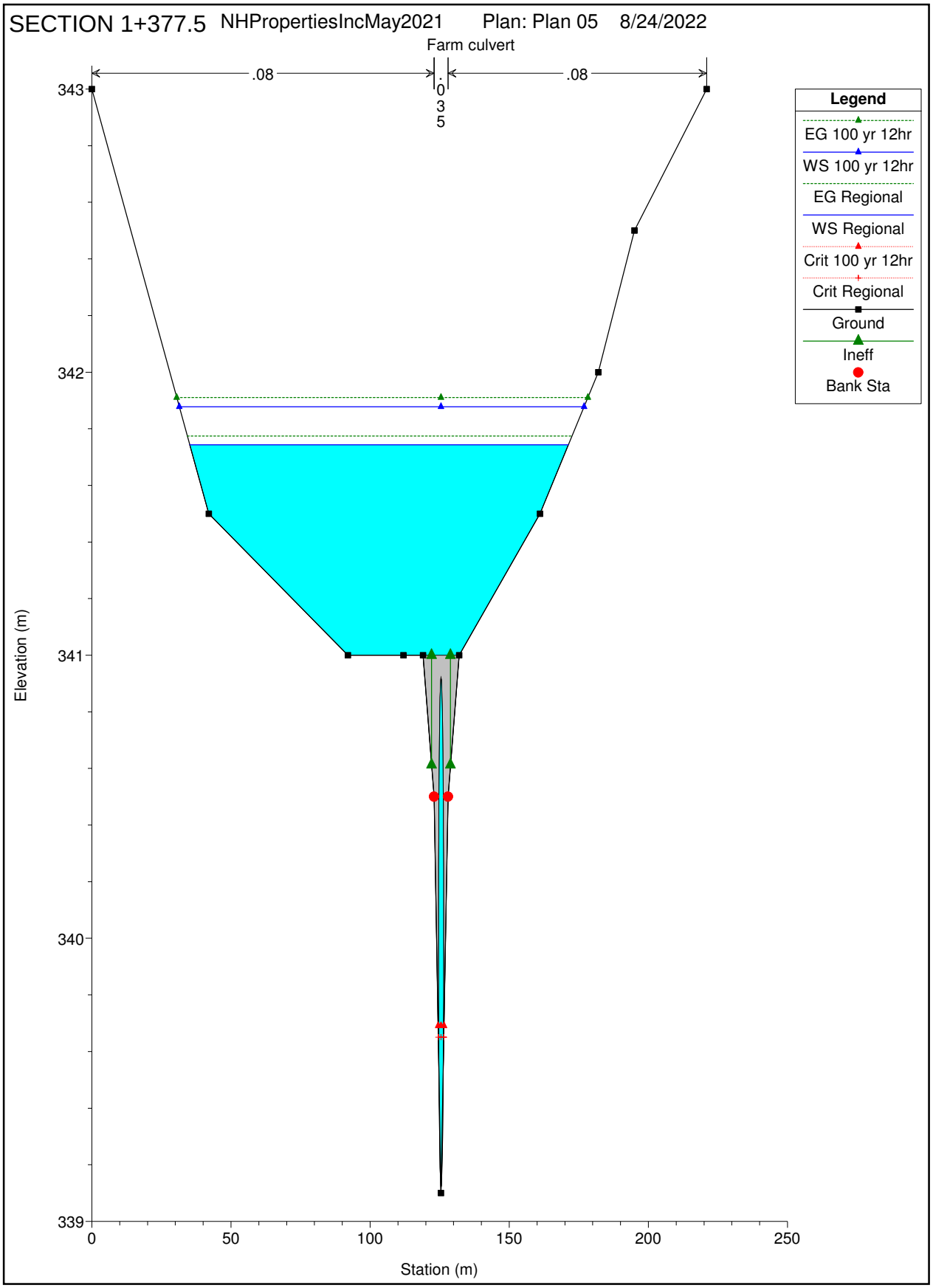
342
341
340
339
0
50
100
150
200
250
Station (m)


SECTION 1+377.5 NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
Farm culvert
.08
.08
.035
343
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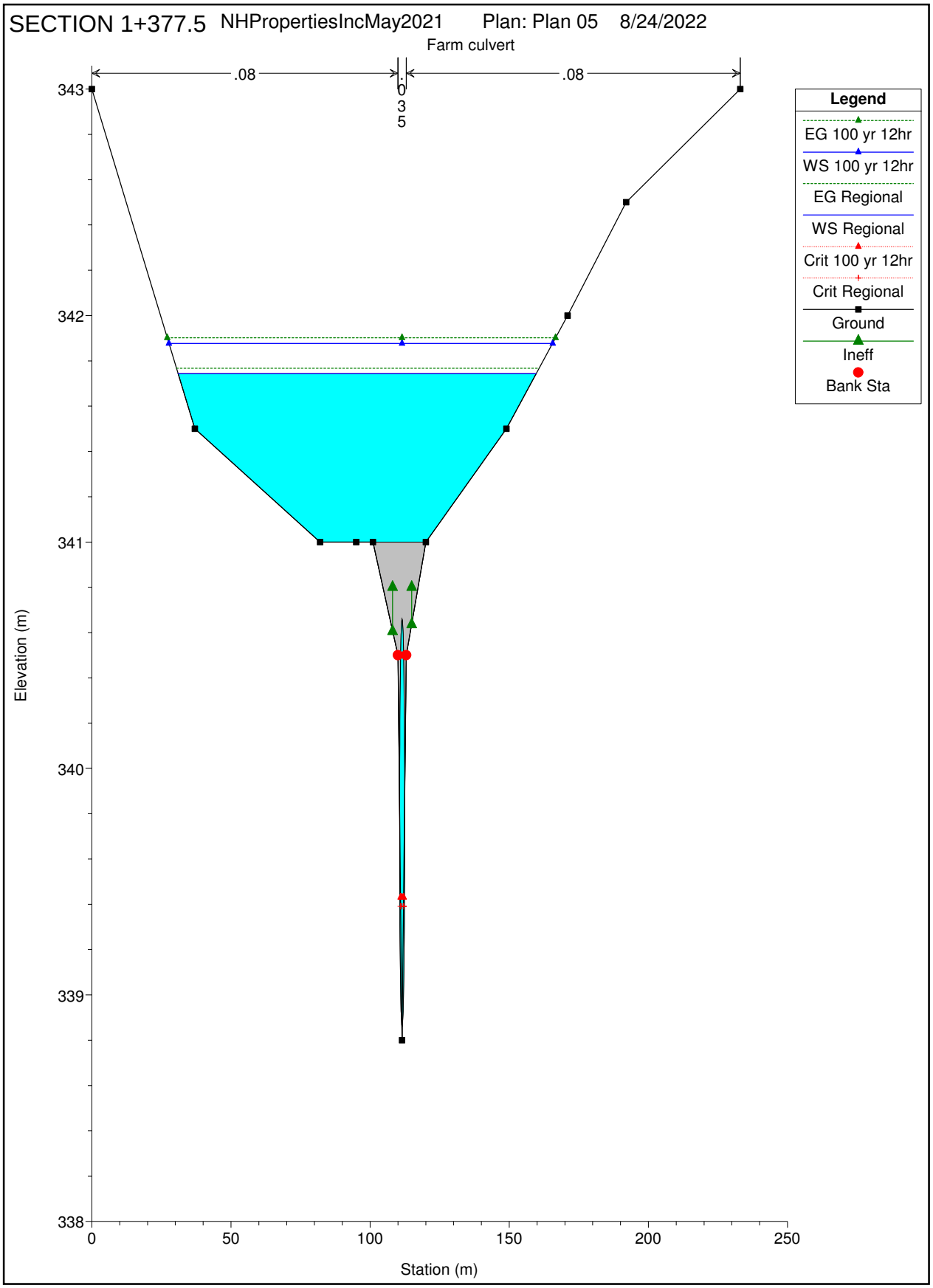
339
Elevation (m)
0
50
100
150
200
250
Station (m)
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
Ground
Ineff
Bank Sta


SECTION 1+377.5 NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
Farm culvert
.08
.08
0.035
343
342
341
340
339
338
Elevation (m)
0
50
100
150
200
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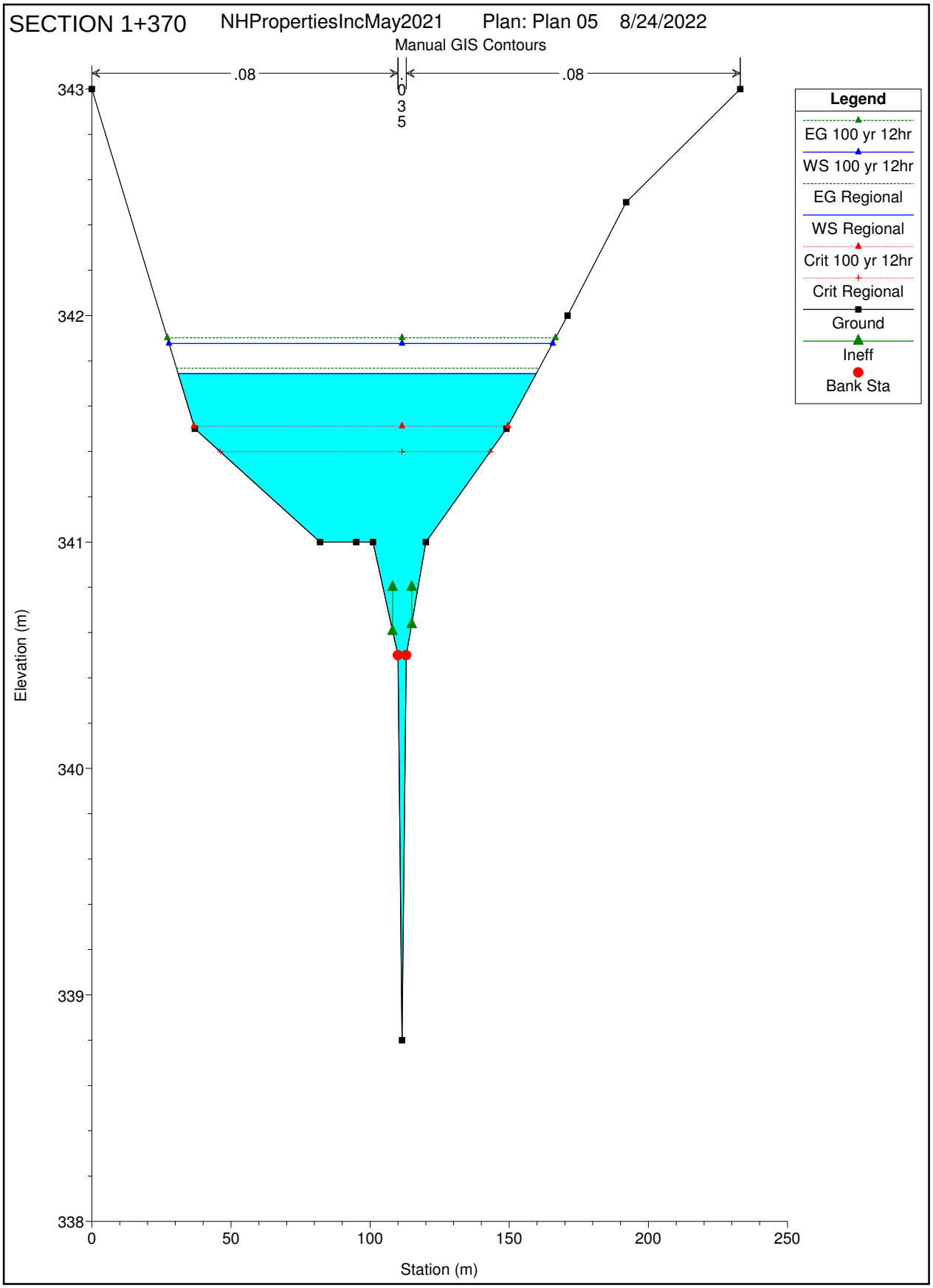
Station (m)
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
Ground
Ineff
Bank Sta


SECTION 1+370
NHPropertiesIncMay2021
Plan: Plan 05
8/24/2022
Manual GIS Contours
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0.035
Legend
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WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
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342
341
340
339
338
0
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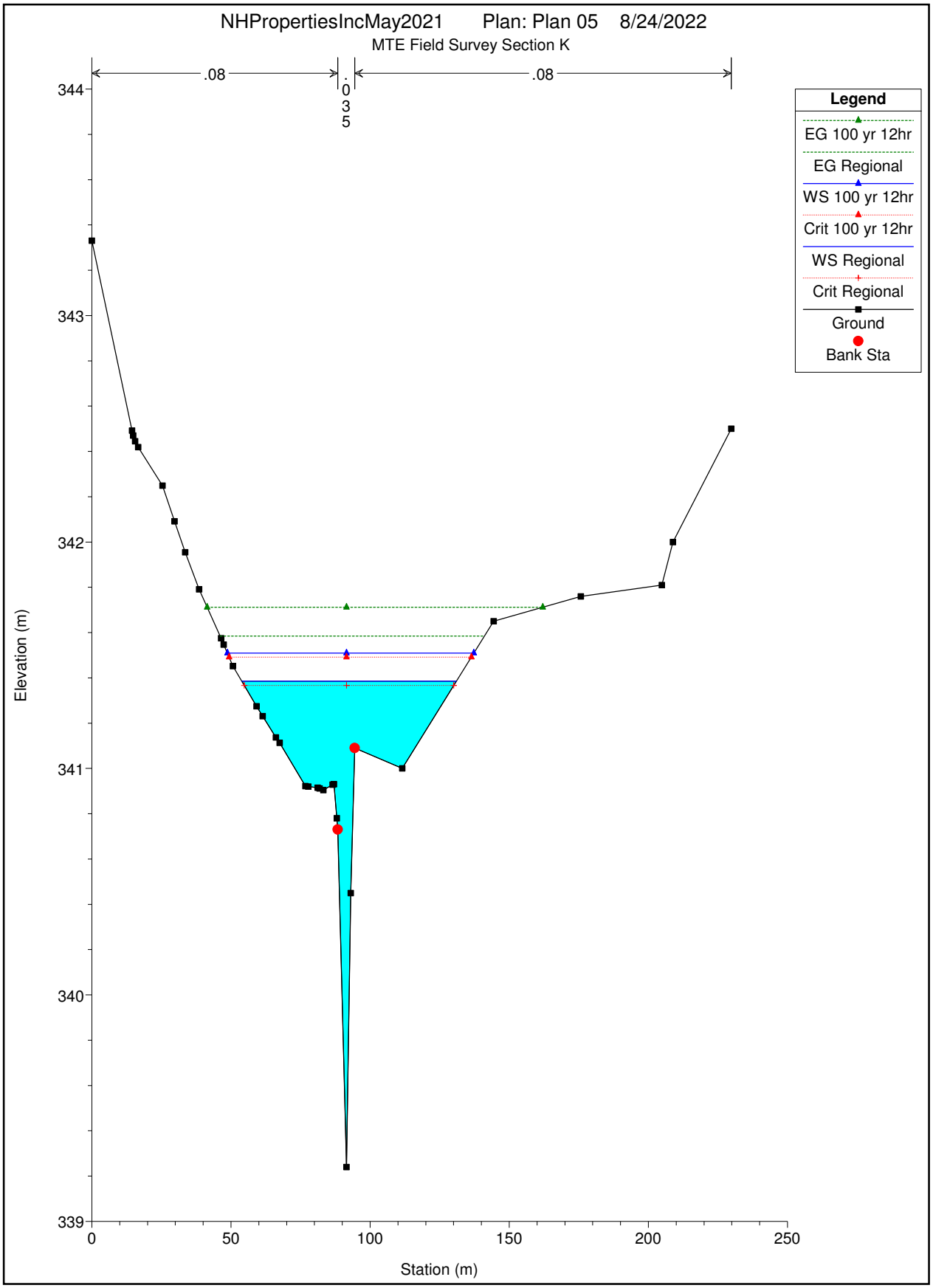
100
150
200
250


NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section K
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EG Regional
WS 100 yr 12hr
Crit 100 yr 12hr
WS Regional
Crit Regional
Ground
Bank Sta
Elevation (m)
Station (m)
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343
342
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340
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150
200
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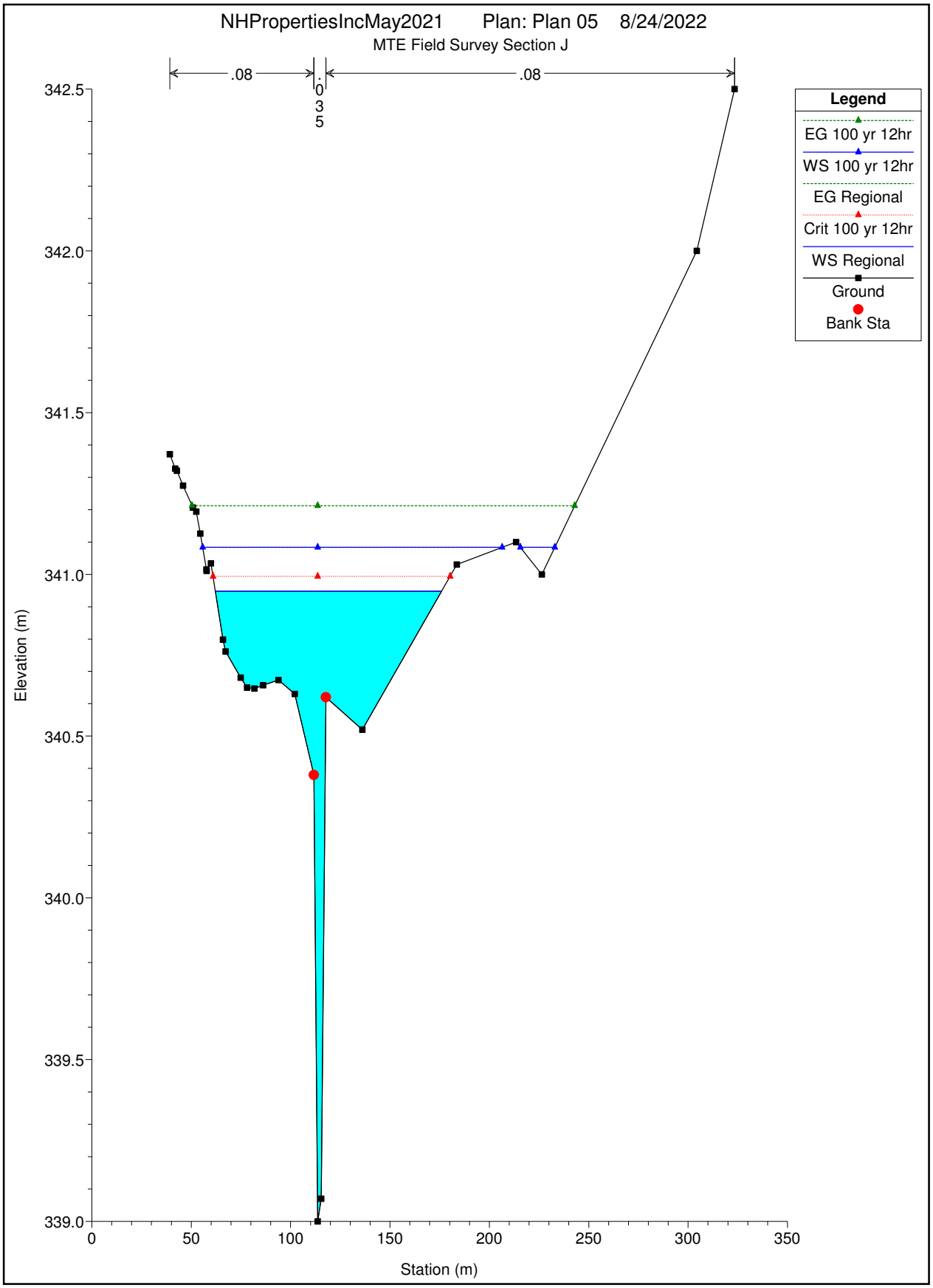
NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section J
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Legend
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WS 100 yr 12hr
EG Regional
Crit 100 yr 12hr
WS Regional
Ground
Bank Sta
Elevation (m)
Station (m)
342.5
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340.5
340.0
339.5
339.0
0
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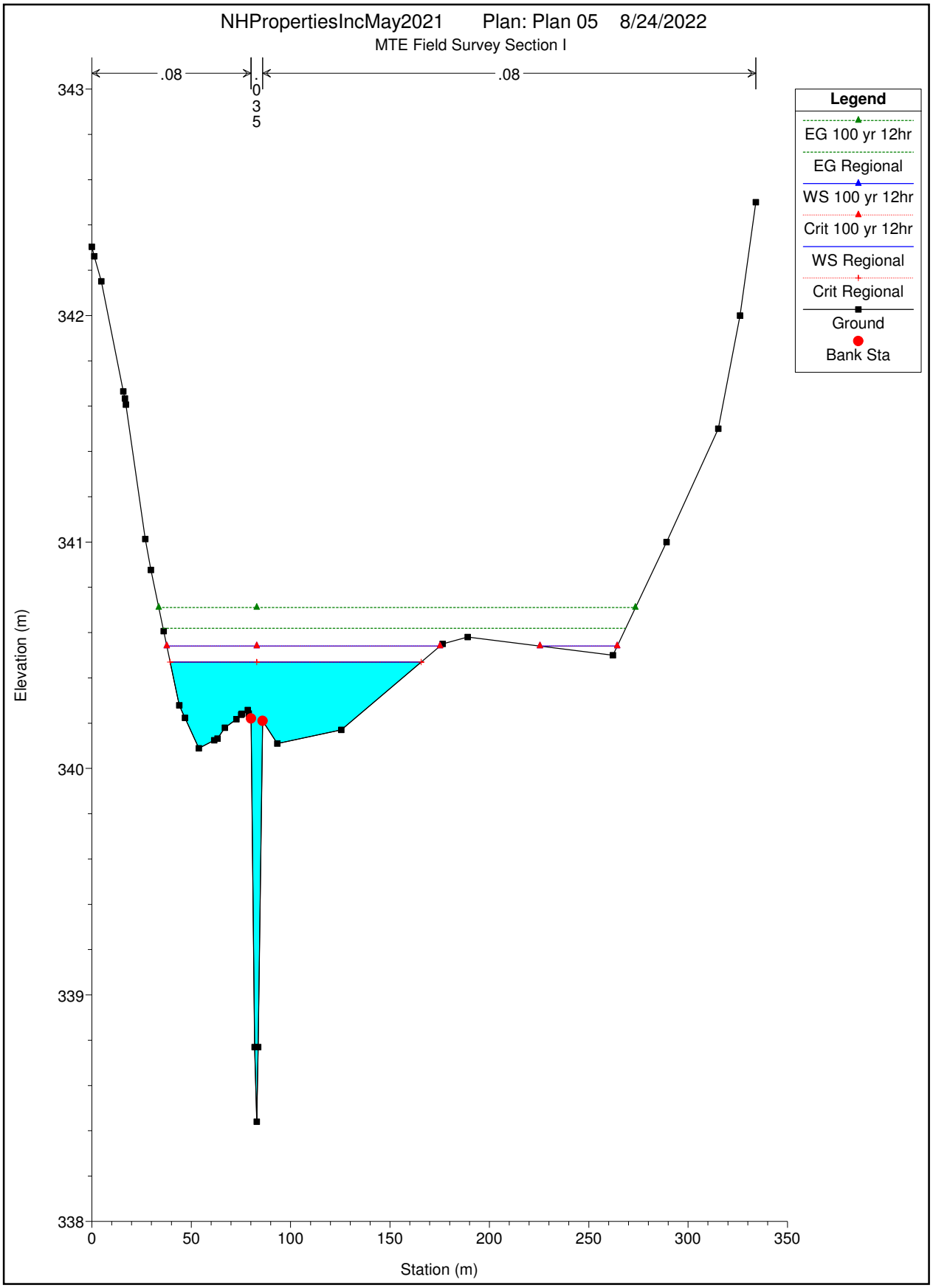
NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section I
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Legend
EG 100 yr 12hr
EG Regional
WS 100 yr 12hr
Crit 100 yr 12hr
WS Regional
Crit Regional
Ground
Bank Sta
Elevation (m)
Station (m)
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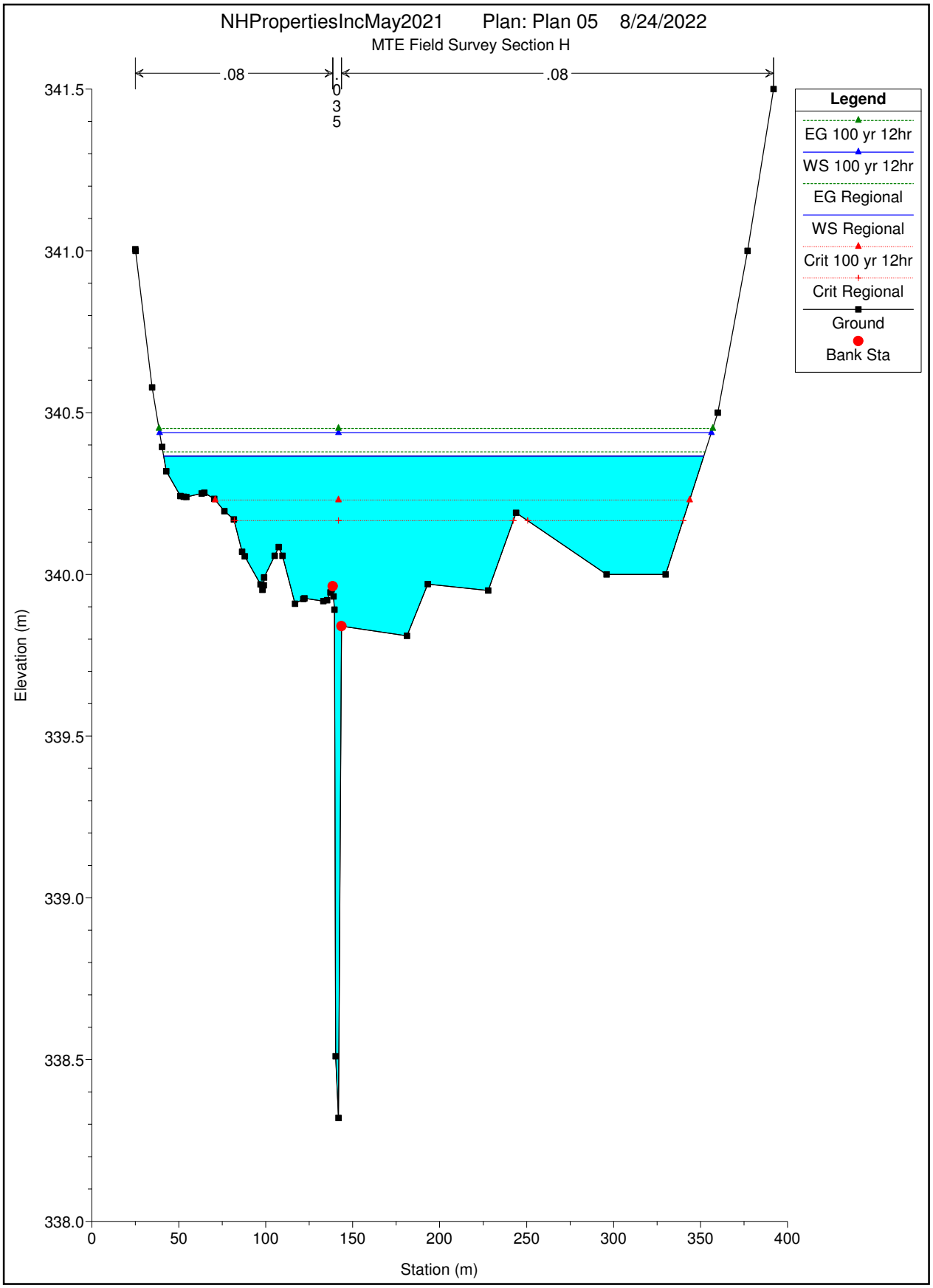
NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section H
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.035
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Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
Ground
Bank Sta
Elevation (m)
Station (m)
341.5
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339.5
339.0
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338.0
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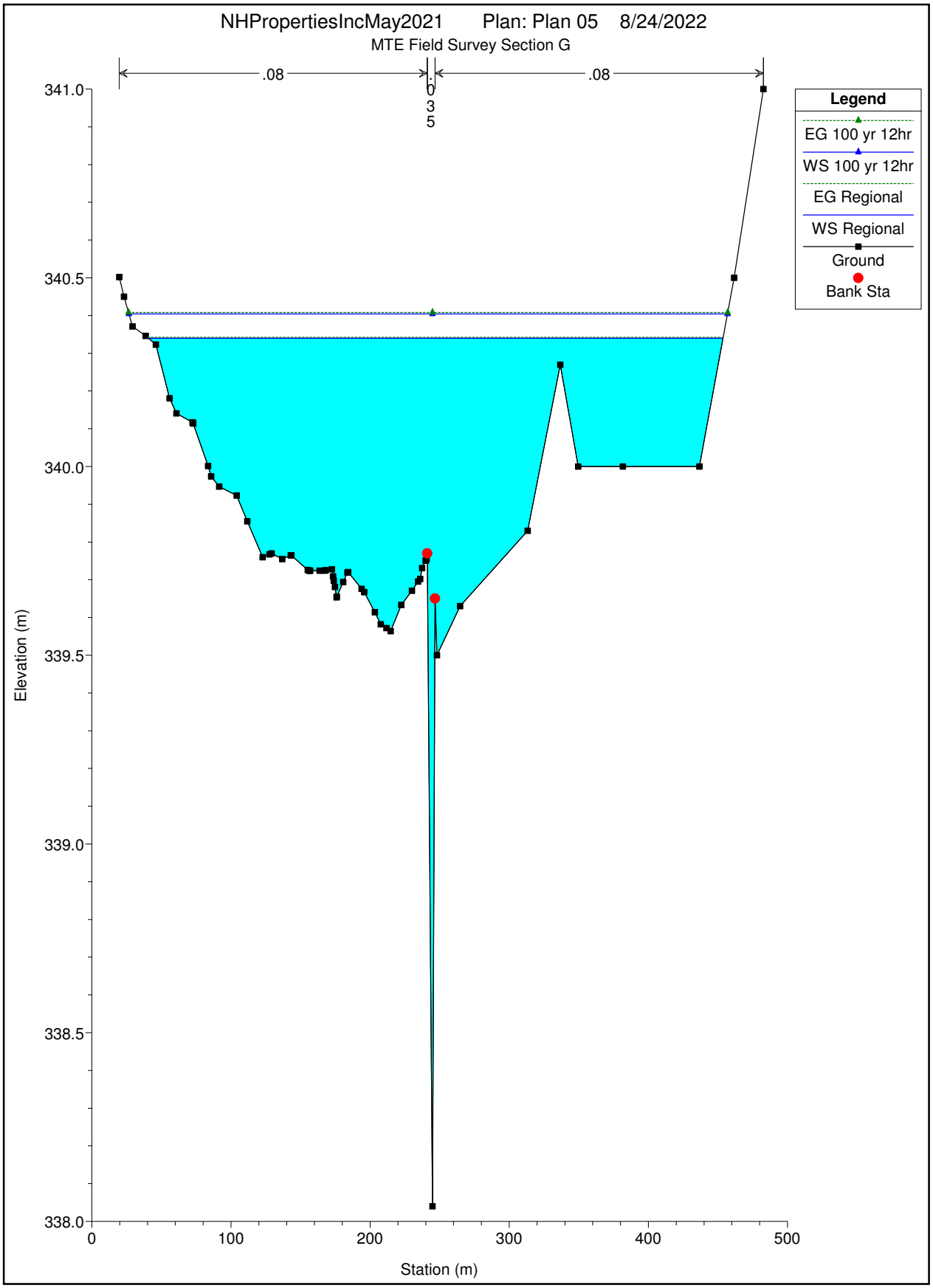
NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section G
.08
.035
.08
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Ground
Bank Sta
Elevation (m)
Station (m)
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340.5
340.0
339.5
339.0
338.5
338.0
0
100
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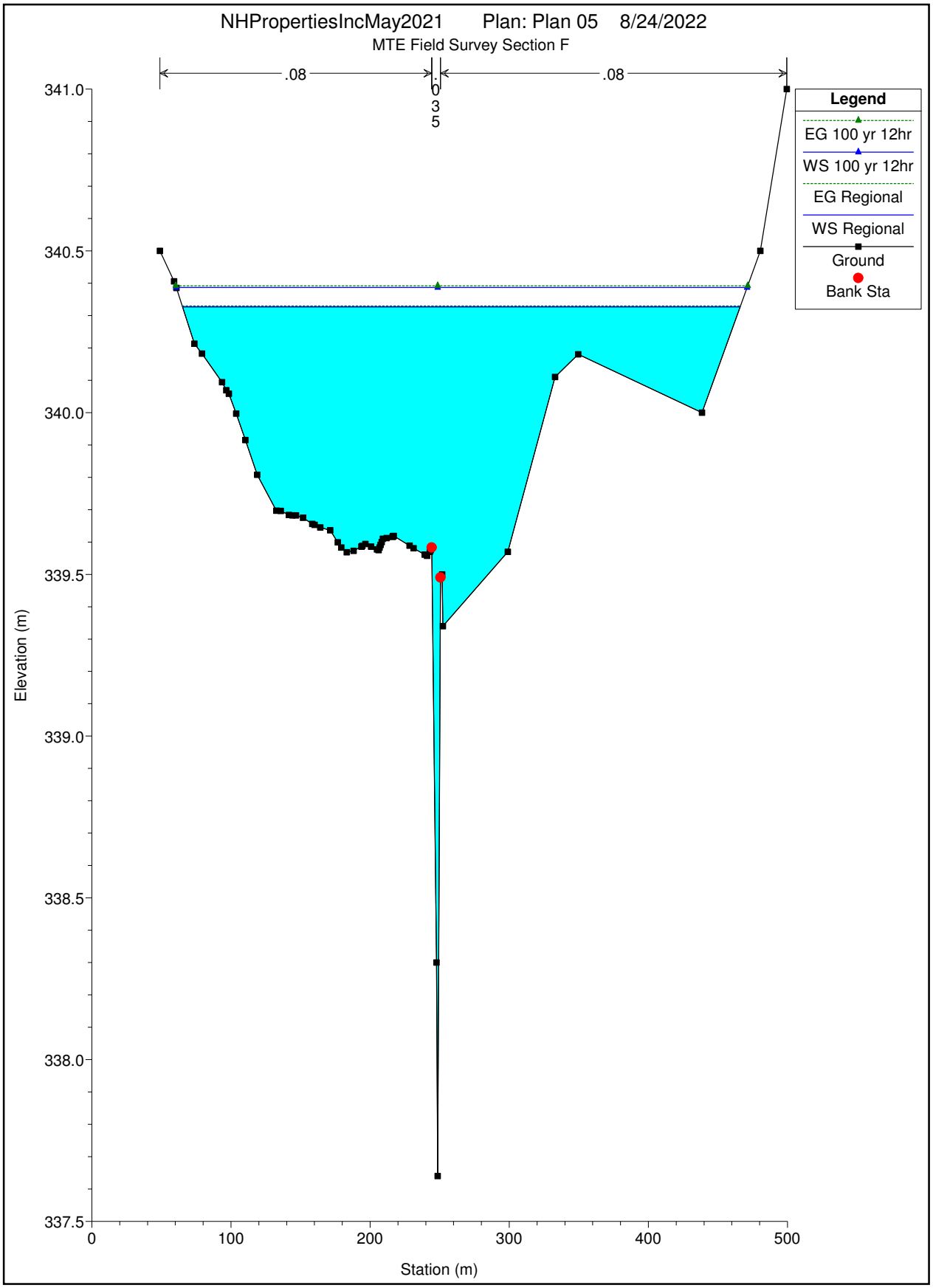
300
400
500


NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section F
.08
.035
.08
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Ground
Bank Sta
341.0
340.5
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338.5
338.0
337.5
Elevation (m)
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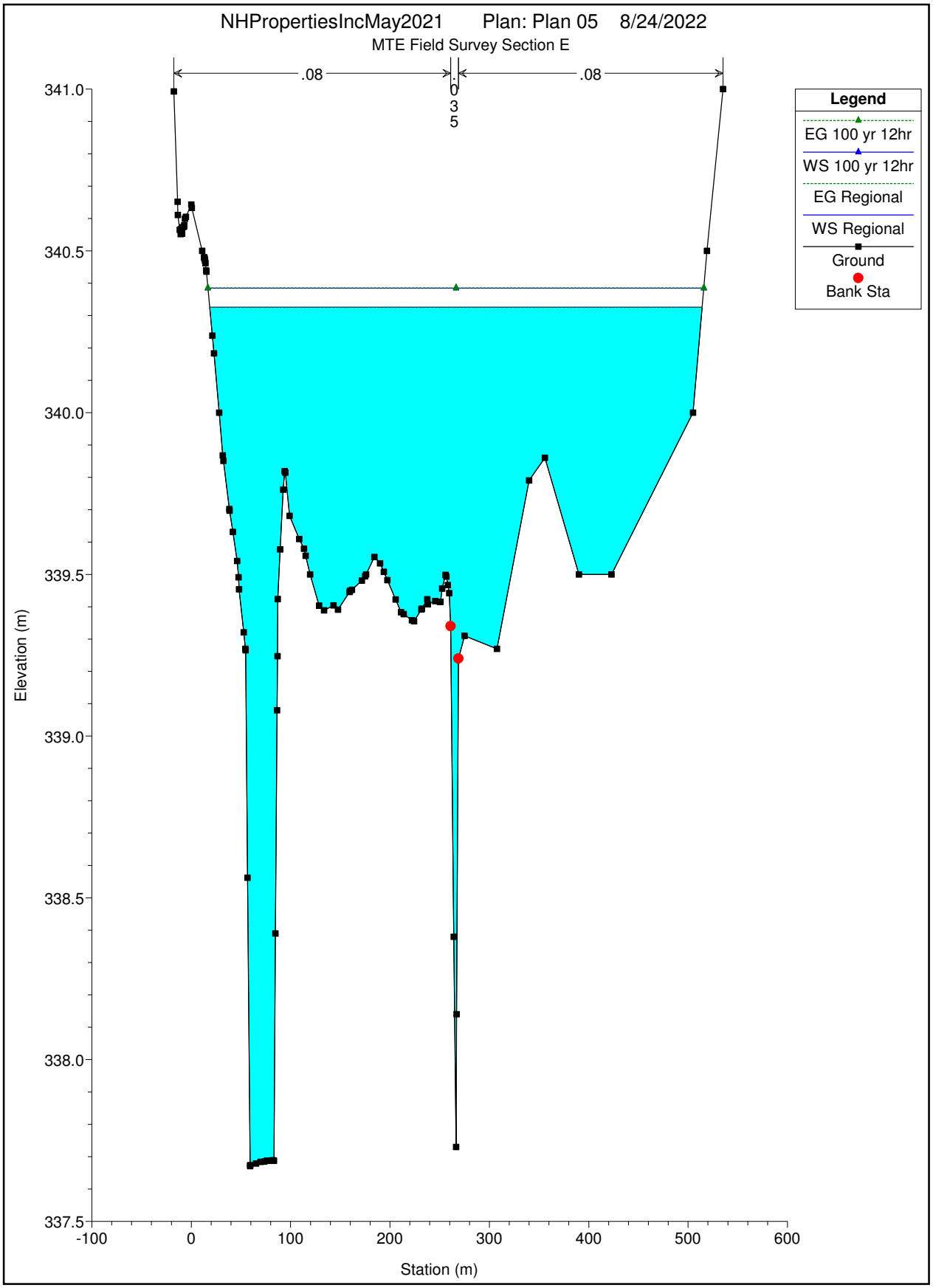
100
200
300
400
500
Station (m)


NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section E
.08
.035
.08
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Ground
Bank Sta
Elevation (m)
Station (m)
341.0
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340.0
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339.0
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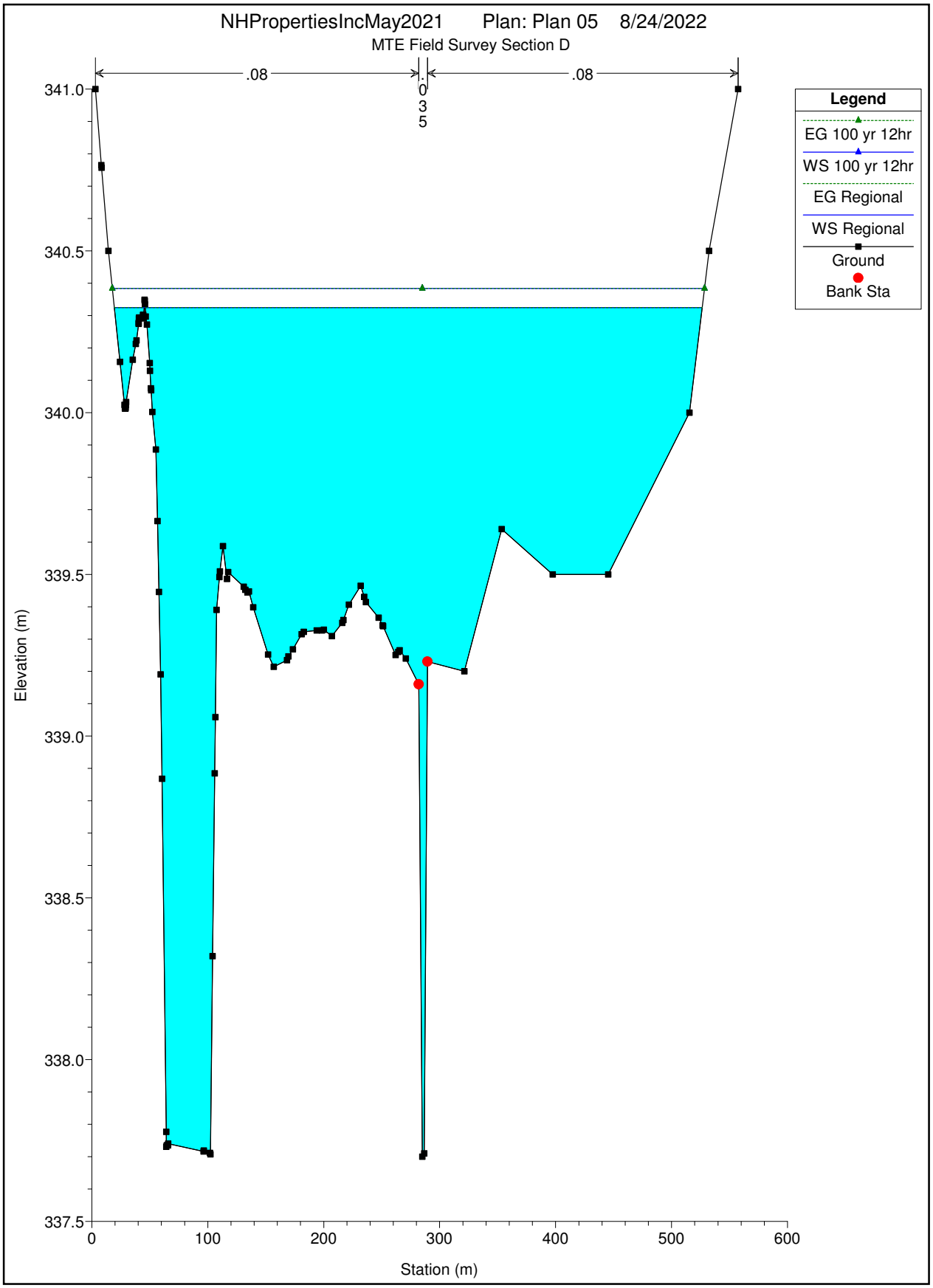
338.0
337.5
-100
0
100
200
300
400
500
600


NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section D
.08
.035
.08
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Ground
Bank Sta
Elevation (m)
Station (m)
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340.0
339.5
339.0
338.5
338.0
337.5
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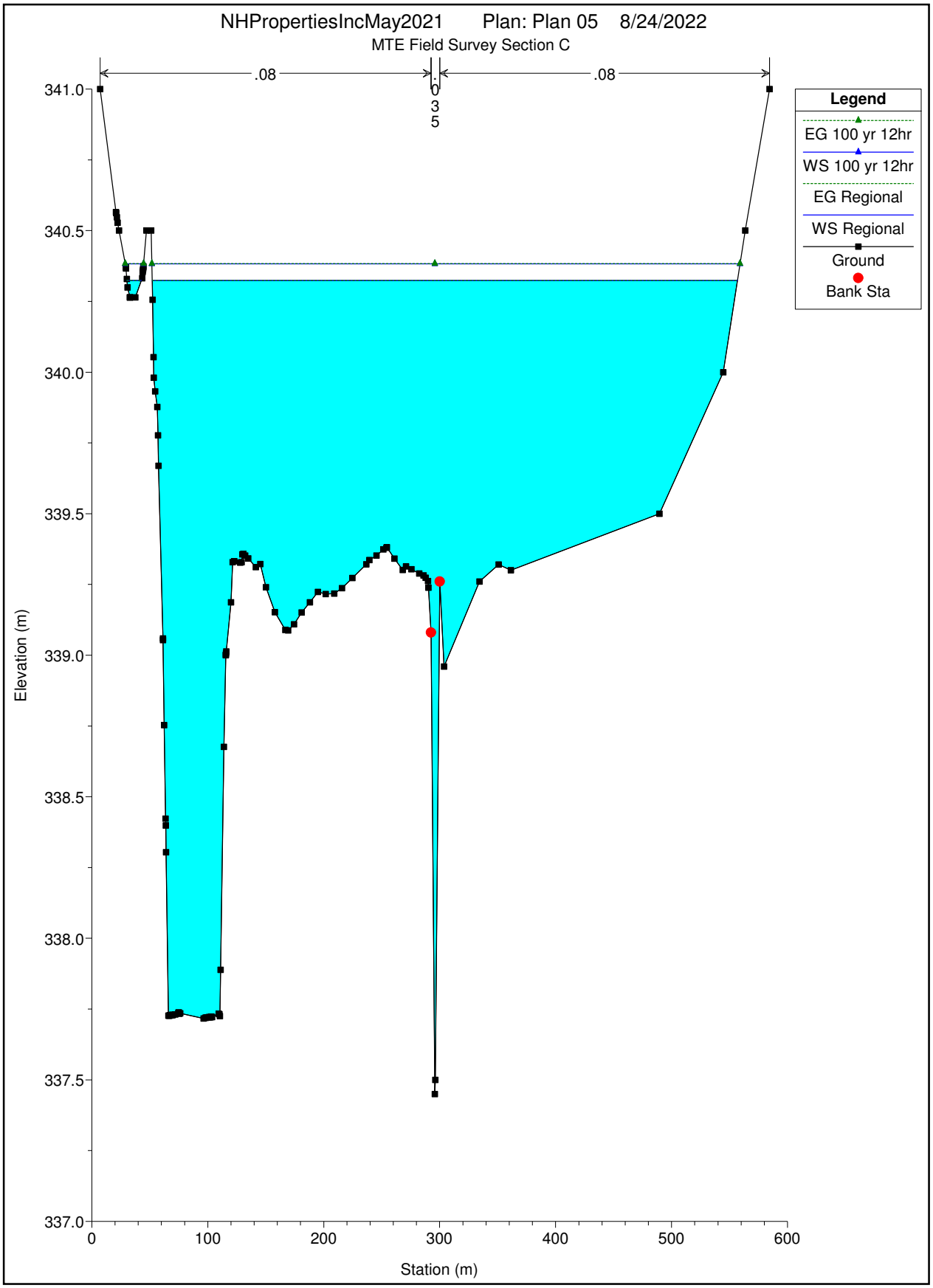
300
400
500
600


NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section C
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.035
.08
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Ground
Bank Sta
Elevation (m)
Station (m)
341.0
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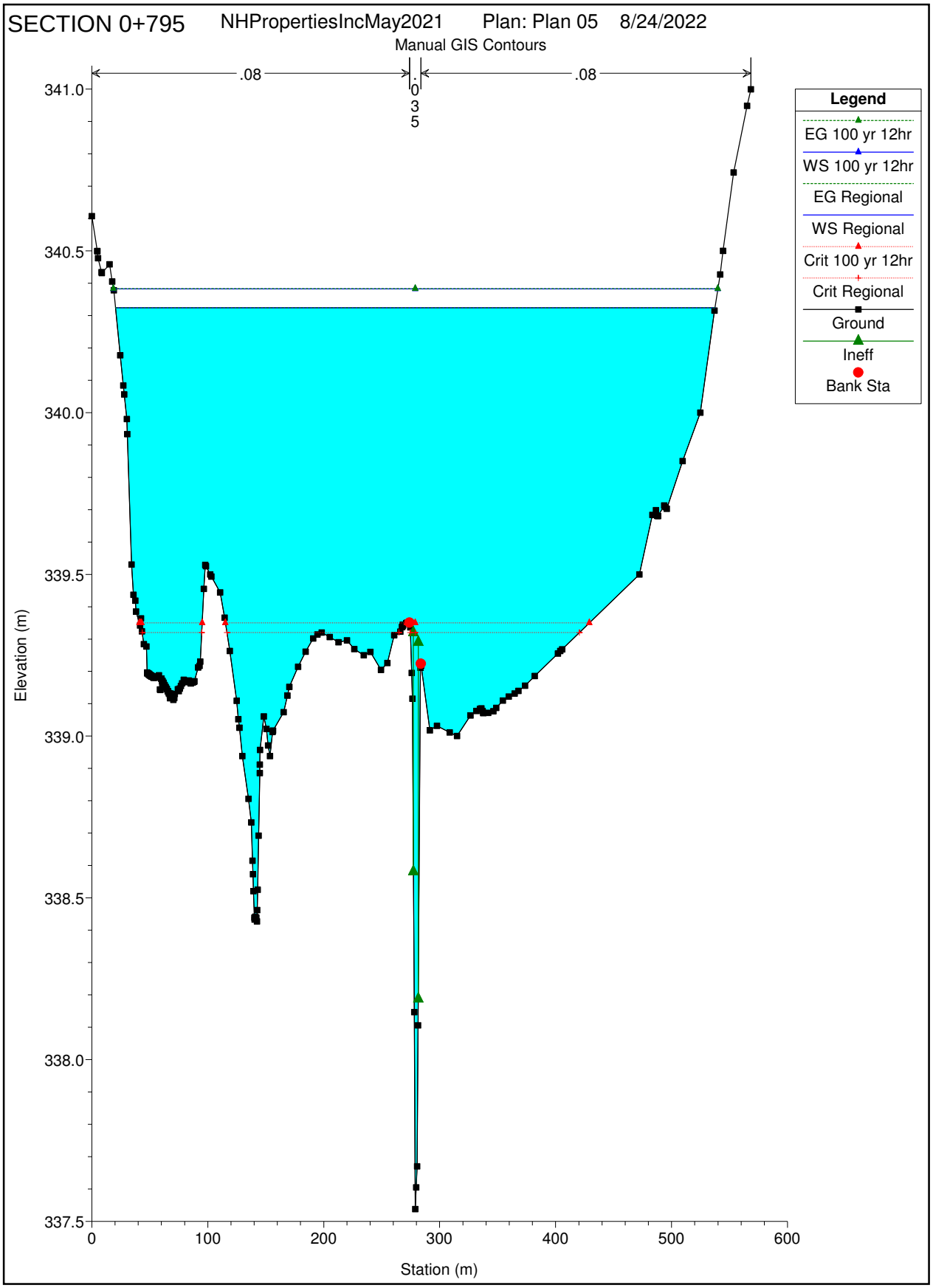
SECTION 0+795
NHPropertiesIncMay2021
Plan: Plan 05
8/24/2022
Manual GIS Contours
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.035
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Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
Ground
Ineff
Bank Sta
Elevation (m)
341.0
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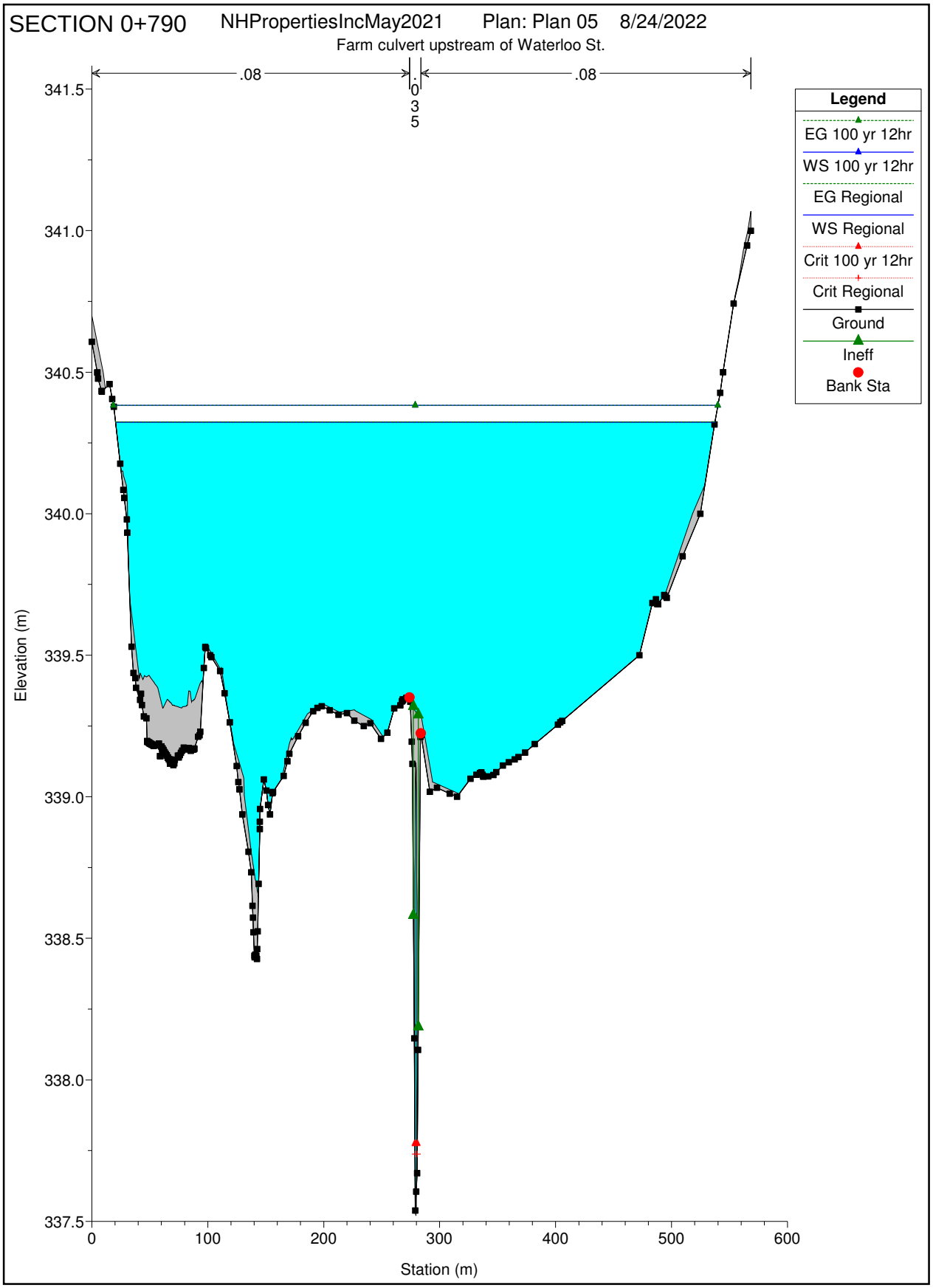
Station (m)


SECTION 0+790
NHPropertiesIncMay2021
Plan: Plan 05
8/24/2022
Farm culvert upstream of Waterloo St.
.08
.035
.08
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
Ground
Ineff
Bank Sta
Elevation (m)
341.5
341.0
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338.0
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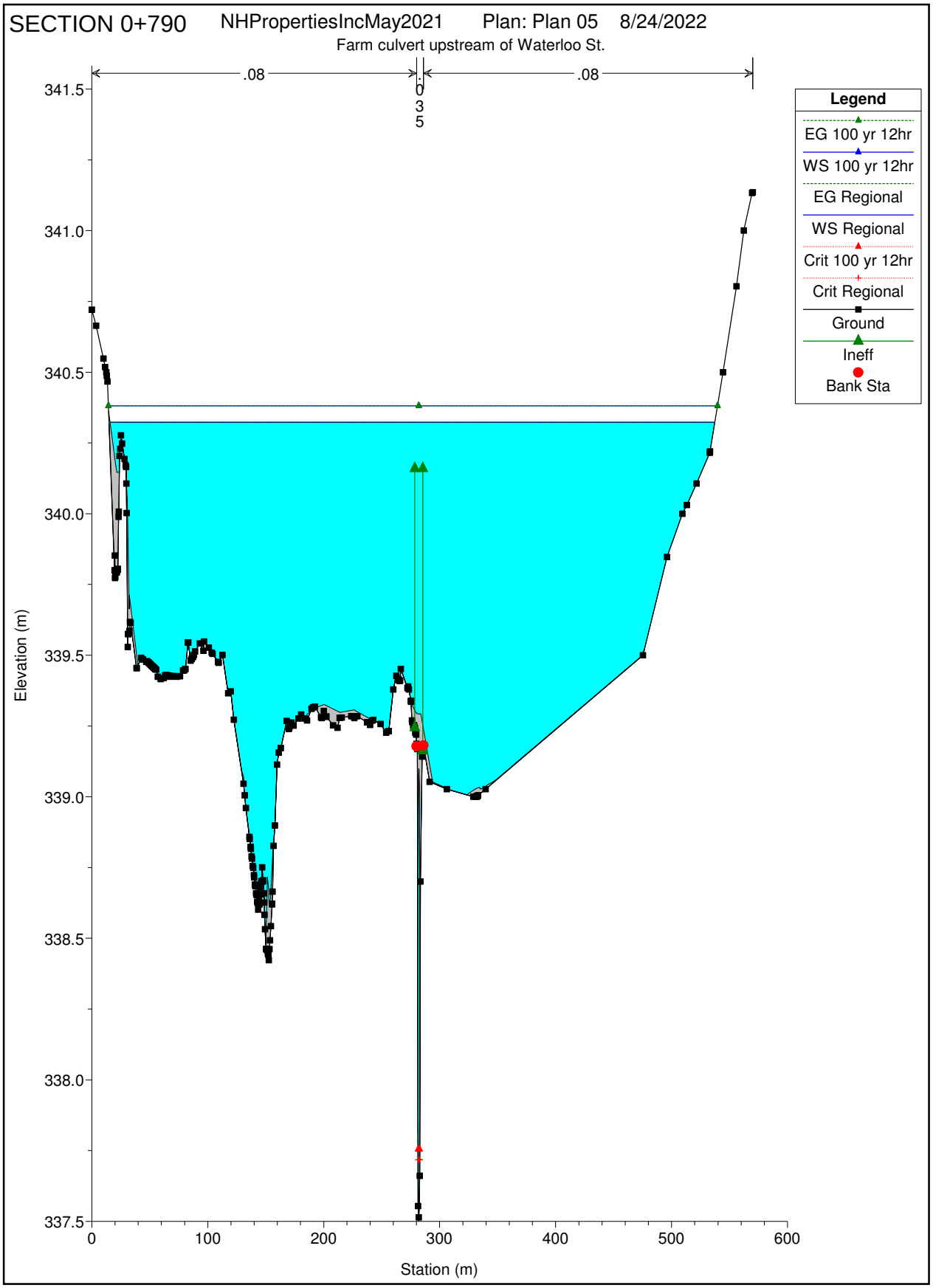
600
Station (m)


SECTION 0+790
NHPropertiesIncMay2021
Plan: Plan 05
8/24/2022
Farm culvert upstream of Waterloo St.
.08
.08
.035
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
341.5
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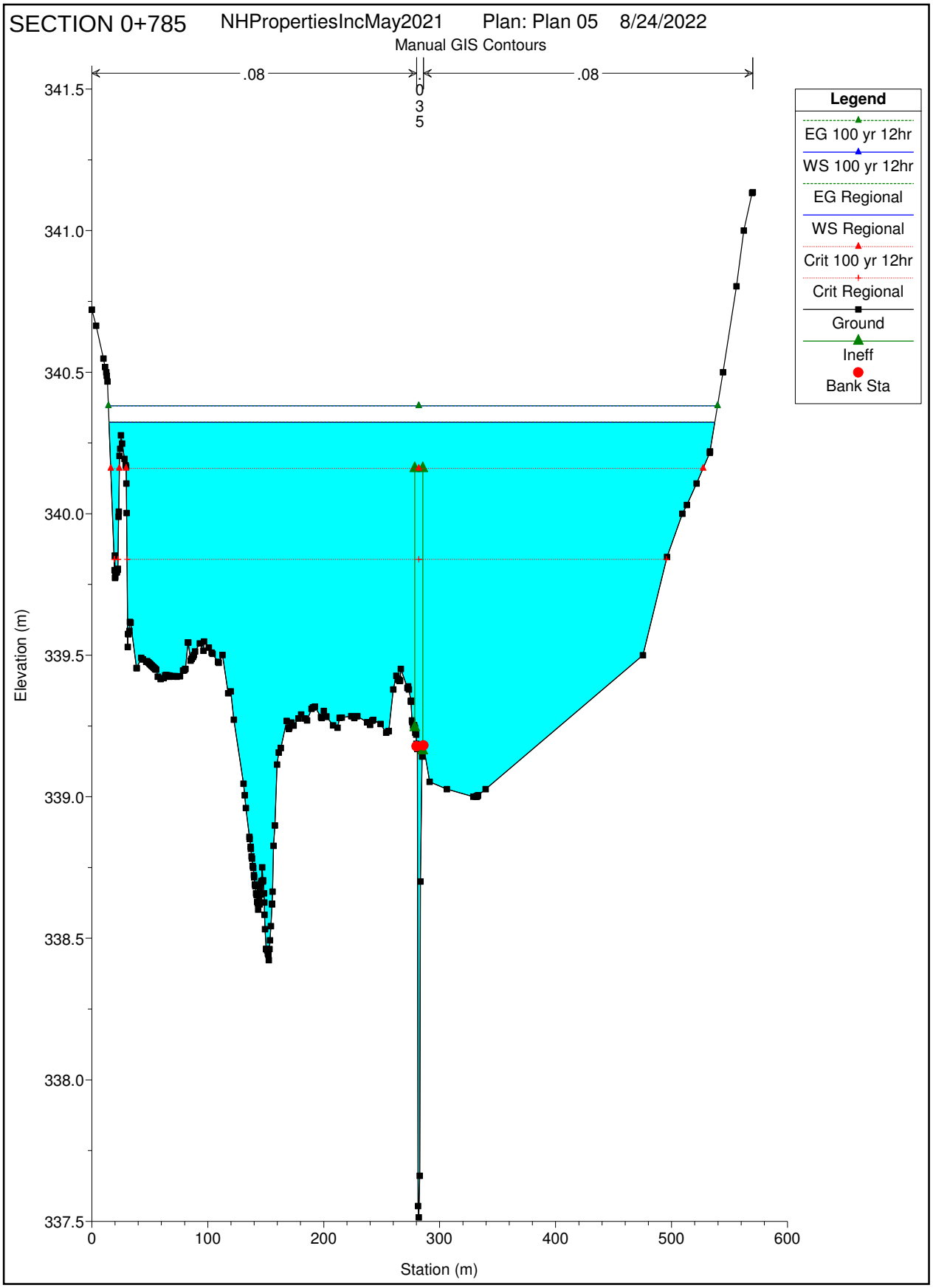
SECTION 0+785
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Plan: Plan 05
8/24/2022
Manual GIS Contours
.08
.08
.035
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
341.5
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339.0
338.5
338.0
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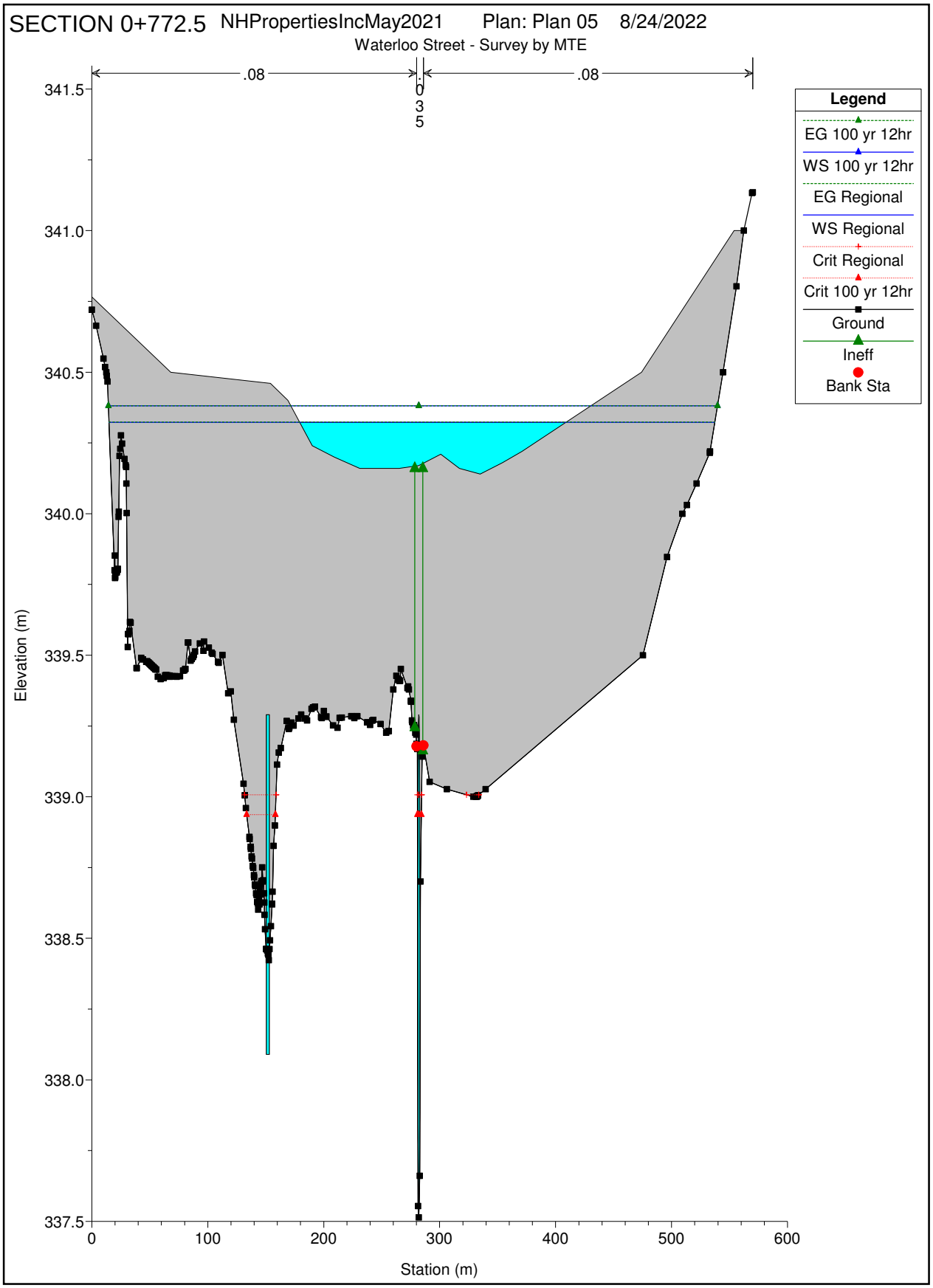
SECTION 0+772.5 NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
Waterloo Street - Survey by MTE
.08
.08
0.035
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Crit Regional
Crit 100 yr 12hr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
341.5
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339.0
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338.0
337.5
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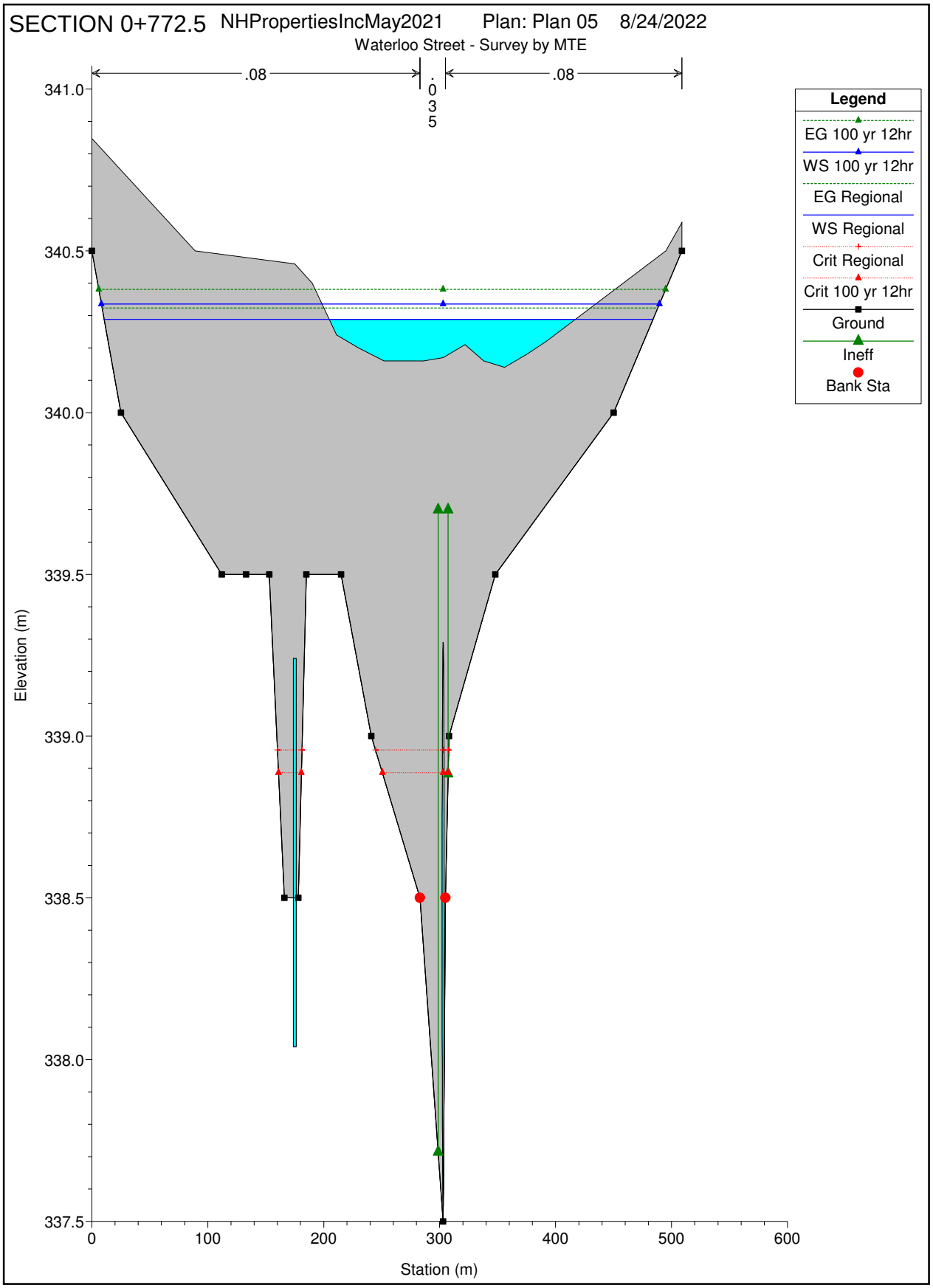
SECTION 0+772.5 NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
Waterloo Street - Survey by MTE
.08
.035
.08
Legend
EG 100 yr 12hr
WS 100 yr 12hr
EG Regional
WS Regional
Crit Regional
Crit 100 yr 12hr
Ground
Ineff
Bank Sta
Elevation (m)
341.0
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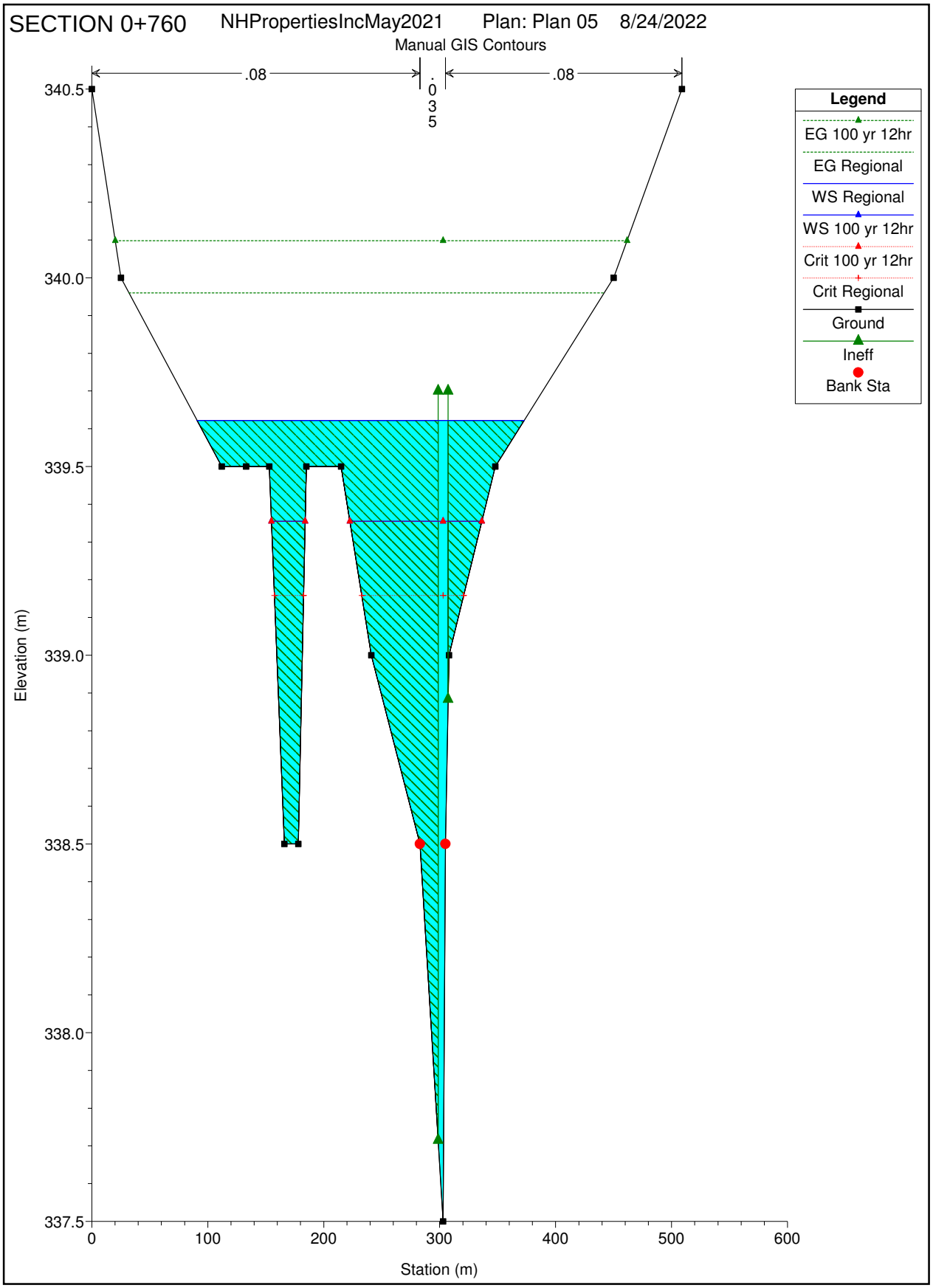
Station (m)


SECTION 0+760
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Plan: Plan 05
8/24/2022
Manual GIS Contours
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.035
.08
Legend
EG 100 yr 12hr
EG Regional
WS Regional
WS 100 yr 12hr
Crit 100 yr 12hr
Crit Regional
Ground
Ineff
Bank Sta
Elevation (m)
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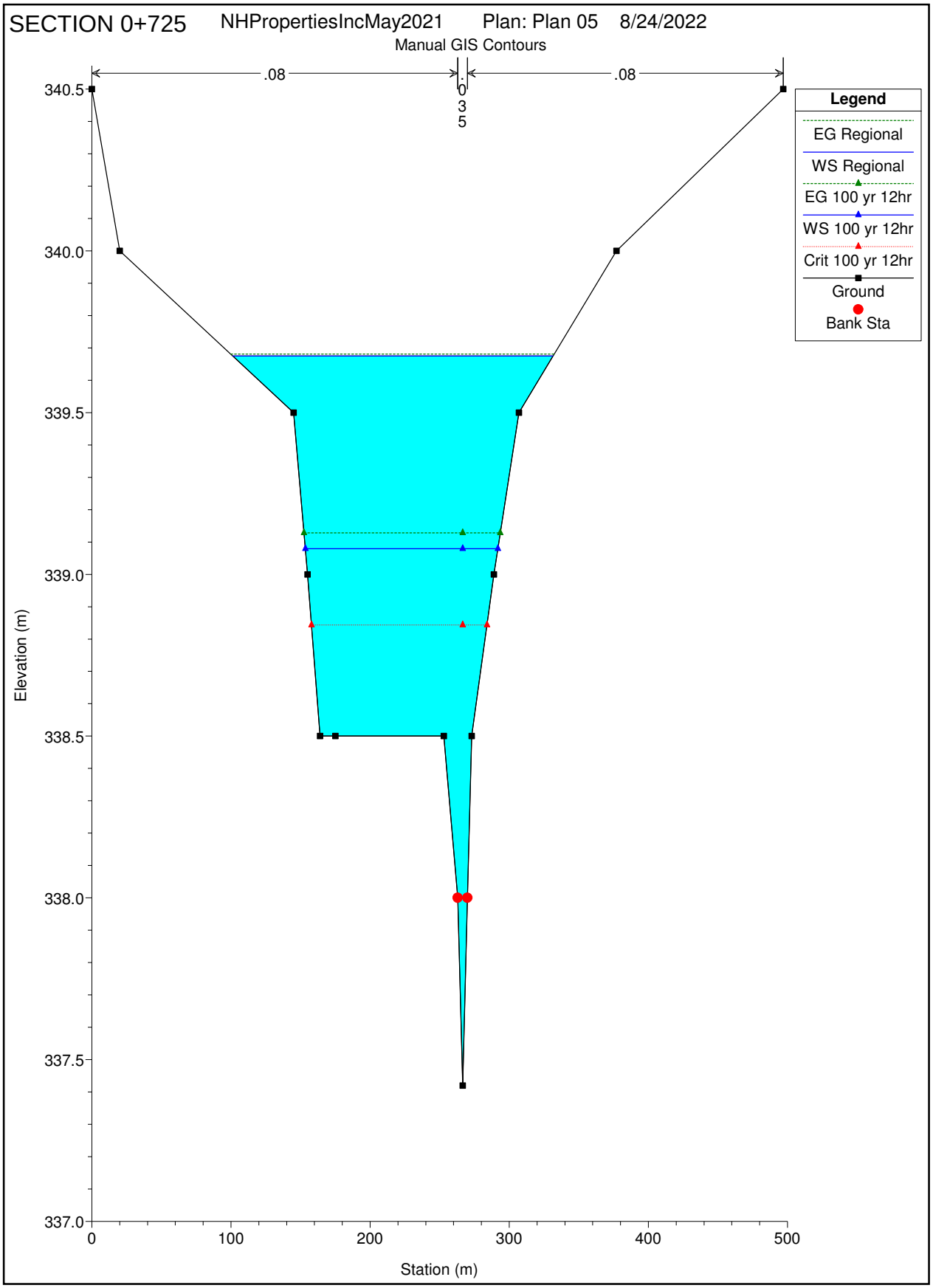
Station (m)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8/24/2022
Manual GIS Contours
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Legend
EG Regional
WS Regional
EG 100 yr 12hr
WS 100 yr 12hr
Crit 100 yr 12hr
Ground
Bank Sta
340.5
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Elevation (m)
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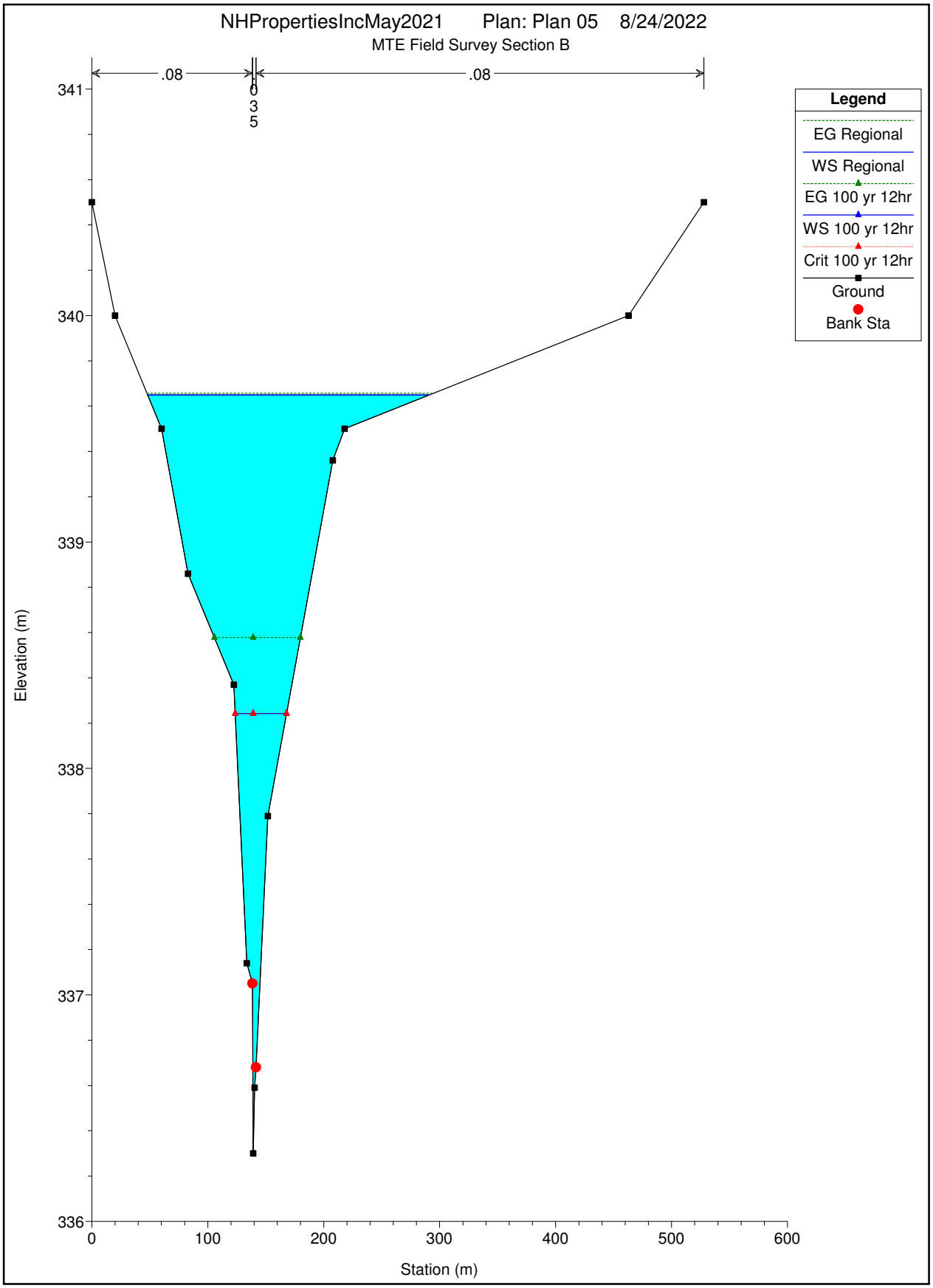
Station (m)


NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section B
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Legend
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WS Regional
EG 100 yr 12hr
WS 100 yr 12hr
Crit 100 yr 12hr
Ground
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200
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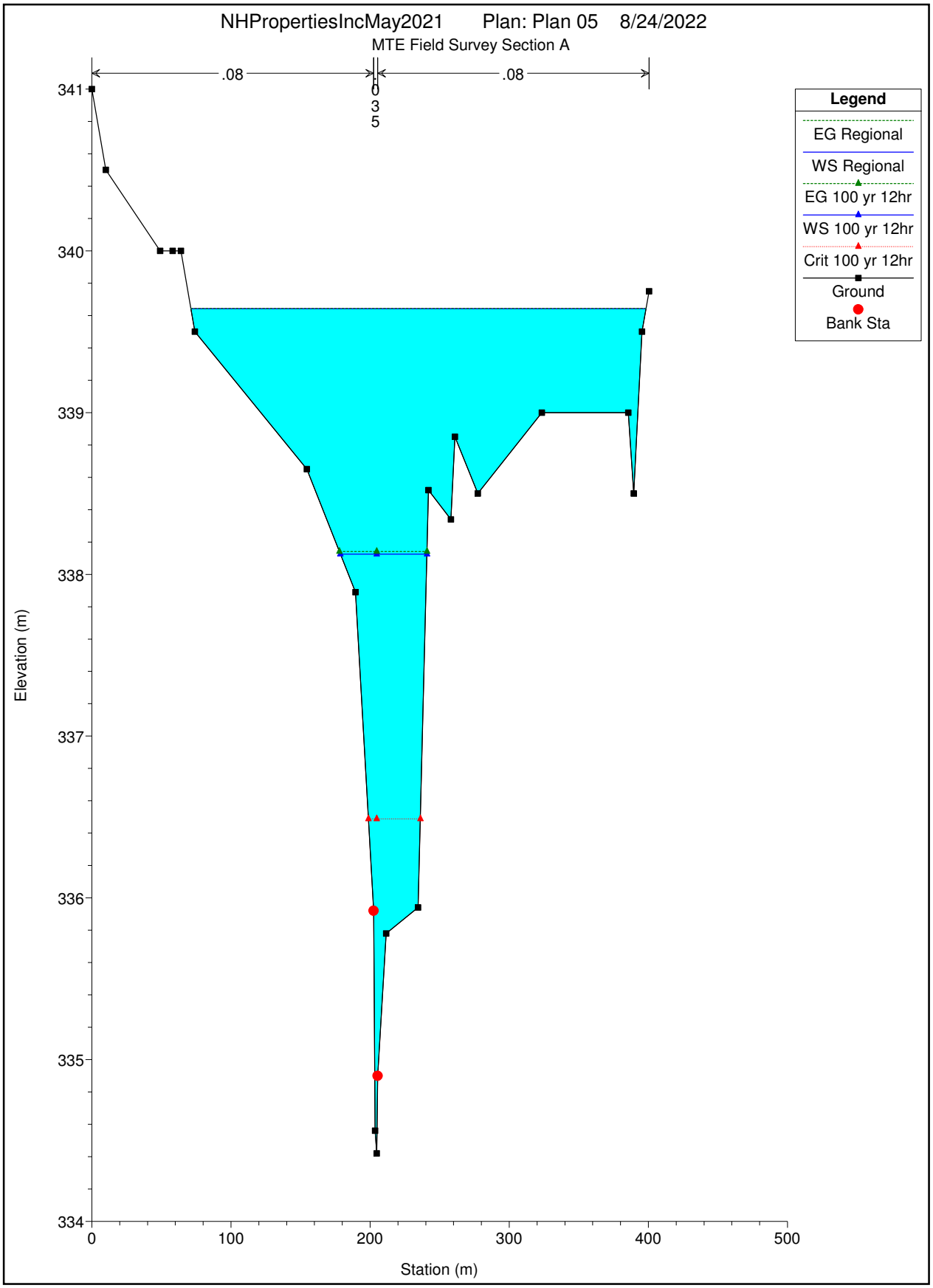
600
Station (m)


NHPropertiesIncMay2021 Plan: Plan 05 8/24/2022
MTE Field Survey Section A
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Legend
EG Regional
WS Regional
EG 100 yr 12hr
WS 100 yr 12hr
Crit 100 yr 12hr
Ground
Bank Sta
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Station (m)
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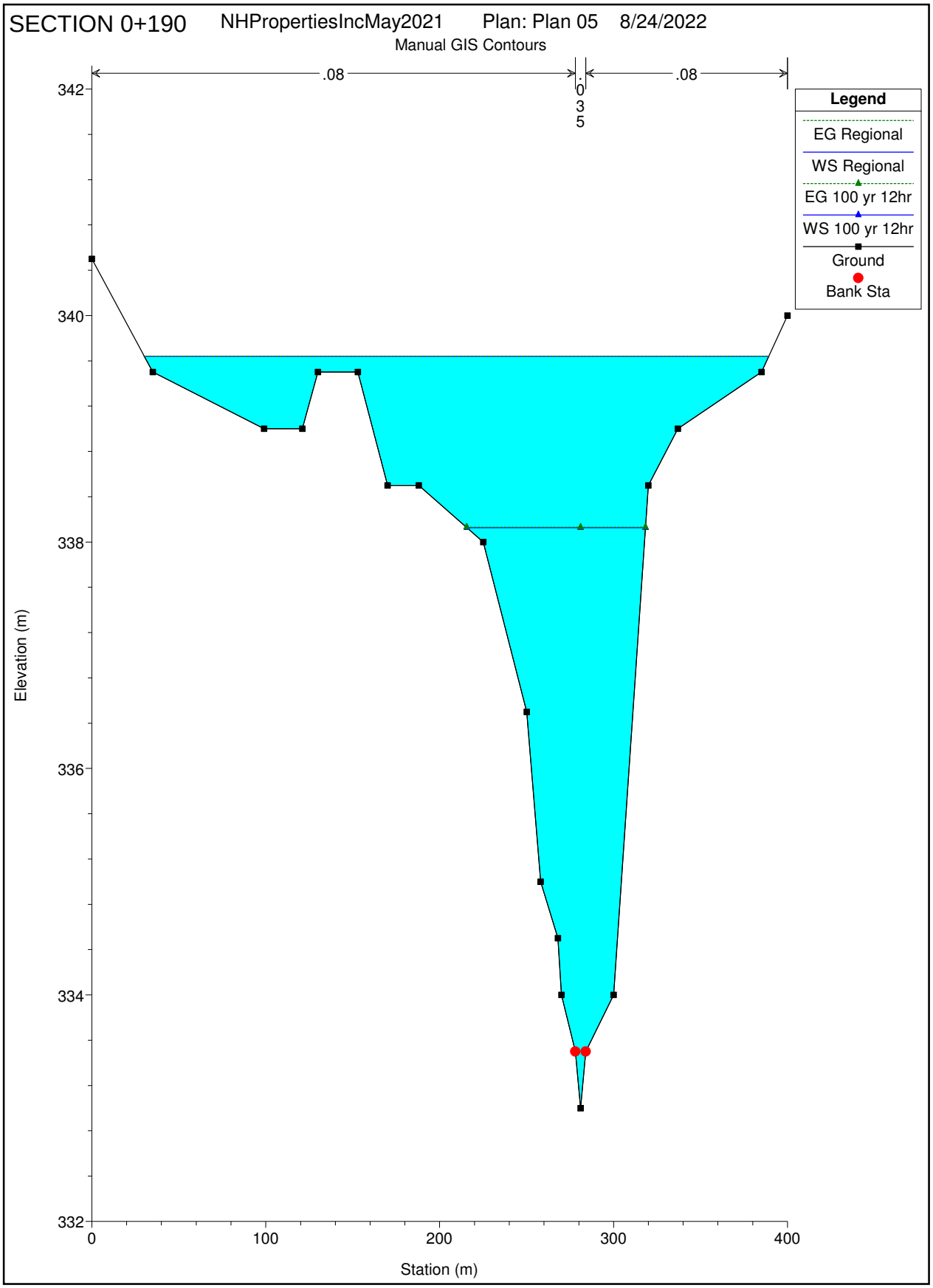
SECTION 0+190
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Plan: Plan 05
8/24/2022
Manual GIS Contours
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.035
.08
Legend
EG Regional
WS Regional
EG 100 yr 12hr
WS 100 yr 12hr
Ground
Bank Sta
342
340
338
336
334
332
Elevation (m)
0
100
200
300
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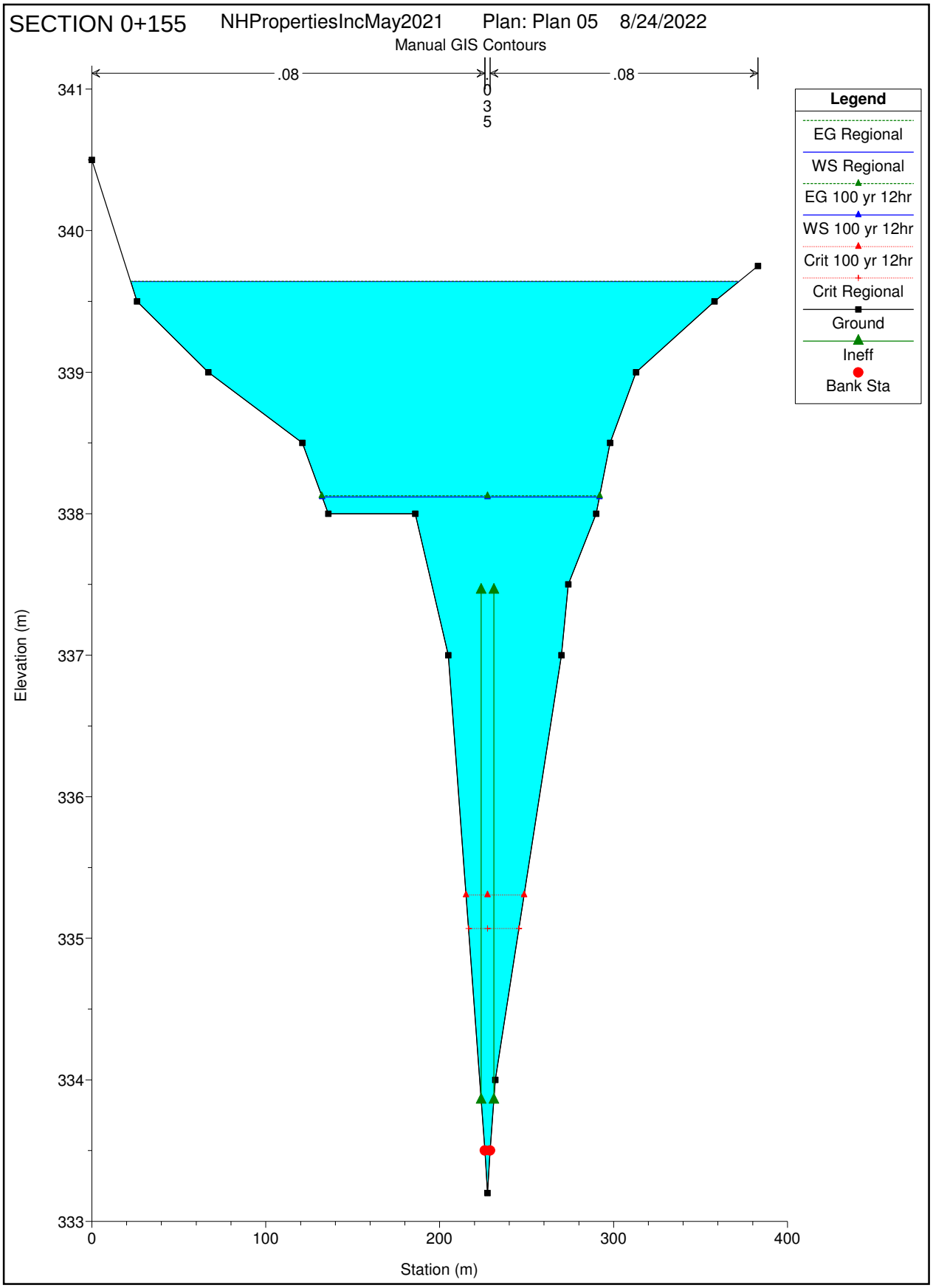
Station (m)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WS 100 yr 12hr
Crit 100 yr 12hr
Crit Regional
Ground
Ineff
Bank Sta
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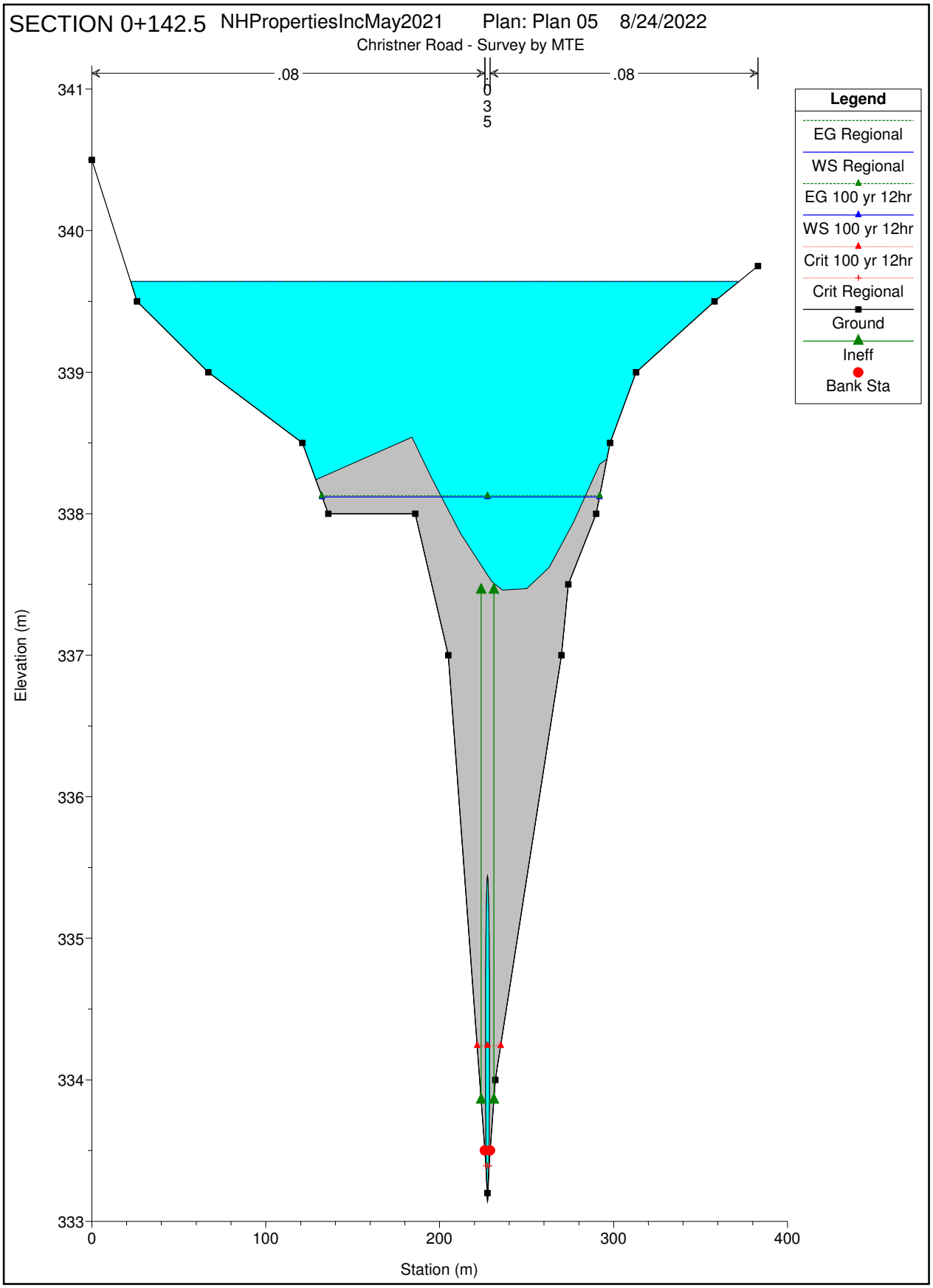
Station (m)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Crit 100 yr 12hr
Crit Regional
Ground
Ineff
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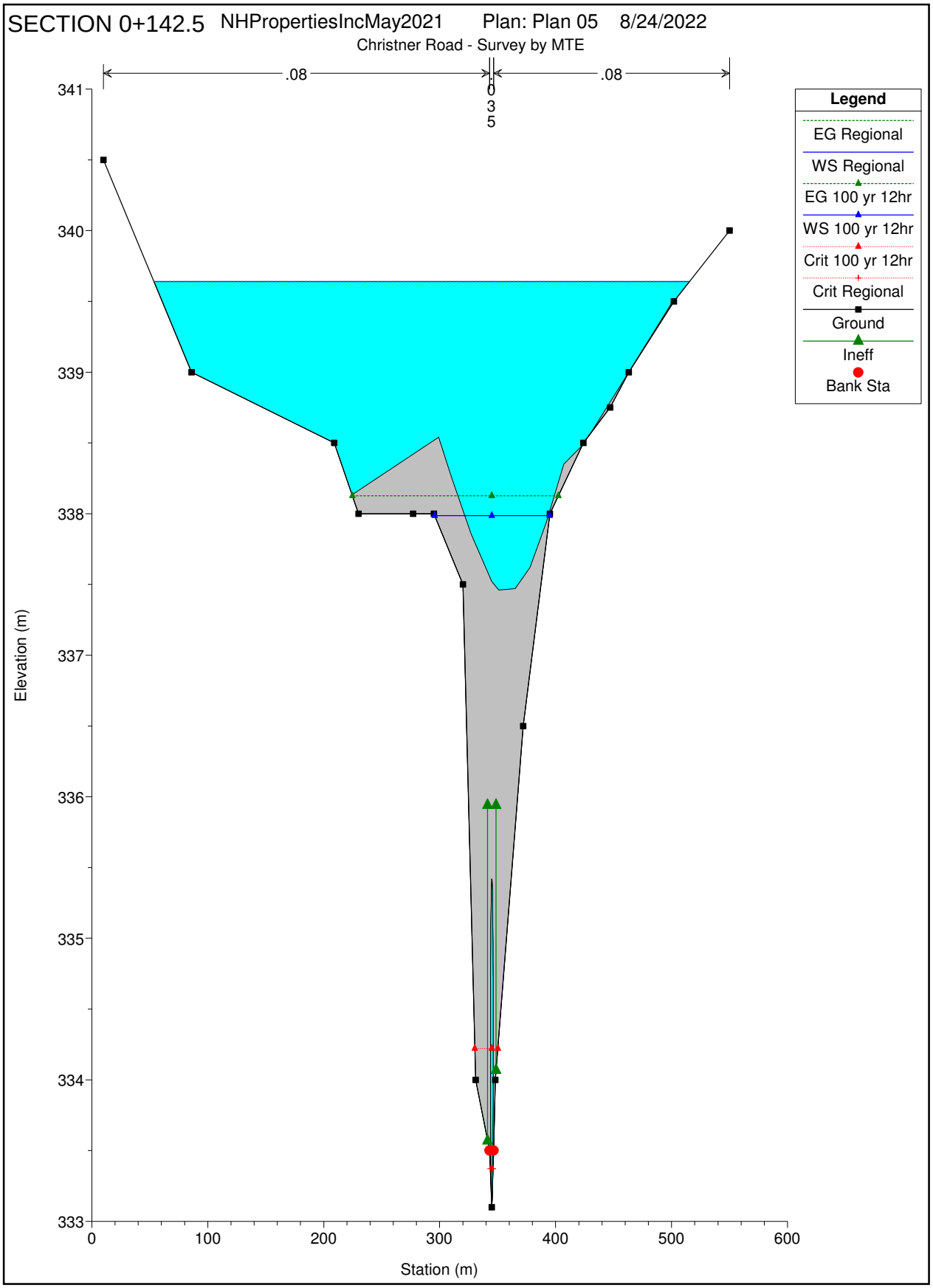
Station (m)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Crit Regional
Ground
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Bank Sta
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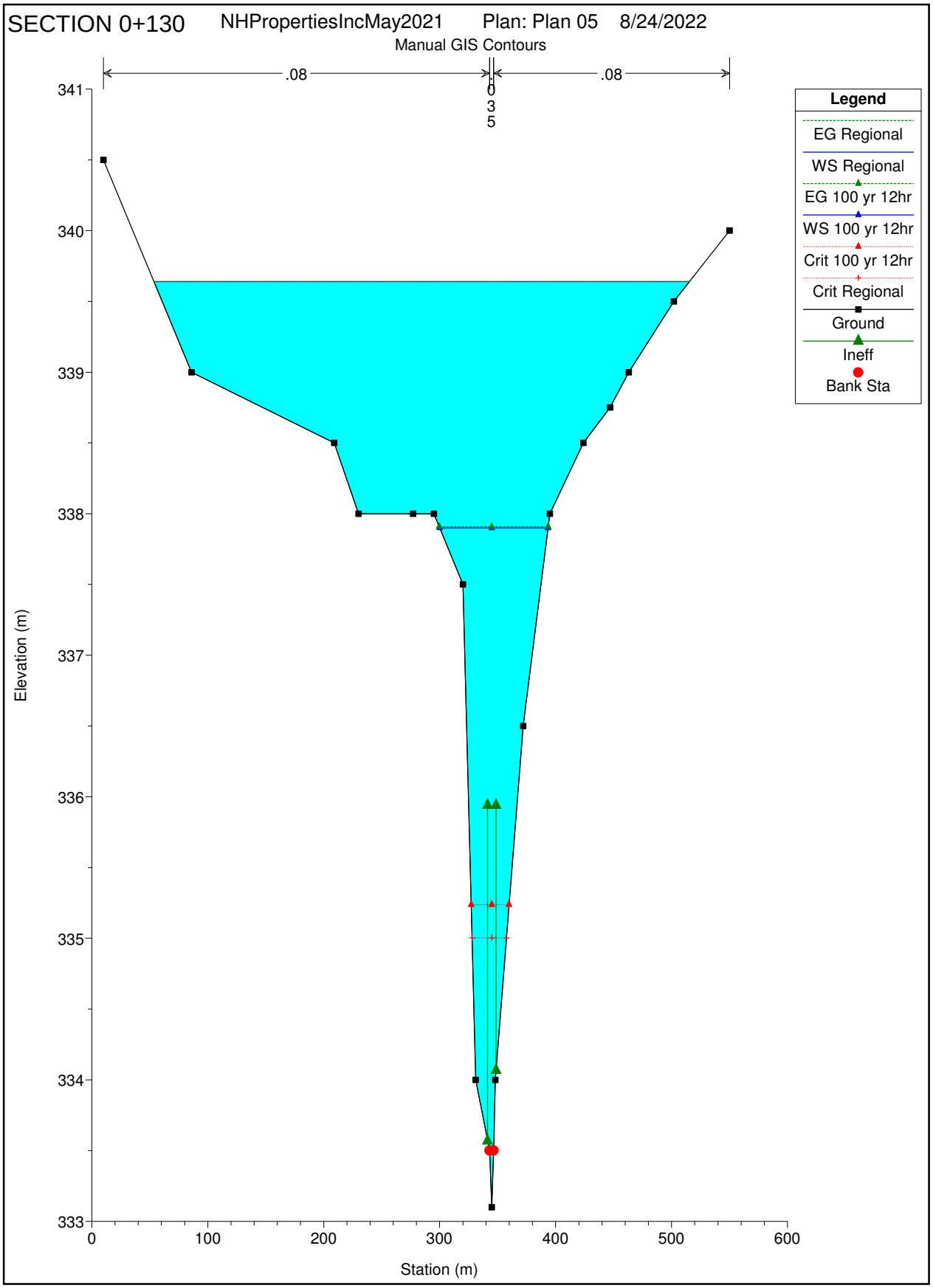
Station (m)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Ineff
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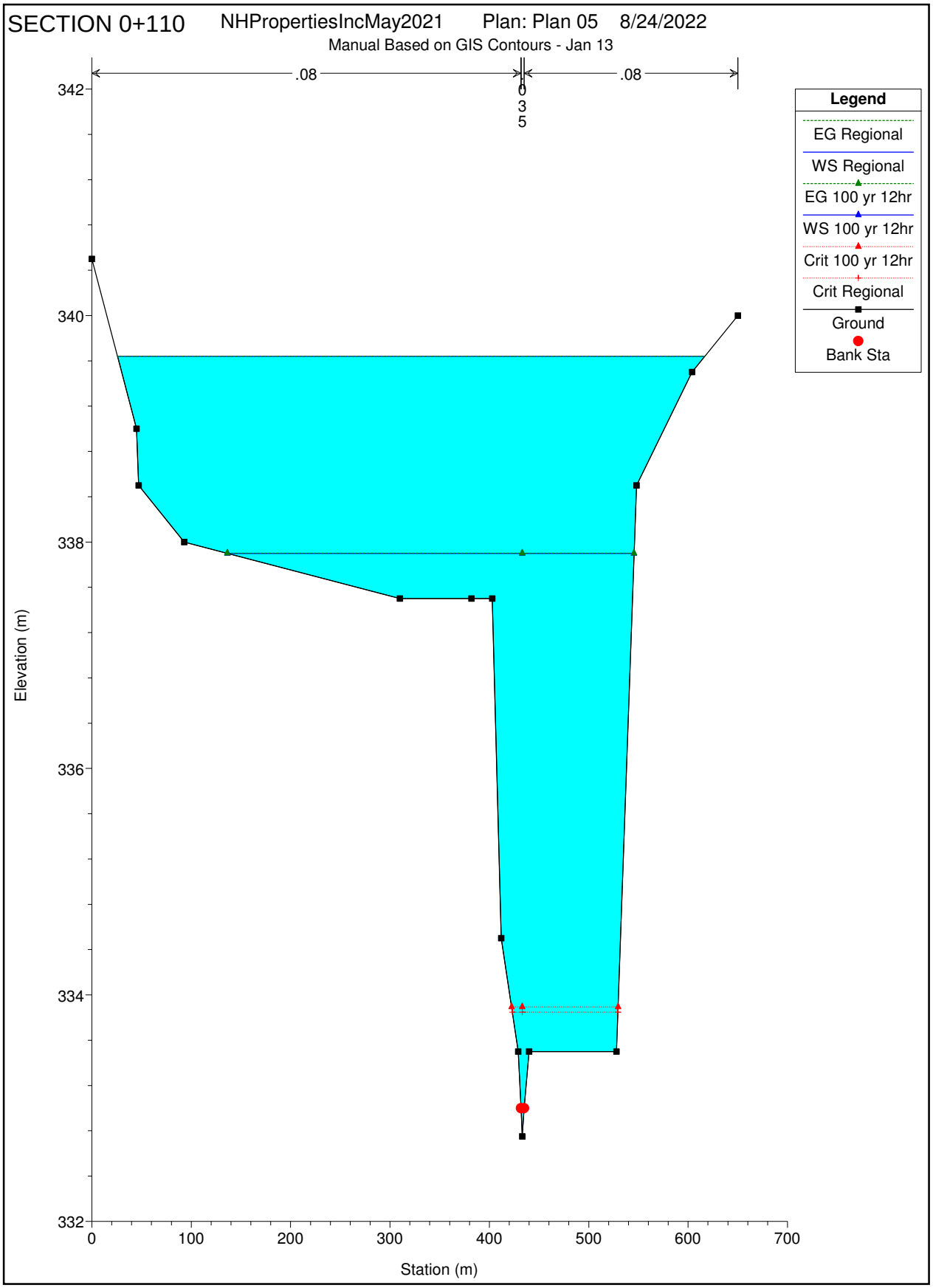
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Ground
Bank Sta
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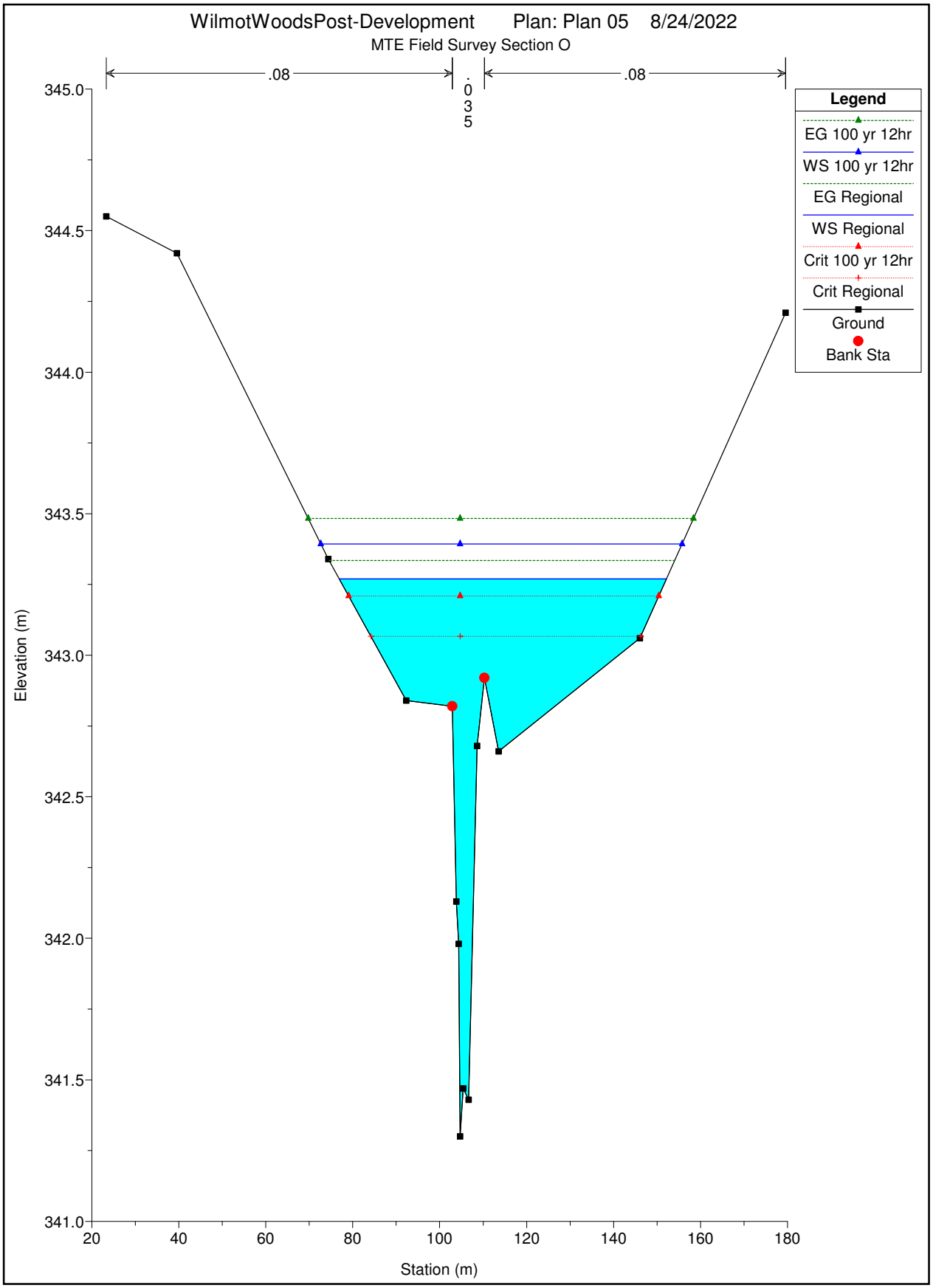
Station (m)

POST-CONSTUCTION SECTIONS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Crit 100 yr 12hr
Crit Regional
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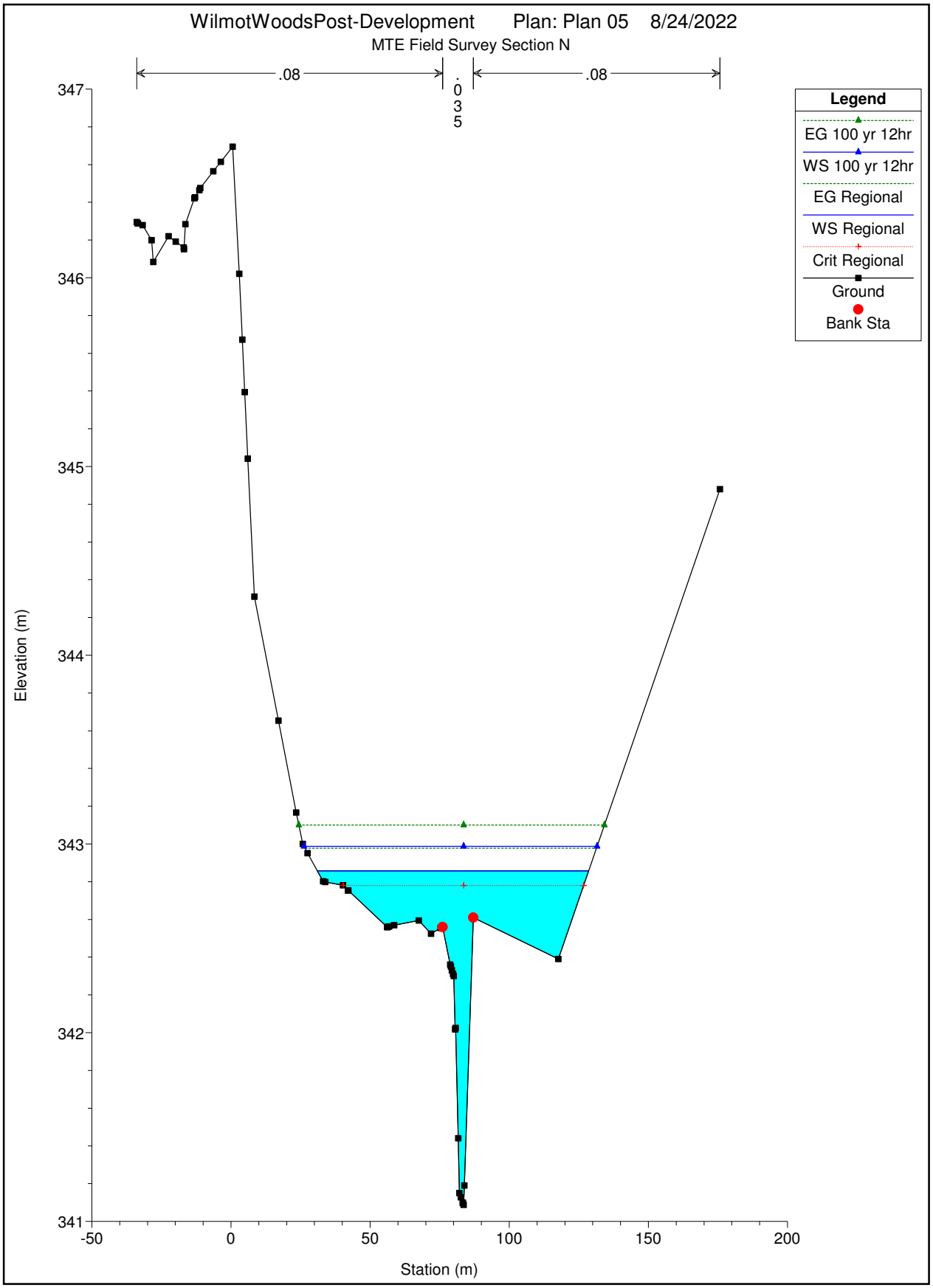
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Crit Regional
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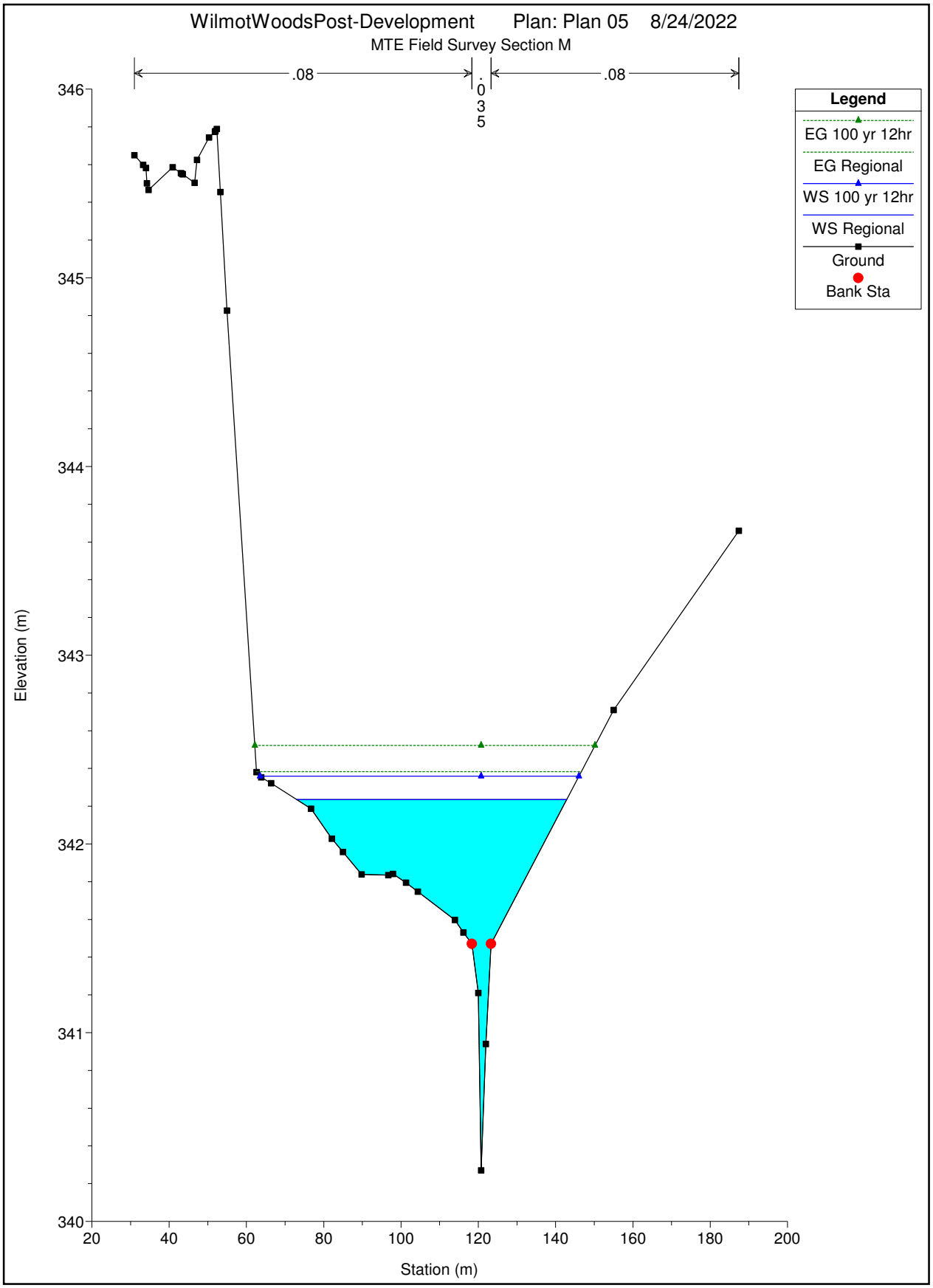
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WS Regional
Ground
Bank Sta
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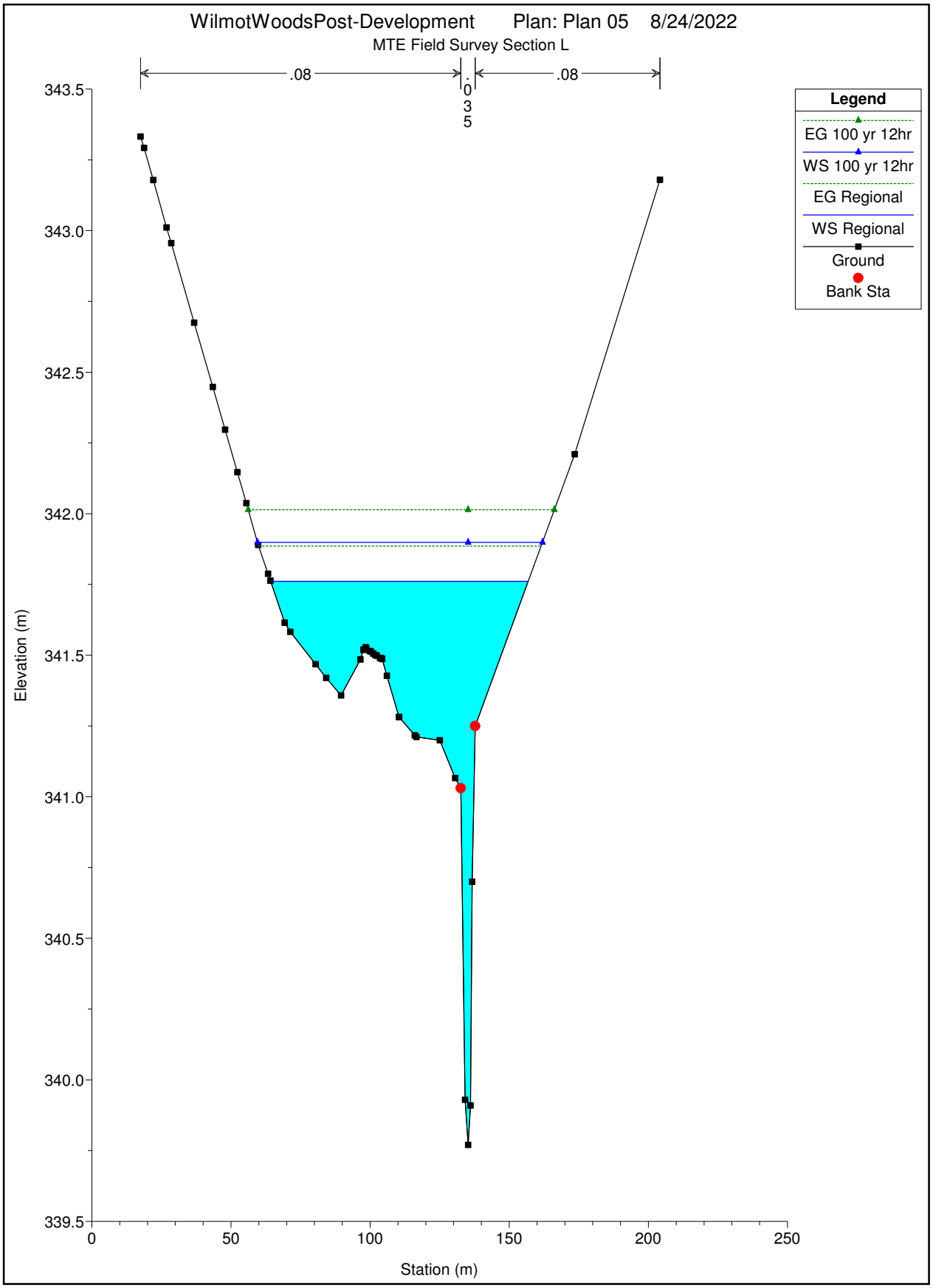
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Ground
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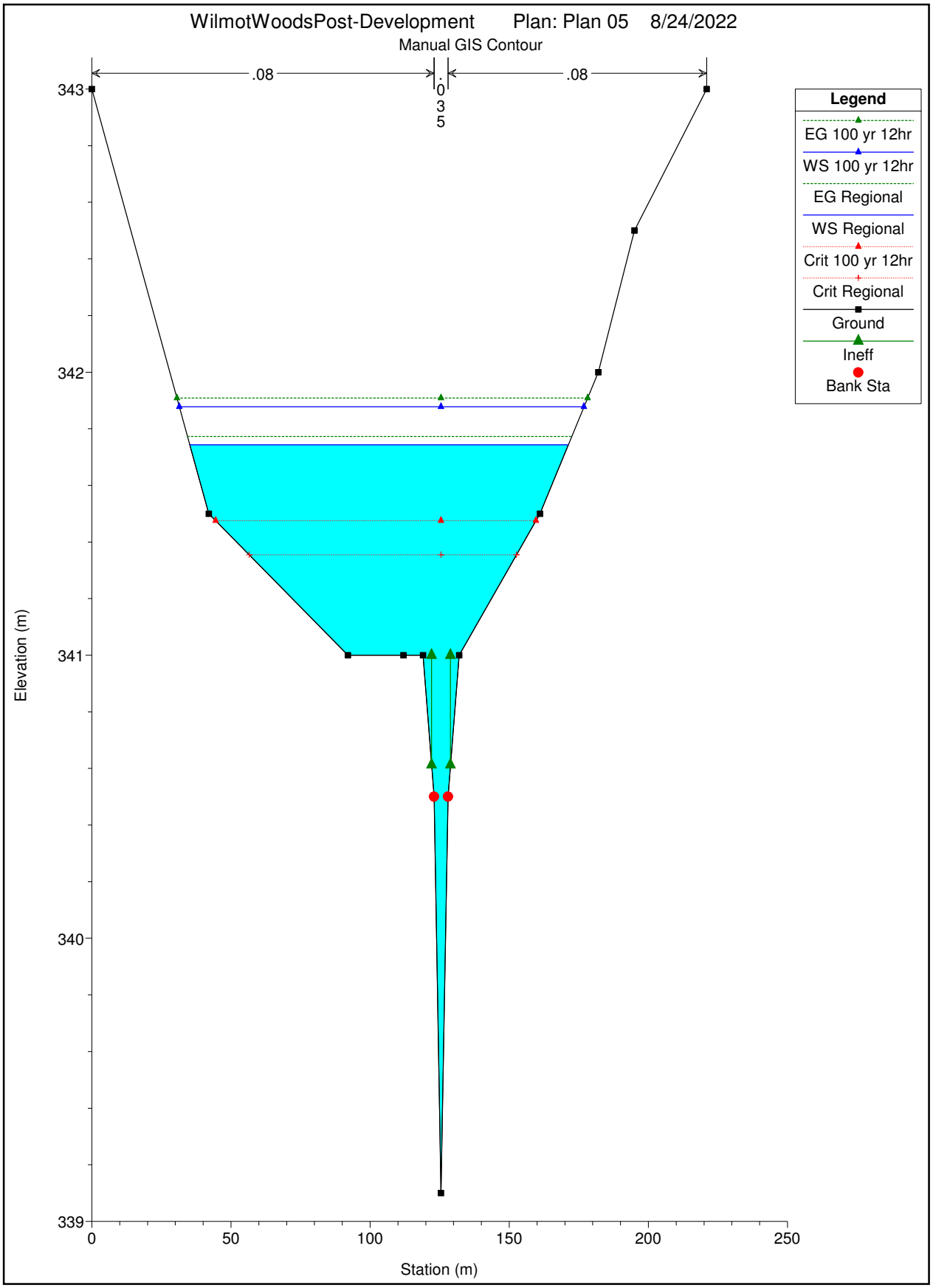
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Crit 100 yr 12hr
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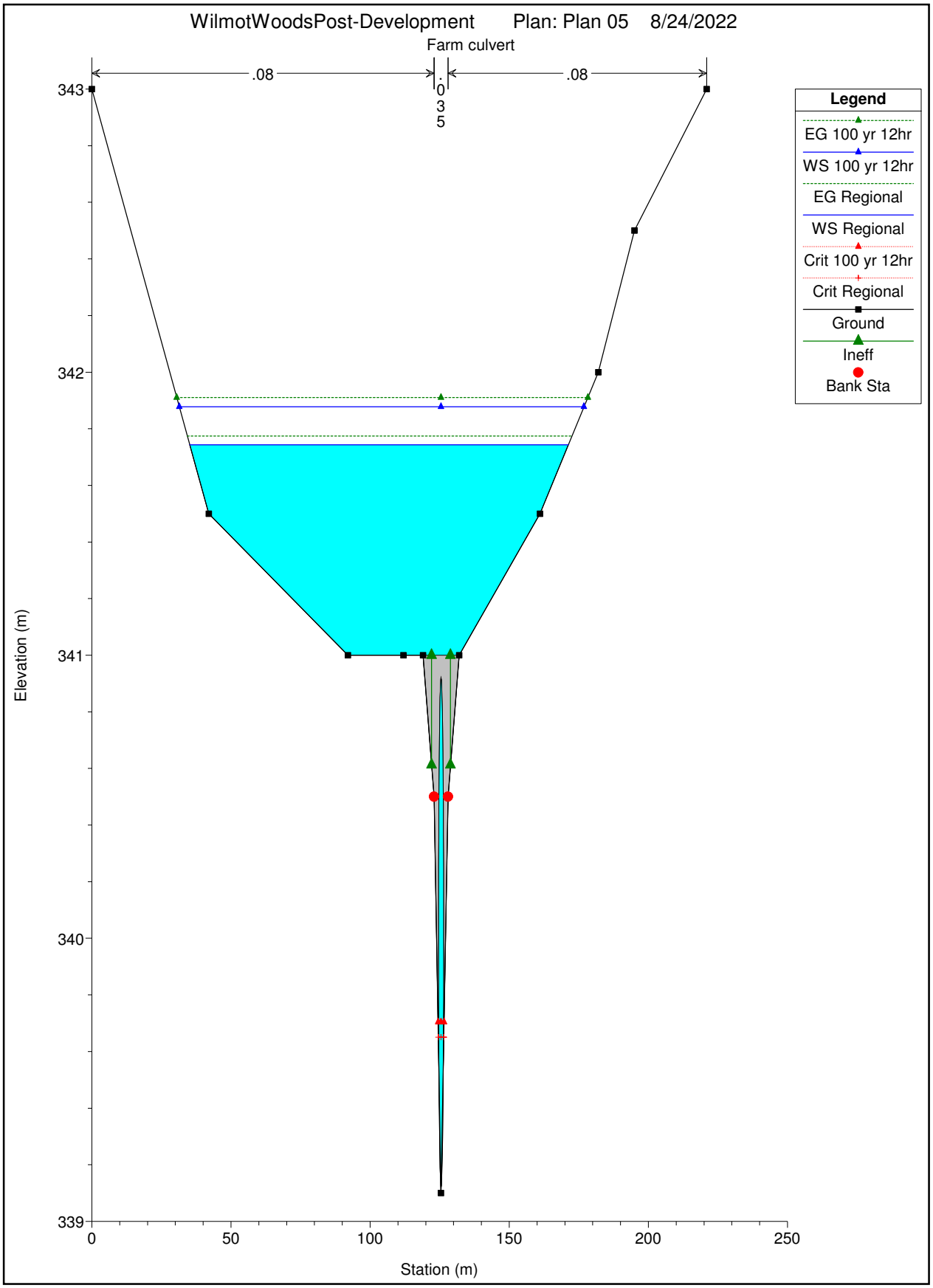
Station (m)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Farm culvert
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WS 100 yr 12hr
EG Regional
WS Regional
Crit 100 yr 12hr
Crit Regional
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Bank Sta
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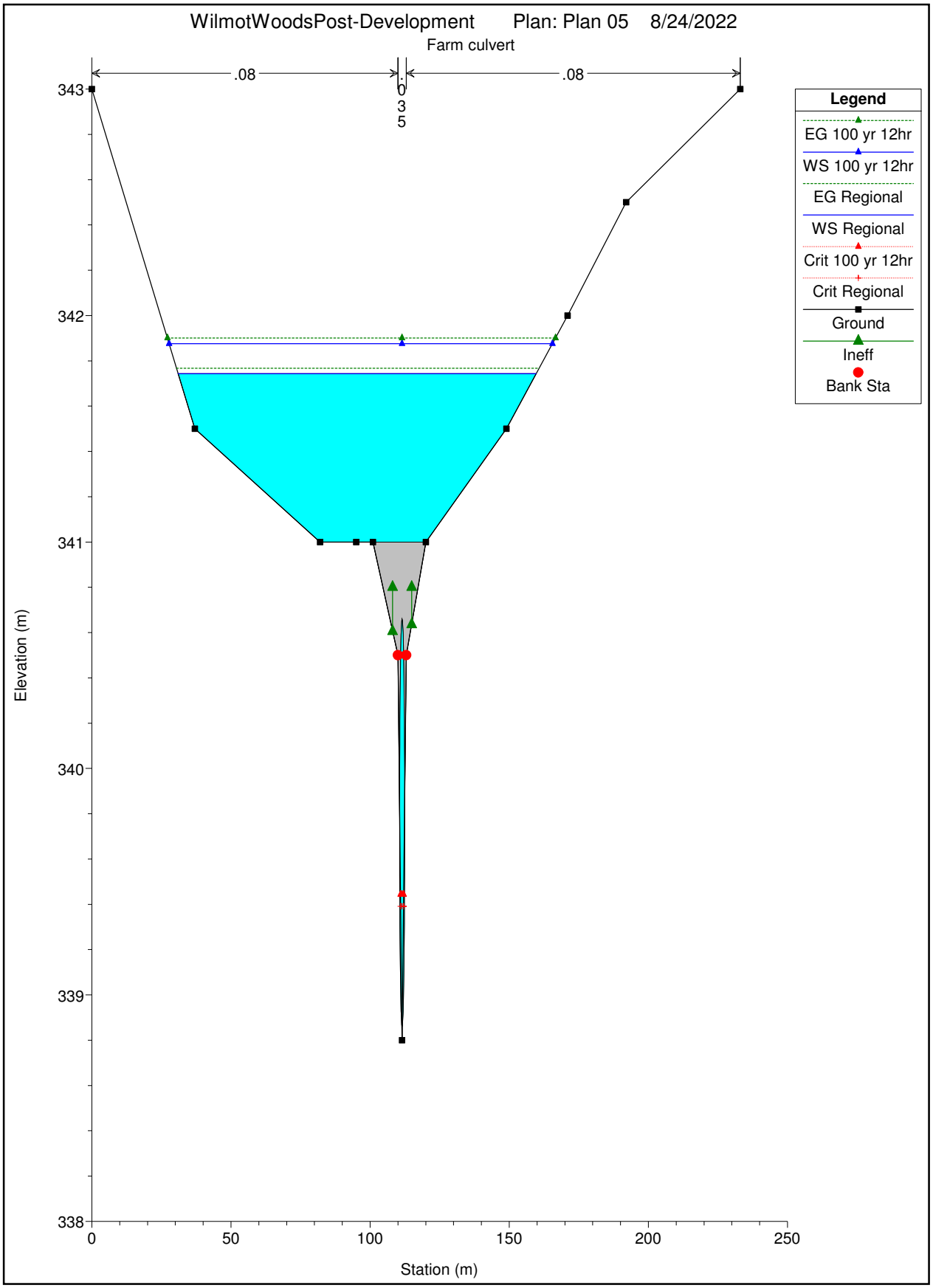
Station (m)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Crit 100 yr 12hr
Crit Regional
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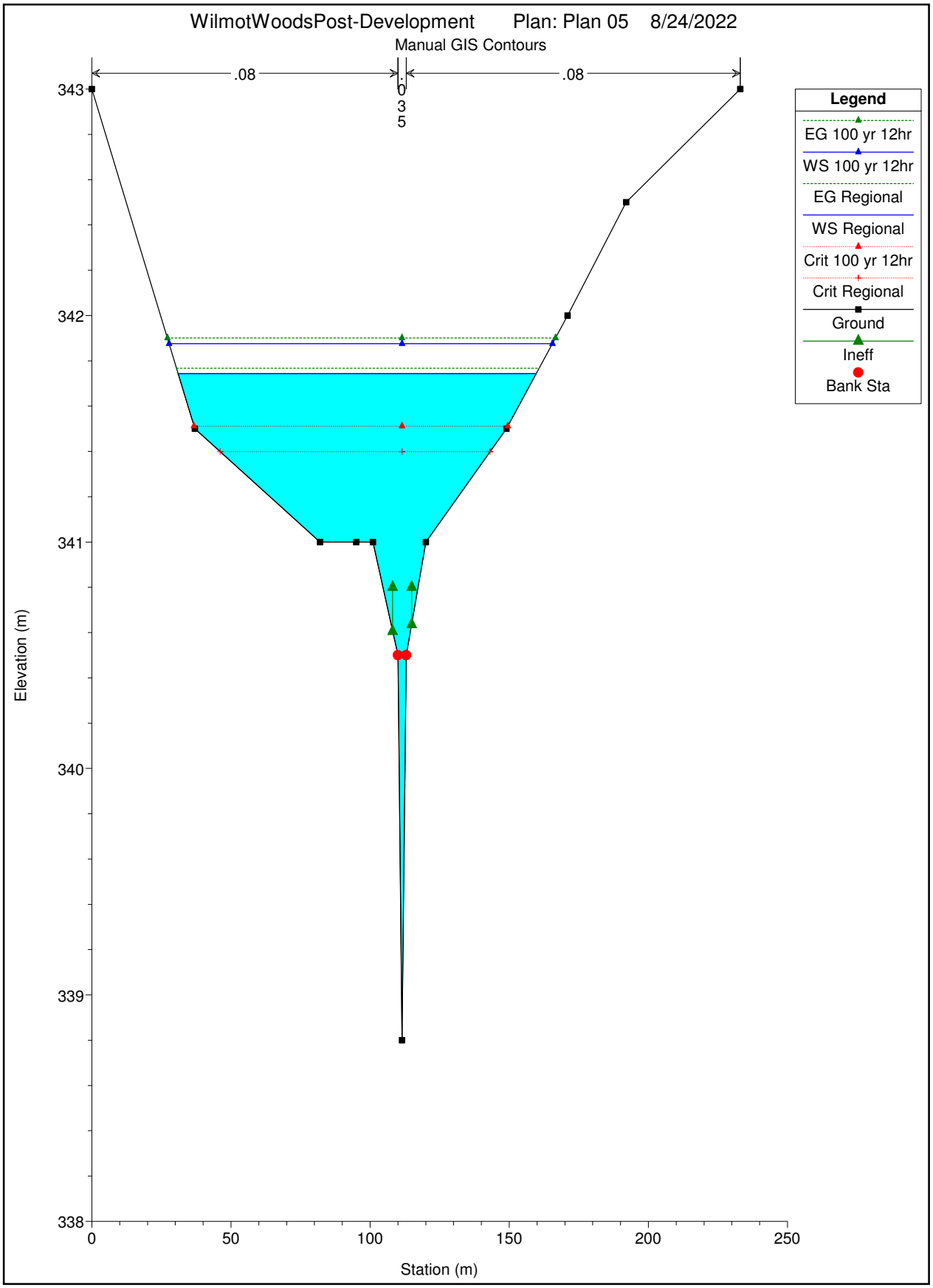
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WS Regional
Crit 100 yr 12hr
Crit Regional
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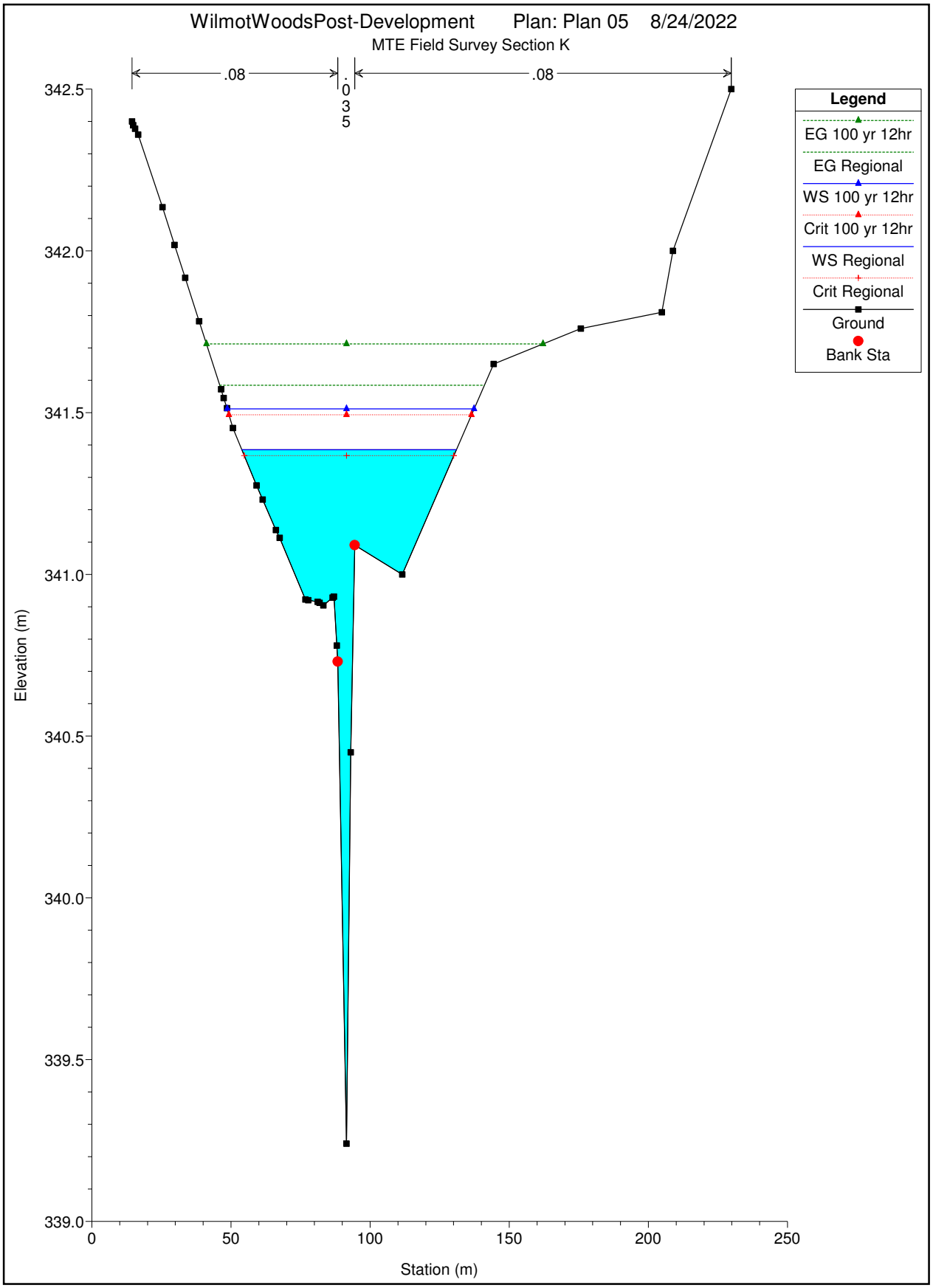
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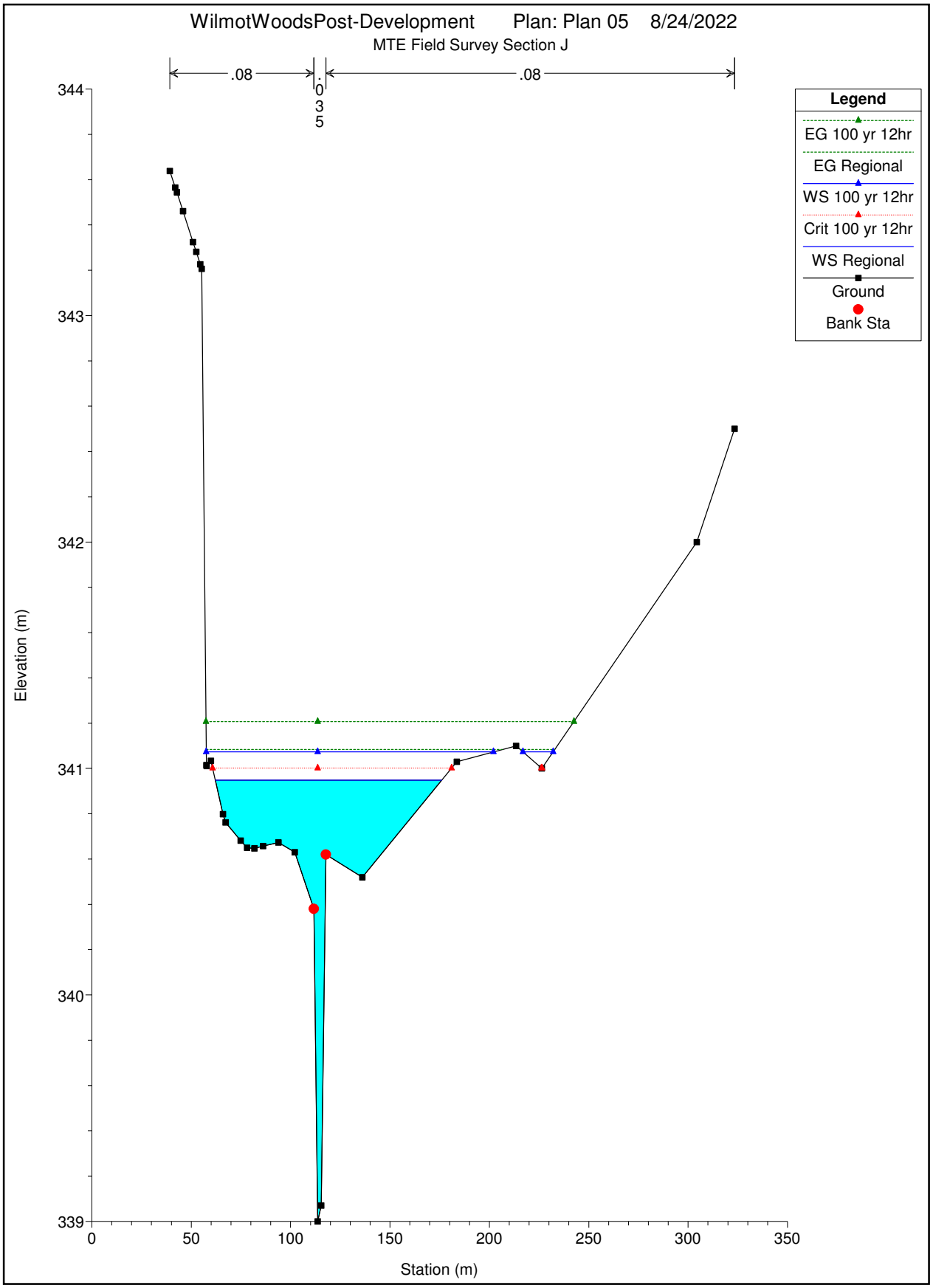
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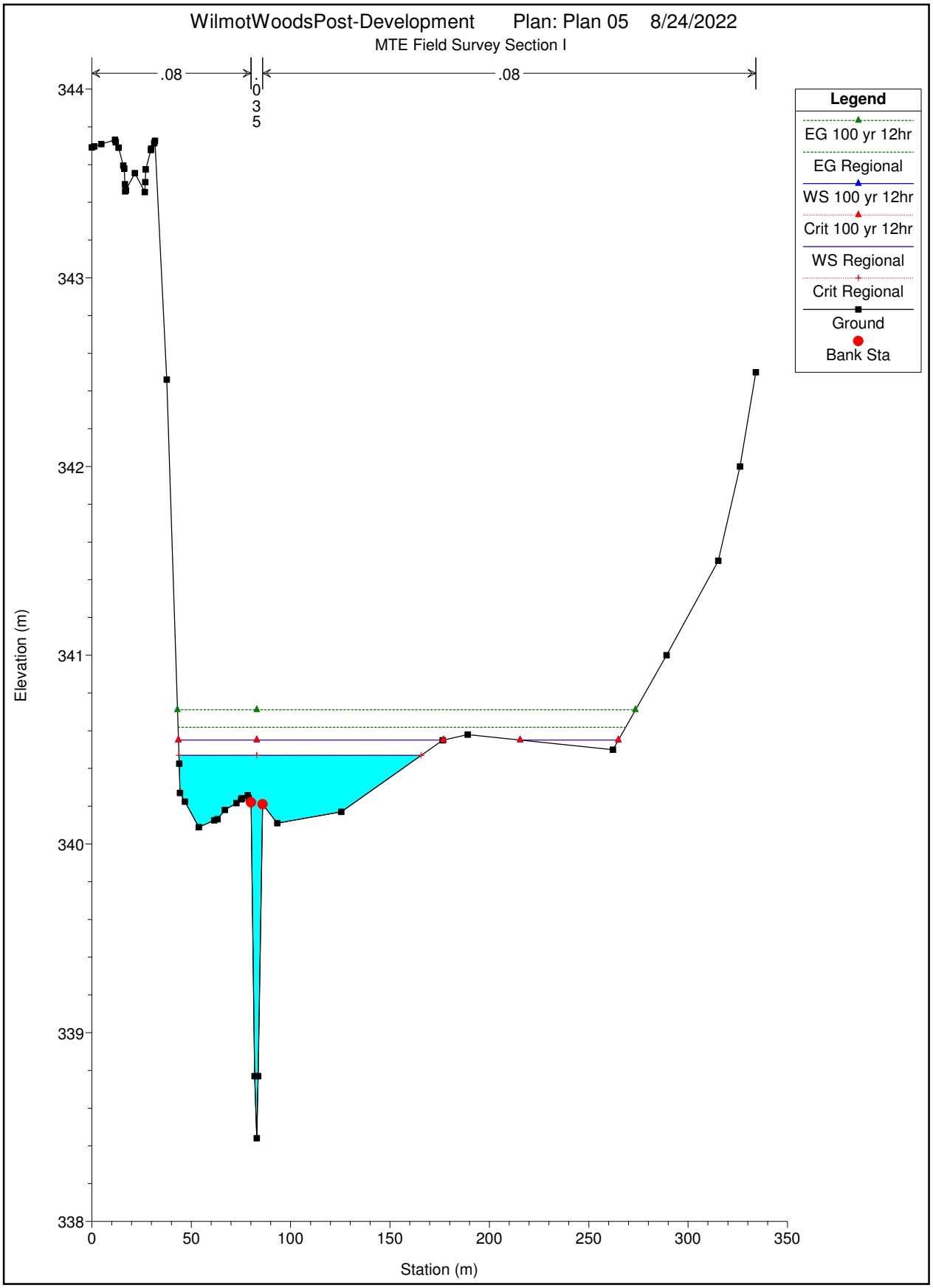
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WS Regional
Crit Regional
Ground
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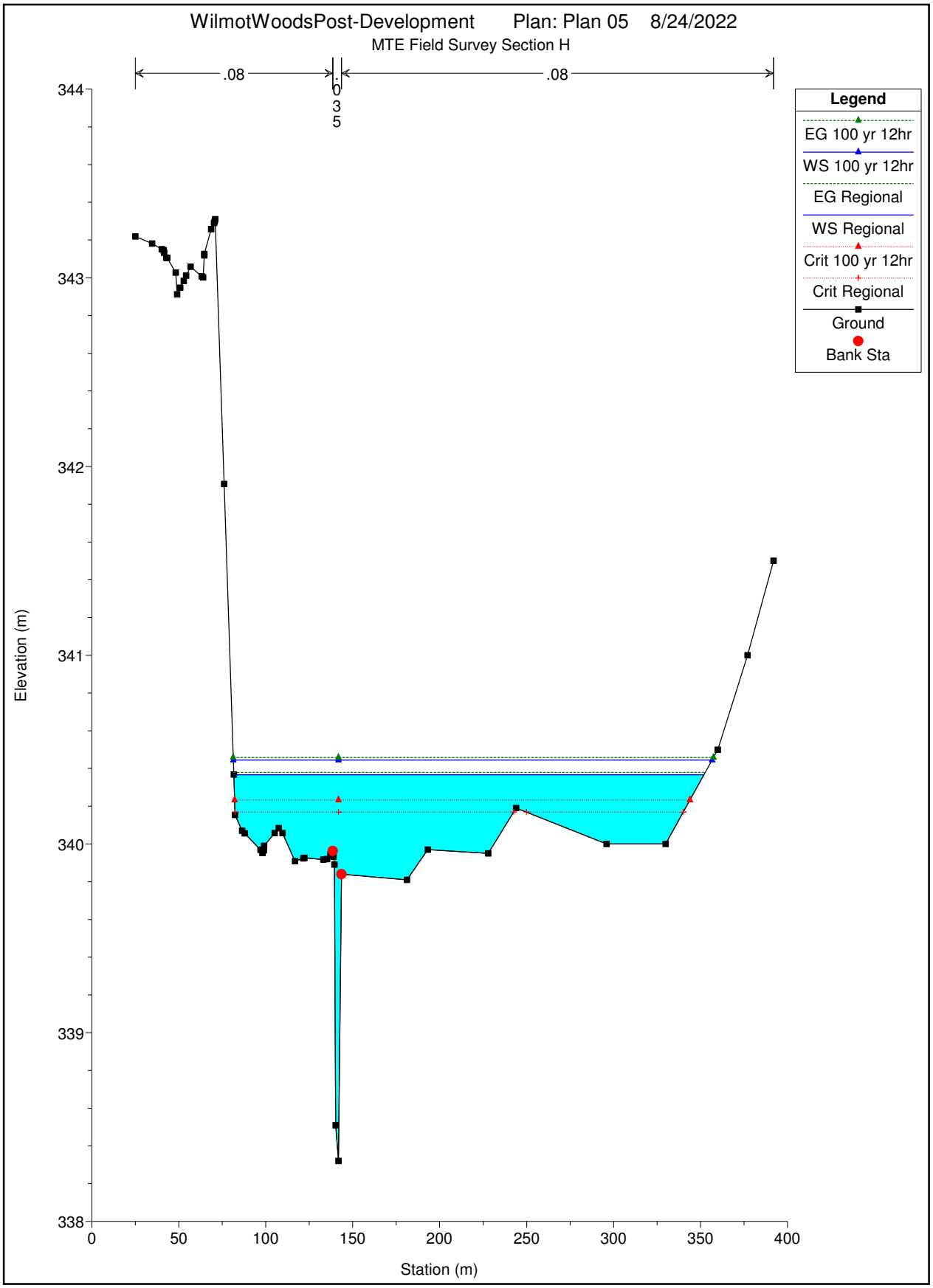
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Crit Regional
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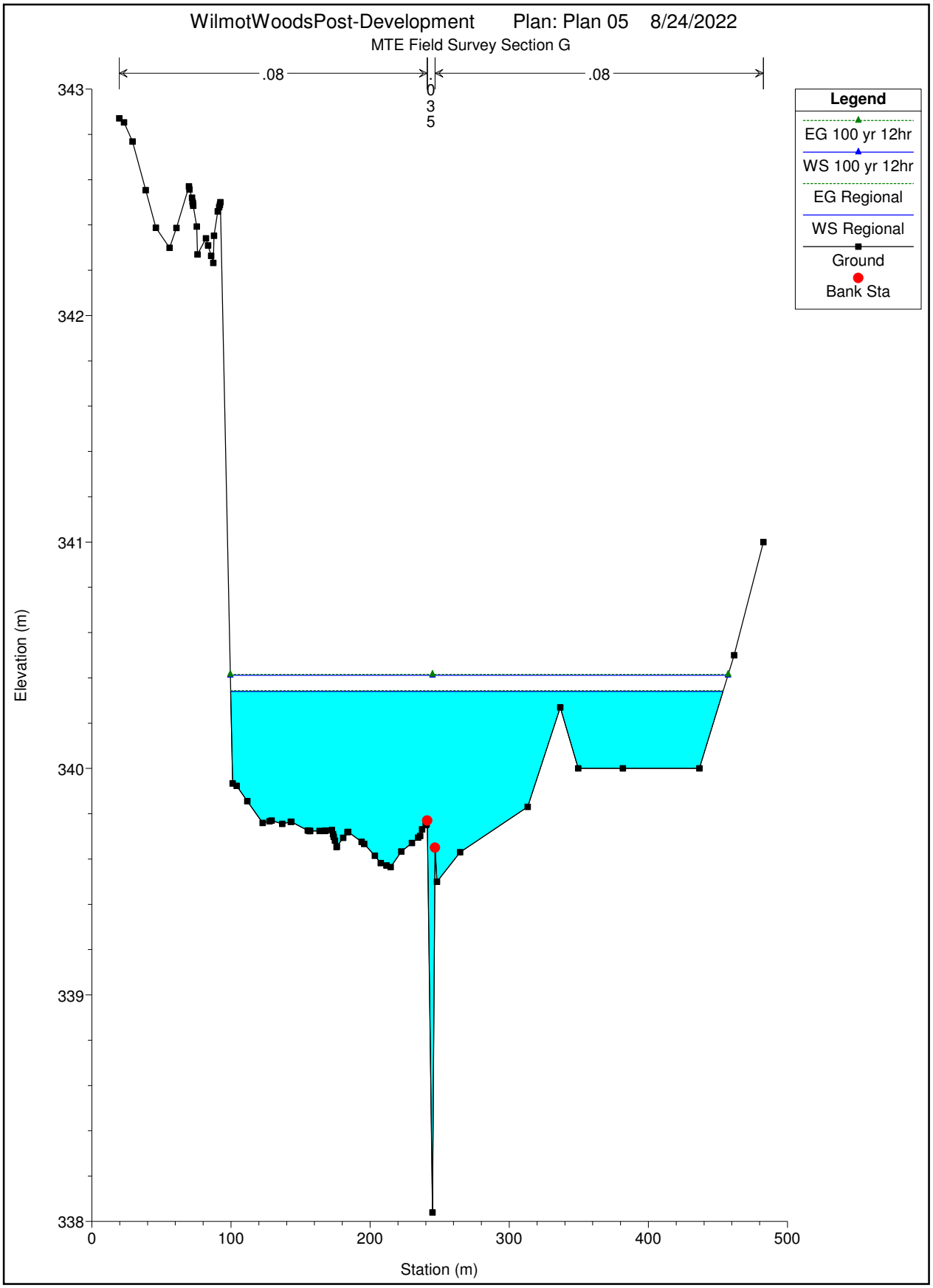
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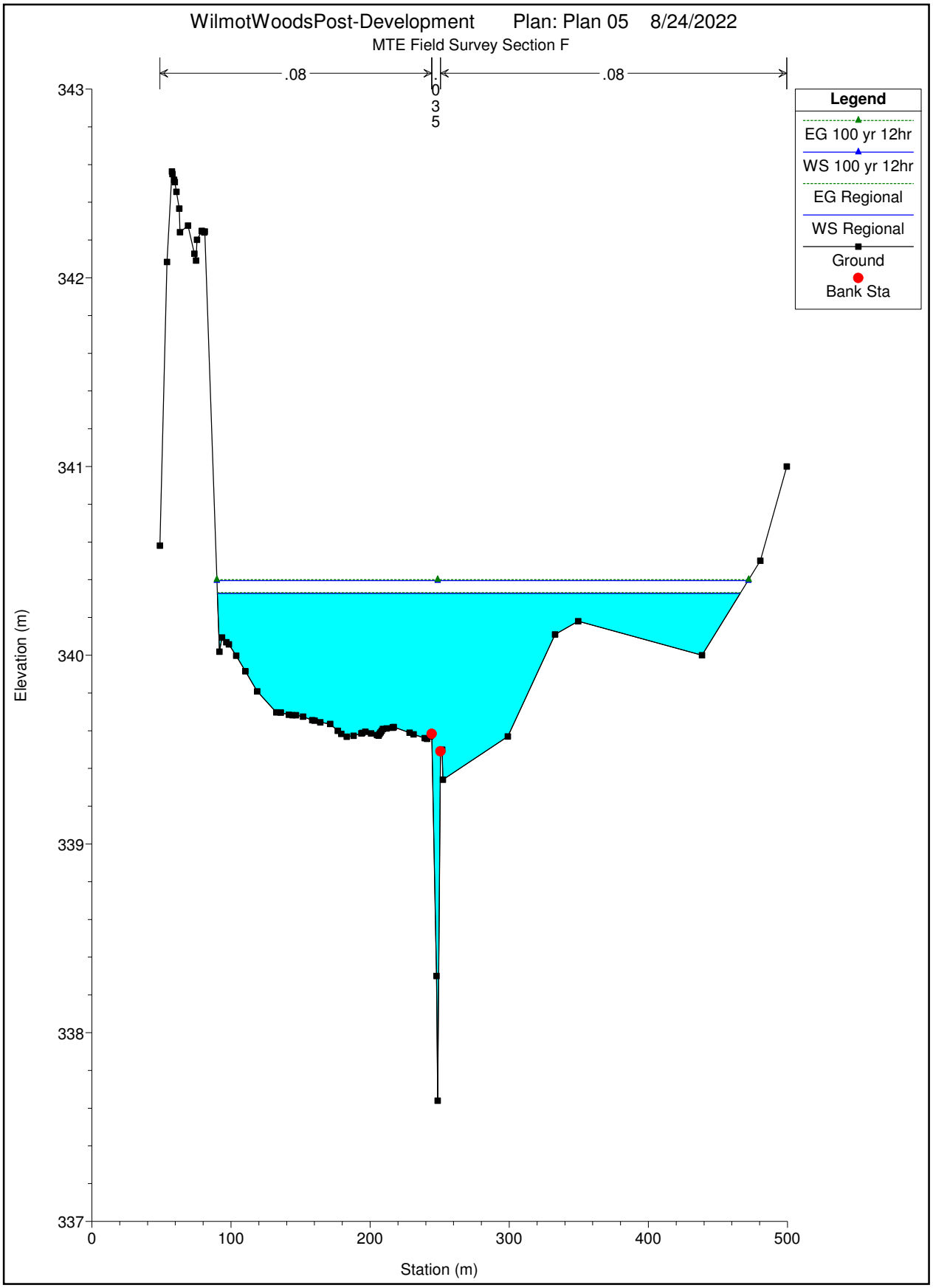
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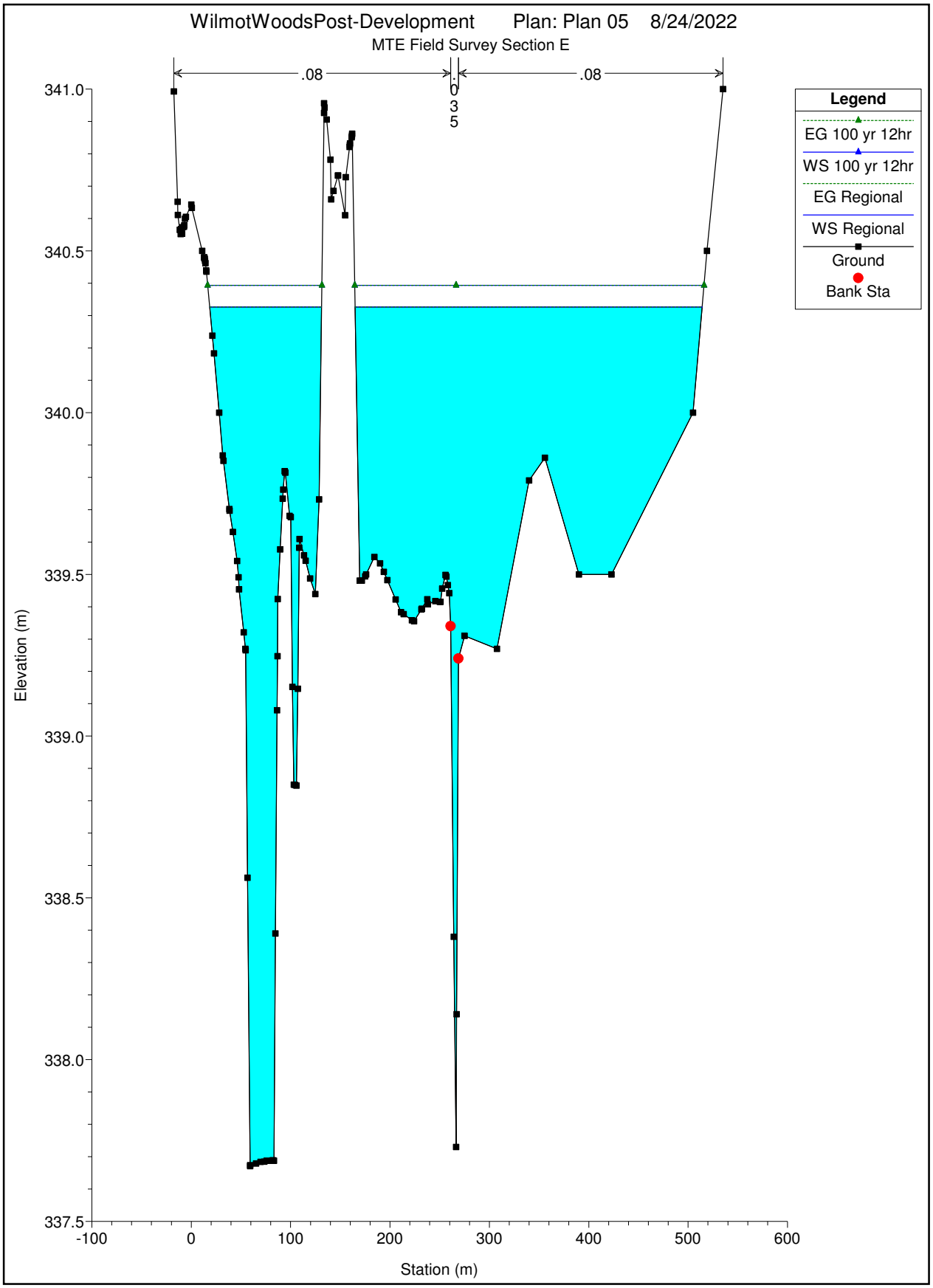
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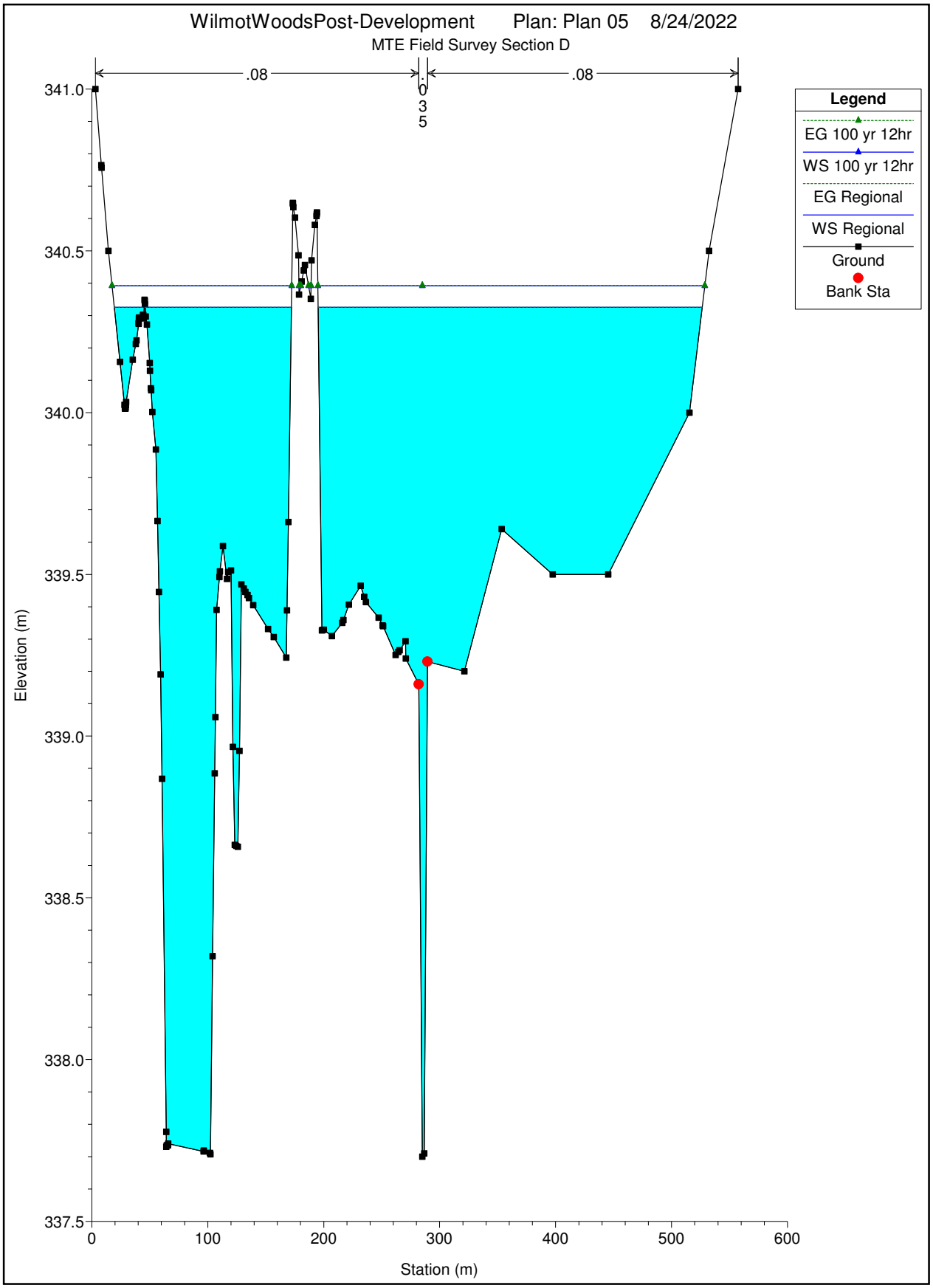
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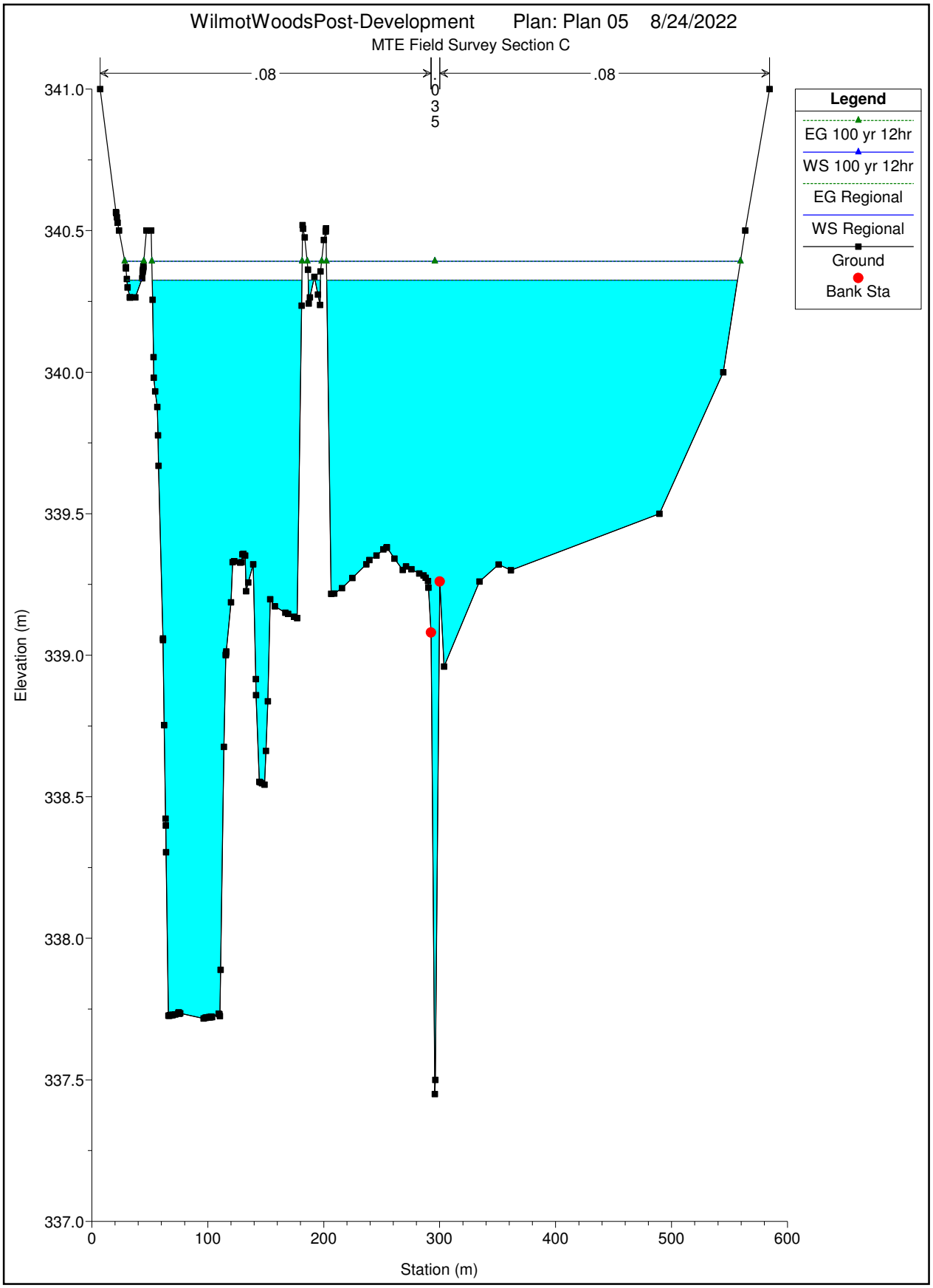
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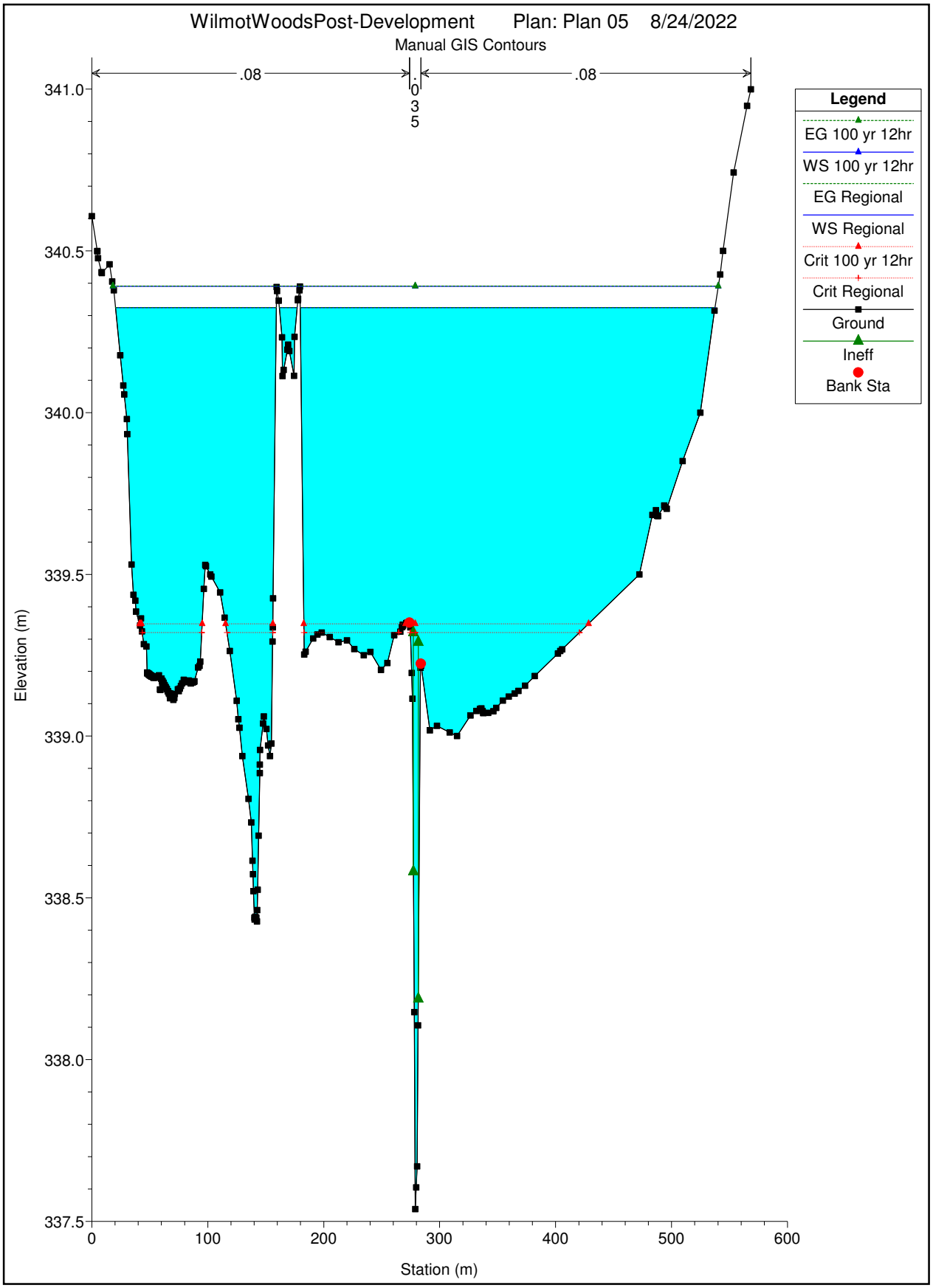
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Crit 100 yr 12hr
Crit Regional
Ground
Ineff
Bank Sta
Elevation (m)
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338.0
337.5
0
100
200
300
400
500
600
Station (m)

Appendix C

HEC-RAS Model Errors

Regional Errors

Location: River: Drain Reach: 1 RS: 2241 Profile: Regional
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1887 Profile: Regional
Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Location: River: Drain Reach: 1 RS: 1725 Profile: Regional
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1625 Profile: Regional
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1515 Profile: Regional
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1415 Profile: Regional
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1377.5 Profile: Regional
Warning: The weir over culvert is submerged.

Location: River: Drain Reach: 1 RS: 1370 Profile: Regional
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Location: River: Drain Reach: 1 RS: 1340 Profile: Regional
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1240 Profile: Regional
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1140 Profile: Regional
Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with
the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Location: River: Drain Reach: 1 RS: 1085 Profile: Regional
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Location: River: Drain Reach: 1 RS: 950 Profile: Regional
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 860 Profile: Regional
Warning: Divided flow computed for this cross-section.

Location: River: Drain Reach: 1 RS: 815 Profile: Regional
Warning: Divided flow computed for this cross-section.

Location: River: Drain Reach: 1 RS: 790 Profile: Regional
Warning: The weir over culvert is submerged.

Location: River: Drain Reach: 1 RS: 785 Profile: Regional
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Location: River: Drain Reach: 1 RS: 760 Profile: Regional
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Location: River: Drain Reach: 1 RS: 545 Profile: Regional
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 330 Profile: Regional
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 155 Profile: Regional
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Location: River: Drain Reach: 1 RS: 142.5 Profile: Regional
Warning: The weir over culvert is submerged.

Location: River: Drain Reach: 1 RS: 130 Profile: Regional
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

100yr12hr Errors

Location: River: Drain Reach: 1 RS: 2241 Profile: 100 yr 12hr
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1887 Profile: 100 yr 12hr
Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Location: River: Drain Reach: 1 RS: 1725 Profile: 100 yr 12hr
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1625 Profile: 100 yr 12hr
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1515 Profile: 100 yr 12hr
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1415 Profile: 100 yr 12hr
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1377.5 Profile: 100 yr 12hr
Warning: The weir over culvert is submerged.

Location: River: Drain Reach: 1 RS: 1370 Profile: 100 yr 12hr
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Location: River: Drain Reach: 1 RS: 1340 Profile: 100 yr 12hr
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Location: River: Drain Reach: 1 RS: 1240 Profile: 100 yr 12hr
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 1140 Profile: 100 yr 12hr
Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth.
This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Location: River: Drain Reach: 1 RS: 1085 Profile: 100 yr 12hr
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional
cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Location: River: Drain Reach: 1 RS: 950 Profile: 100 yr 12hr
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional
cross sections.

Location: River: Drain Reach: 1 RS: 815 Profile: 100 yr 12hr
Warning: Divided flow computed for this cross-section.

Location: River: Drain Reach: 1 RS: 790 Profile: 100 yr 12hr
Warning: The weir over culvert is submerged.

Location: River: Drain Reach: 1 RS: 760 Profile: 100 yr 12hr
Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with
the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Location: River: Drain Reach: 1 RS: 725 Profile: 100 yr 12hr
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Location: River: Drain Reach: 1 RS: 545 Profile: 100 yr 12hr
Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional
cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Location: River: Drain Reach: 1 RS: 330 Profile: 100 yr 12hr
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Location: River: Drain Reach: 1 RS: 190 Profile: 100 yr 12hr
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Location: River: Drain Reach: 1 RS: 155 Profile: 100 yr 12hr
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Location: River: Drain Reach: 1 RS: 130 Profile: 100 yr 12hr
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Location: River: Drain Reach: 1 RS: 110 Profile: 100 yr 12hr
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

Appendix F

Geotechnical Information

GEOTECHNICAL INVESTIGATION
PROPOSED WILMOT WOODS DEVELOPMENT
NEW HAMBURG, ONTARIO

for

WILMOT WOODS DEVELOPMENT INC.

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PML Ref.: 18KF031
Report: 1
February 24, 2022

Peto MacCallum Ltd.
CONSULTING ENGINEERS

February 24, 2022

PML Ref.: 18KF031
Report: 1

Mr. Adam Belksy
Wilmot Woods Development Inc.
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Dear Mr. Belksy

Geotechnical Investigation
Proposed Wilmot Woods Development
New Hamburg, Ontario

Peto MacCallum Ltd. (PML) is pleased to report the results of the geotechnical investigation recently completed at the above noted project site. Authorization to proceed with this assignment was provided by Mr. Galbraith in an email dated July 9, 2018.

In general, the project involves the proposed construction of a residential subdivision on a 37 Ha site located south of Waterloo Street and north or the railway in New Hamburg, Ontario. The proposed development is located on an existing agricultural property. Details of the proposed development have yet to be established, but in general it is understood that approximately 600 residential dwellings will be constructed at the site. It is anticipated that the proposed development will have full municipal servicing including watermain, storm and sanitary sewers, with typical invert depths expected to be to a maximum 3 m depth below existing grade. It is also understood that a trunk sewer will extend southward from the site, under the railway and connect to a proposed trunk sewer on the neighbouring property (the Wilmot Employment Lands). Two storm water ponds also are proposed for the development, one near the northwest corner of the site, and the second at the south side of the site.

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The purpose of the current geotechnical investigation was to explore the subsurface soil and ground water conditions at the site and based on this information, to provide geotechnical recommendations for the proposed development. Specific considerations to be addressed in this report include:

- A description of the site and the field investigation procedure;
- A summary of the subsurface soil and ground water conditions encountered;
- Log of borehole sheets, a borehole location plan drawing, and geotechnical laboratory test results;
- Excavation and construction dewatering requirements;
- House foundation design, including bearing resistances, settlement projections and site class for seismic design;
- Slab on grade floors and below grade walls, including compaction requirements and geotechnical suitability of onsite soils for re-use;
- Site servicing (storm, sanitary, water and utilities) including pipe bedding requirements;
- Pavement structure design for new roadways; and,
- Suitability of native soils for infiltration of stormwater.

Recommendations for the proposed trenchless crossing of the railway will be provided under separate cover.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are for the current project only. Any changes in plans will require review by PML to assess the applicability of the report, and may require modified recommendations, additional analysis and / or investigation. When the project design is complete, the general recommendations given in this report should be reviewed by PML to ensure their applicability.

Investigation Procedure

The field work for this geotechnical investigation was conducted between July 30 and October 15, 2018. The investigation program comprised a total of 22 boreholes (BH1 to BH12 and MW101 to MW110) advanced to between 6.5 and 12.6 m depth, with monitoring wells installed in ten of the boreholes (designated MW101 to MW110). The borehole and monitoring well locations are shown on the appended Borehole Location Plan, Drawing 1.

The borehole locations were established in the field by PML. Borehole locations were surveyed by PML using a Global Navigation Satellite System (GNSS). The survey equipment was provided by SOKKIA Canada, model GCX-2.

The boreholes were advanced using a Diedrich D-50 track mounted drillrig fitted with continuous flight solid and hollow stem augers and automatic hammer, supplied and operated by a specialist drilling contractor. The work was carried out under the full-time supervision of a PML engineering staff member who directed the drilling and sampling operations, documented the soil stratigraphy, monitored ground water conditions and processed the recovered samples.

Representative samples of the overburden were recovered at regular intervals throughout the depths explored. Standard penetration tests (SPT) were carried out during sampling operations in the boreholes using conventional split spoon equipment. Pocket penetrometer testing was carried out on the recovered samples to determine the undrained shear strength of the cohesive soils. Ground water observations were made in the boreholes during and upon completion of drilling. The boreholes were backfilled in accordance with O.Reg.903 upon completion of drilling.

Monitoring wells were installed in ten boreholes to more accurately measure ground water levels. The monitoring wells comprised 50 mm diameter PVC pipe, filter sand, bentonite seals, and protective casings. Subsequent water level measurements from the wells were conducted by PML.

All of the recovered samples were returned to PML's laboratory for detailed visual examination, classification, and routine moisture content determinations. The laboratory testing also included particle size distribution analyses on eleven samples of the major soil types encountered.

Summarized Subsurface Conditions

Reference is made to the appended Log of Borehole sheets for details of the field work including soil descriptions, inferred stratigraphy, standard penetration test (SPT) N values, pocket penetrometer test values, ground water observations and laboratory moisture content determinations.

Due to the soil sampling procedures and the limited size of samples, the depth / elevation demarcations on the borehole logs must be viewed as "transitional" zones, and cannot be construed as exact geologic boundaries between layers.

In general, the soil stratigraphy encountered comprised surficial topsoil and localized fill, underlain by an extensive clayey silt deposit containing localized discontinuous cohesionless silt, sandy silt, silty sand and sand layers.

Surficial topsoil was contacted in all of the boreholes, with the exception of Borehole 104. The topsoil was between 180 and 850 mm thick, with an average of 294 mm.

Surficial fill was encountered locally in Borehole 104, and extended 0.68 m depth.

An extensive clayey silt deposit was encountered below the surficial topsoil and fill deposits, in all of the boreholes, and extended to the 6.5 to 12.6 m borehole termination depths. The cohesive clayey silt deposit was generally firm to very stiff based on SPT N values between 4 and 30 blows per 0.3 m penetration of the split spoon sampler. Pocket penetrometer shear strengths of the clayey silt ranged between 50 and 225 kPa. Moisture content ranged between 8 and 31% indicating drier than plastic limit (DTPL) to wetter than limit (WPL) conditions in the cohesive clayey silt soils.

Reference is given to the appended Figures 1 to 6 for the results of the particle size analyses conducted on samples of the clayey silt.

Discontinuous localized layers of cohesionless silt, sandy silt, silty sand and sand were encountered above, below and within the clayey silt, in Boreholes BH5, BH6, BH9, MW101, MW102. These layers were loose to compact based on SPT N values between 5 to 28 blows per 0.3 m penetration of the split spoon sampler. Moisture contents ranged between 5 and 22% indicating damp to saturated conditions in the cohesionless soils. Reference is given to Figures 6 to 11 for the results of particle size distribution analyses conducted on samples of the silt, sandy silt, silty sand, and sand soils.

Ground Water Conditions

Ground water observations carried out during and upon completion of drilling are presented on the appended Log of Borehole Sheets.

During drilling, wet and saturated conditions were generally encountered in the silt, sandy silt, silty sand and sand layers below 1.0 to 2.9 m depth (Elevation 338.1 to 340.3). Free water was observed upon completion of drilling, in Boreholes 2 and 9, below 2.0 to 2.3 m depth (Elevation 339.4 to 340.9).

On November 26, 2018 water level measurements from the monitoring wells installed in Boreholes 101 to 110 ranged between 0.1 to 5.4 m depth below existing grade (about Elevation 338.1 to 344.1).

The ground water levels at the site are subject to seasonal fluctuations and precipitation patterns. It should be noted that the relatively impermeable nature of the clayey silt deposits could contribute to the development of perched water conditions following short term and seasonal participation events.

Discussion and Recommendations

In general, the project involves the proposed construction of a residential subdivision on a 37 Ha site located south of Waterloo Street and north of the railway in New Hamburg, Ontario. It is anticipated that the proposed development will have full municipal servicing including watermain, storm and sanitary sewers, with typical invert depths expected to be to a maximum 3 m depth below existing grade. It is also understood that a trunk sewer will extend southward from the site, under the railway and connect to a proposed trunk sewer on the neighbouring property (the Wilmot Employment Lands). Two storm water ponds also are proposed for the development.

Foundations and Earthworks Grading

Details of the buildings in the proposed residential subdivision have yet to be established. We have provided the following preliminary foundation design recommendations and earthworks grading recommendations for the development.

The site is generally underlain by firm to very stiff clayey silt. It is feasible to support buildings on conventional spread or strip footings founded in the native firm to very stiff clayey silt. Based on the investigation findings, footings founded a minimum 0.3 m into the firm to very stiff native clayey silt deposits, below any surficial fill and topsoil and local surficial soft or loose zones, may be designed for a net bearing resistance of 150 kPa at the serviceability limit state (SLS) and a factored bearing resistance of 225 kPa at the ultimate limit state (ULS).

Alternatively, in areas where grades are to be raised footings may be placed at higher elevations on engineered structural fill. The existing topsoil and fill must be excavated to the levels of competent native clayey silt deposits in advance of engineered structural fill placement. Engineered structural fill used to establish footing founding subgrade levels should comprise an approved compactable inorganic soil, placed in lifts with a maximum thickness of 300 mm and be compacted to at least 98% standard Proctor maximum dry density (SPMDD). Additional generic recommendations for engineered fill construction are provided in Appendix A. Footings supported on approved engineered structural fill may also be designed using the values for a net factored resistance of 150 at SLS and 225 kPa at ULS. Full time inspection of any structural fill placement by PML personnel is recommended to approve subgrade conditions, fill materials and to verify that the specified compaction levels are being achieved.

The excavated soils likely to be used for site grading will comprise primarily clayey silt soils, in DTPL to WTPL condition, with moisture contents between 8 to 31%. Material described as 'wet' or 'WTPL' on the appended borehole will generally not be compactible to 98% SPMDD and should be segregated and allocated to areas where post construction settlement would not present a concern. The bulk of the clayey silt soil to be excavated would be too wet for immediate reuse given the observed moisture conditions.

Therefore, the excavated soils are considered suitable for reuse only if the work is carried out during the dry summer months and the construction schedule is flexible to permit air drying to reduce the moisture content closer to the optimum value.

It should also be noted that the in-situ clayey silt materials will tend to retain a voided structure when placed as backfill. Sufficient compaction must be applied to breakdown all lumps / clods within the fill matrix to achieve a non-voided condition. Significant post construction settlement could otherwise result.

The maximum total settlement of foundations designed for the net SLS bearing pressures noted above are not expected to exceed 25 mm. Differential settlements of around 50 to 75% of the total settlement should be anticipated.

All founding surfaces should be examined by PML personnel prior to concrete placement, to check that all loose, frozen, organic or otherwise deleterious materials have been satisfactorily removed and the required bearing capacity is available throughout.

All exterior footings and all footings exposed to seasonal freezing conditions must be provided with frost protection. The minimum frost protection should be 1.2 m of earth cover or the thermal insulation equivalent.

Design provisions for earthquake loading should also be applied. For the soil conditions at the site, a Class D site category may be assumed, in accordance with the 2012 Ontario Building Code.

Slab-on-Grade Floors

Preparation of the floor slab subgrade should include stripping of the surficial, topsoil, and other deleterious material, placement and compaction of engineered fill, if necessary, followed by proof rolling of the exposed subgrade with a heavy roller to ensure uniform adequate support. Excessively loose, soft or compressible materials revealed during the proofrolling operations should be subexcavated and replaced with well compacted approved material.

Engineered fill placed under the floor slab to achieve finished subgrade levels or as foundation wall backfill should comprise approved inorganic material having a moisture content within 3% of the optimum value, placed in maximum 200 mm thick lifts, and compacted to at least 95% SPMDD. Reference is given to Appendix A for additional engineered fill construction recommendations.

A minimum 150 mm thick layer of free draining Granular A type material compacted to 98% SPMDD is recommended directly beneath the slab-on-grade. A polyethylene vapour barrier should be placed on the surface of the granular base if a moisture sensitive finish is to be placed on the floor. Joints should be saw cut into concrete floor immediately after initial set of the concrete to control potential cracking of the slab.

Below Grade Walls

Below grade walls and basement walls should be designed as retaining walls to resist the unbalanced horizontal earth pressure imposed by the backfill adjacent to the wall. The unfactored lateral earth pressure, p, may be computed using the following equation, assuming a triangular pressure distribution:

$$p = K(\gamma h + q)$$

where K = lateral earth pressure coefficient
= 0.5 for wall restrained at both top and bottom

γ = unit weight of free-draining granular material
= *21* kN/m^3

h = depth below final grade (m)

q = surcharge load (kPa), if present

The excavation adjacent to the basement walls should be backfilled with free-draining granular material satisfying the OPS Granular B gradation specification and a weeping tile system installed to minimize the build-up of hydrostatic pressure behind the wall.

The weeping tiles should be surrounded by a properly designed graded granular filter or wrapped with approved geotextile to prevent migration of fines into the system. The drainage pipe should be placed on a positive grade and lead to a frost-free sump or outlet.

Excavation and Ground Water Control

It is generally envisaged that excavations for the earthworks and site servicing will extend to a maximum 5 m depth within the proposed development.

Excavations for service installations are expected to extend up to about 3 m depth through topsoil and into the native clayey silt deposits containing localized layers of silt, sandy silt, silty sand and sand, which are classified as Type 3 materials as defined in the OHSA. Subject to inspection and providing adequate ground water control is achieved, excavations within Type 3 soils that are to be entered by workers should be inclined from the base of the excavation at one horizontal to one vertical (1H:1V) or flatter.

It is anticipated that ground water seepage or surface water entering the excavations will be handled readily by conventional sump pumping. The actual dewatering methods should be established at the contractor's discretion within the context of a performance specification for the project. Regardless of the dewatering method chosen, the hydraulic head and ground water inflow must be properly controlled to ensure a stable and safe excavation and to facilitate construction. The design of the dewatering system should be specified to maintain and control ground water at least 0.3 m below the excavation base level, in order to provide a stable excavation base throughout construction.

It should be noted that, under the Ontario Water Resources Act, the Water Taking and Transfer Regulation 387/04, a Permit to Take Water (PTTW) from the Ministry of Environment Conservation and Parks (MECP) is required if the dewatering discharge is greater than 400,000 L/day. In accordance with the above noted regulatory requirements and in compliance with the MECP's PTTW Manual (April 2005), and application should be filed to the MECP for the subject property construction dewatering PTTW, if the dewatering discharge is greater than 400,000 L/day, or about 4.6 L/S. If the dewatering discharge is between 50,000 L/day (or about 0.6 L/S) and 400,000 L/day (or about 4.6 L/S) dewatering activities need to be registered on the Environmental Activity and Sector Registry (EASR). PML would be pleased to assist with this process, if required. The depth of excavations for site grading and site servicing are expected to extend to a maximum 3 m depth into clayey silt deposits with wet to saturated layers of silt, sand, sandy silt, and silty sand and it is generally envisaged that sump pumping from within trenching excavating will have dewatering rates less than 50,000 L/day, and a PTTW or EASR should not be required.

It is recommended that test pits be carried out during the tendering stage of the project in order that prospective contractors may familiarize themselves with soil and ground water conditions to be contacted. Also, as noted above, the dewatering requirements should be established by the contractor in the context of a performance specification.

Pipe Bedding and Cover

It is expected that the proposed water and sewer pipes will be founded on competent native deposits, or engineered fill. Providing adequate ground water control is achieved, bearing problems are not anticipated for conduits founded on the native mineral soils or engineered fill. It may be necessary to increase the bedding thickness if excessively loose, soft or wet conditions are present at the pipe subgrade. The need for this is best determined during construction.

Conventional bedding and cover constructed in accordance with applicable Ontario Provincial Standard Drawings (OPSD) will be suitable. Material containing stones larger than 50 mm size should not be used in the bedding layer. The bedding and cover material should be placed in 150 mm lifts compacted to at least 95% SPMDD. Compaction should be provided beneath the pipe haunches to provide uniform support. Over-compaction should be avoided as damage to the pipe could result.

Trench backfill material should comprise approved material placed in uniform 200 mm thick lifts within 3% of the optimum moisture content and compacted to at least 95% SPMDD.

It is anticipated that the excavated material will primarily comprise clayey silt. The in-situ moisture content of the clayey silt typically ranges from 8 to 31%. Based on our experience with similar types of material, the upper limit of placement moisture content compatible with efficient compaction is expected to be about 15%. Therefore, the excavated clayey silt containing wet and saturated soils are considered suitable for reuse only if the work is carried out during the dry summer months and the construction schedule is flexible to permit air drying to reduce the moisture content closer to the optimum value.

Excavated materials intended for backfilling purposes should not be exposed to the elements for prolonged time periods, as they might be rendered unsuitable for reuse. Organic soil, topsoil, deleterious or excessively wet material should not be used as backfill. Should construction start during the winter season, particular attention must be given to ensure that frozen material is not used as backfill for service trenches. Topsoil may be reused for landscape purposes only.

It should also be noted that the in-situ clayey silt materials will tend to retain a voided structure when placed as backfill. Sufficient compaction must be applied to breakdown all lumps / clods within the fill matrix to achieve a non-voided condition. Significant post construction settlement could otherwise result.

The trenching and backfilling operations should be carried out in a manner which minimizes the length of trench left open yet accommodates efficient pipe laying and compaction activities.

Soil Infiltration

Two storm water management (SWM) ponds are proposed for the site. The first SWM pond will be near Boreholes BH2, MW102 and MW103, while the second will be near MW108 and MW109. Design details of the ponds have yet to be finalized. Typical soils at the pond site comprise clayey silt with occasional to numerous silt layers and deposits of sand and sandy silt. Although the clayey silt is considered to be relatively impermeable, the silt, sandy silt and sand layers which are interlayered with the clayey silt are more permeable. Therefore, it will be necessary to line the base of the ponds to maintain the permanent pool water levels.

The earthen liner should comprise clayey silt soils having a hydraulic conductivity of no more than $1x10^{-6}$ cm/s. The native clayey silt has a permeability less than $1x10^{-6}$ cm/sec, however, inspection and testing during construction will be required to confirm if excavated materials are suitable for reuse as the earth liner.

Fill used for earth liner construction at the pond, should be placed in lifts with a maximum 300 mm thickness, and compacted to at least 95%SPMDD. General recommendations for fill subgrade preparation and engineered fill construction are provided in Appendix A.

Where berms are required, they should be constructed using select soil placed in maximum 300 mm thick lifts compacted to 95% SPMDD. Finished slopes of the ponds should not be steeper than 5H:1V for the interior. Slopes should be provided with vegetation cover or other means for erosion protection.

Full-time inspection should be carried out by PML personnel to examine and approve backfill, fill placement operations, and to check the compaction by in situ density testing using nuclear gauges.

It is understood that onsite storm water infiltration parameters are required. The following table provides hydraulic conductivity and infiltration design parameters for the major onsite soils encountered. An appropriate factor of safety should also be used for design.

SOIL	HYDRAULIC CONDUCTIVITY (cm/s)	INFILTRATION RATE (mm/hr)
Clayey Silt/Silt	Less than $1x10^{-6}$	Less than 0.1
Silt/Sandy Silt/Silty Sand	$1x10^{-4}$ to $1x10^{-5}$	2
Sand	$1x10^{-3}$	40

Cognizant of the low permeability and infiltration rates and considering the limited extent and high groundwater level within the silt/sandy silt/silty sand/sand layers, the amount of onsite infiltration is expected to be negligible.

Pavement Design

Based on the proposed pavement usage, frost susceptibility, and strength of the expected subgrade soils, the following minimum pavement component thicknesses are considered suitable for the proposed residential subdivision roadways.

PAVEMENT COMPONENT	THICKNESS (mm)
Asphalt	80
Granular A Base	150
Granular B Subbase	600

The pavement design considers that construction will be carried out during the drier time of the year and that the subgrade is stable, as determined by proofrolling and inspection by PML personnel. If the subgrade is wet and unstable, subexcavation and placement of additional granular subbase material will be required.

In areas where the subgrade is sensitive to disturbance or construction is to occur outside of the drier time of year, then consideration can be given to thickening the granular subbase or using a geotextile separator between the pavement structure and subbase, in lieu of additional granular subbase. The geotextile separator envisaged should provide reinforcement, filtration and separation of the granular subbase from the anticipated clayey silt / clayey silt fill subgrade soils, and a woven geotextile such Terrafix's 200 W (or equivalent) is envisaged.

The pavement materials should conform to current OPS and municipal specifications. The Granular A base and Granular B subbase courses should be placed in thin lifts and be compacted to a minimum of 100% SPMDD, and asphalt should be placed to a minimum of 92% of the material's maximum relative density (MRD) and reference is made to OPS Specification 310.

During construction, testing should be conducted to confirm the gradation and compactibility characteristics of the granular base materials and the mix design properties of the asphalt.

Proofrolling procedures and the placement and compaction of all the granular materials and asphalt for the pavement construction should be inspected on a continuous basis by PML personnel.

The pavement subgrade materials will lose strength to support traffic loads if allowed to become wet. Moreover, the silty clay subgrade soils are considered frost susceptible and the roadway may heave during freezing and thawing periods. Drainage of the pavement structure is essential to maintain structural integrity and limit frost heave. In this regard, installation of longitudinal subdrains is recommended. The longitudinal subdrains should comprise a minimum 100 mm diameter perforated plastic pipe, set below the subbase level, and outlet to ditching, or catch basins. Subdrain pipes should be surrounded by appropriate filter media such as clear stone wrapped in geotextile, or alternatively the pipes should be wrapped in filter cloth and surrounded by concrete sand.

Geotechnical Review and Construction Inspection and Testing

When development design is complete, it is recommended that the design drawings be submitted to PML for general geotechnical review for compatibility with site conditions and recommendations of this report.

Earthworks operations should be carried out under the supervision of PML to approve subgrade preparation, backfill materials, placement and compaction procedures, and verify the specified degree of compaction is achieved uniformly throughout fill materials.

The comments and recommendations provided in the report are based on the information revealed in the boreholes. Conditions away from and between boreholes may vary, particularly where service trenches exist. Geotechnical review during construction should be on going to confirm the subsurface conditions are substantially similar to those encountered in the boreholes, which may otherwise require modification to the original recommendations.

This report is subject to the Statement of Limitations that is included in Appendix B, which must be read in conjunction with the report

Closure

We trust the information presented in this report is sufficient for your immediate requirements. If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.

LICENSED PROFESSIONAL ENGINEER
W.A.P. LOGHRIN
100143946
Feb. 24/2022
PROVINCE OF ONTARIO

William Loghrin, P.Eng.
Manager Engineering Services

LICENSED PROFESSIONAL ENGINEER
G.P. MITCHELL
32057507
Feb 24/22
PROVINCE OF ONTARIO

Gerry Mitchell, MEng, P.Eng.
Senior Consultant

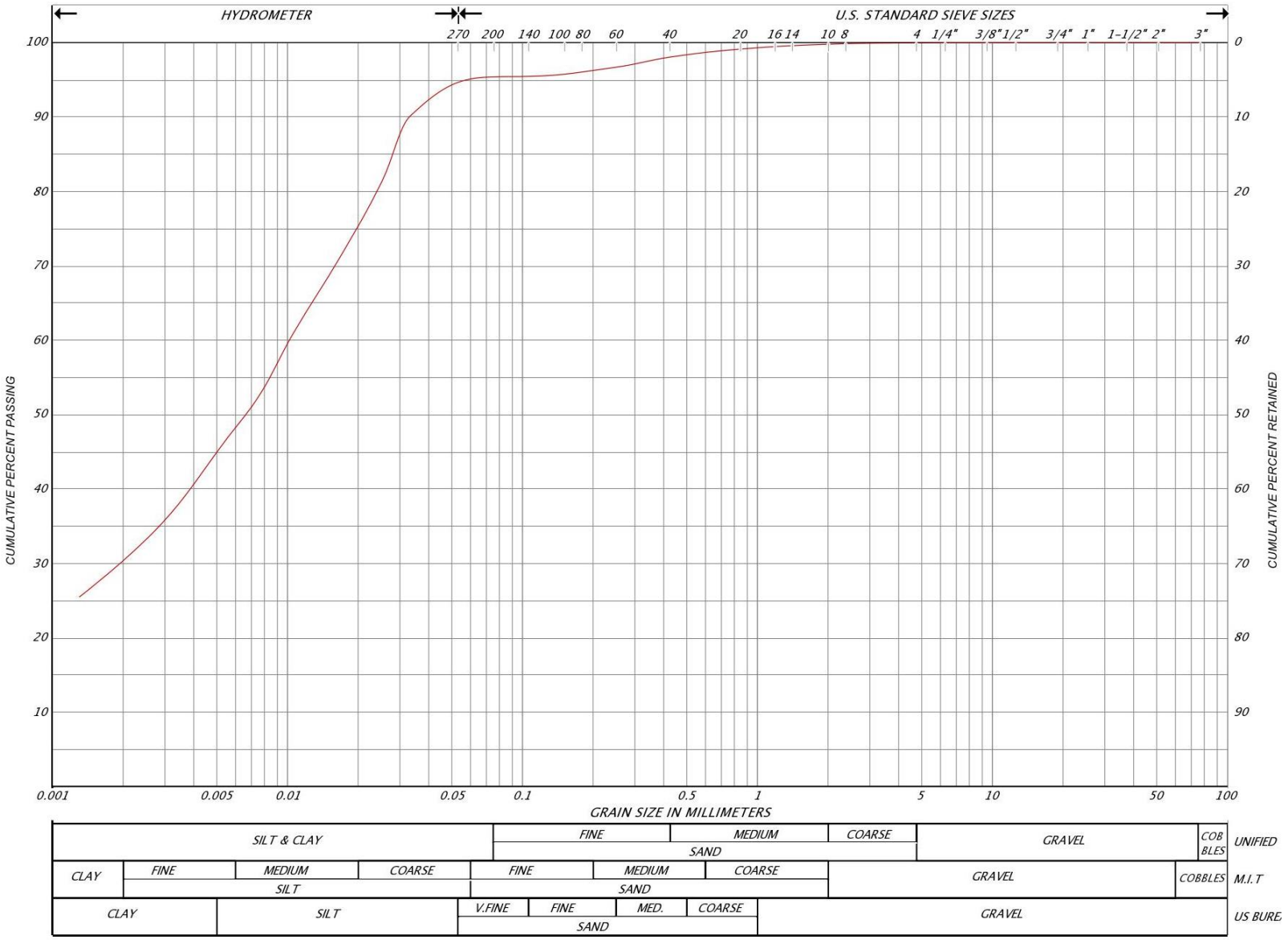
WL/GM:tm

Enclosures:
Figures 1 to 11 - Particle Size Distribution Charts
List of Abbreviations
Log of Boreholes BH1 to BH12 and BH/MW101 to BH/MW110
Drawing 1 - Borehole Location Plan
Appendix A – Engineered Fill
Appendix B – Statement of Limitations

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 1



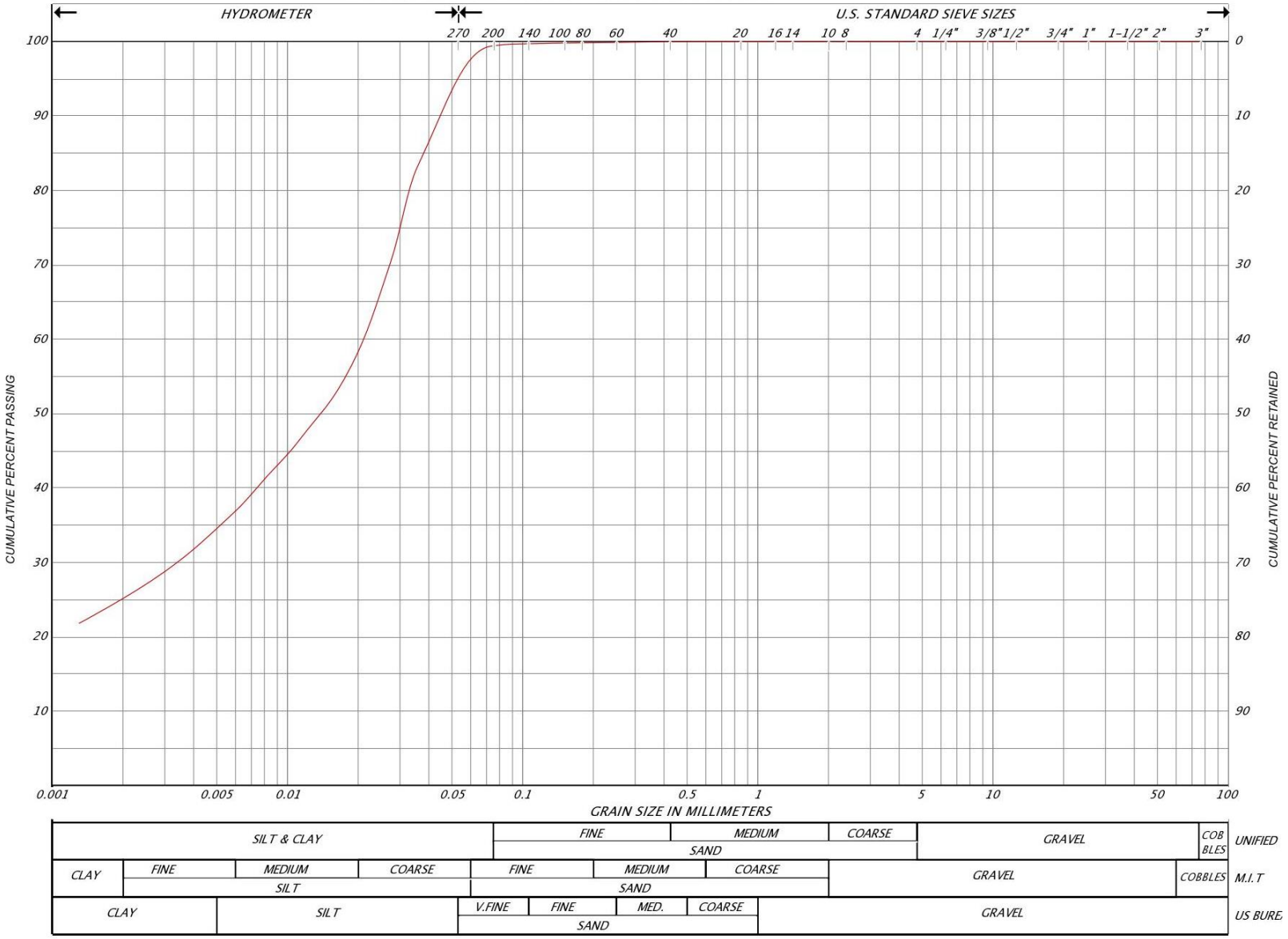
REMARKS Borehole MW101, Sample SS7, Depth 6.1 to 6.5 m

CLAYEY SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 2



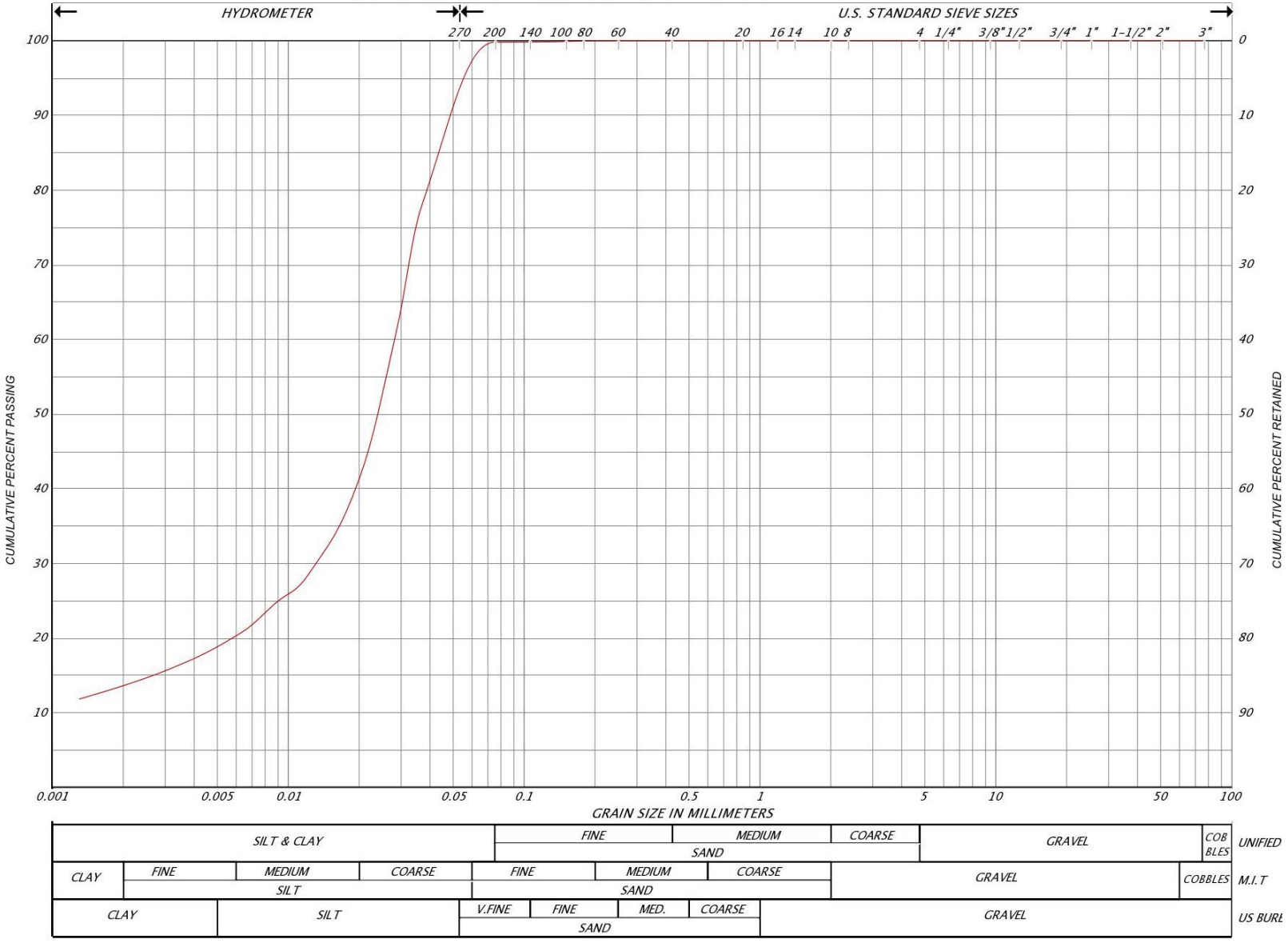
REMARKS Borehole MW104, Sample SS6, Depth 4.6 to 5.0 m

CLAYEY SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 3



REMARKS Borehole MW105, Sample SS6, Depth 4.5 to 5.0 m

CLAYEY SILT

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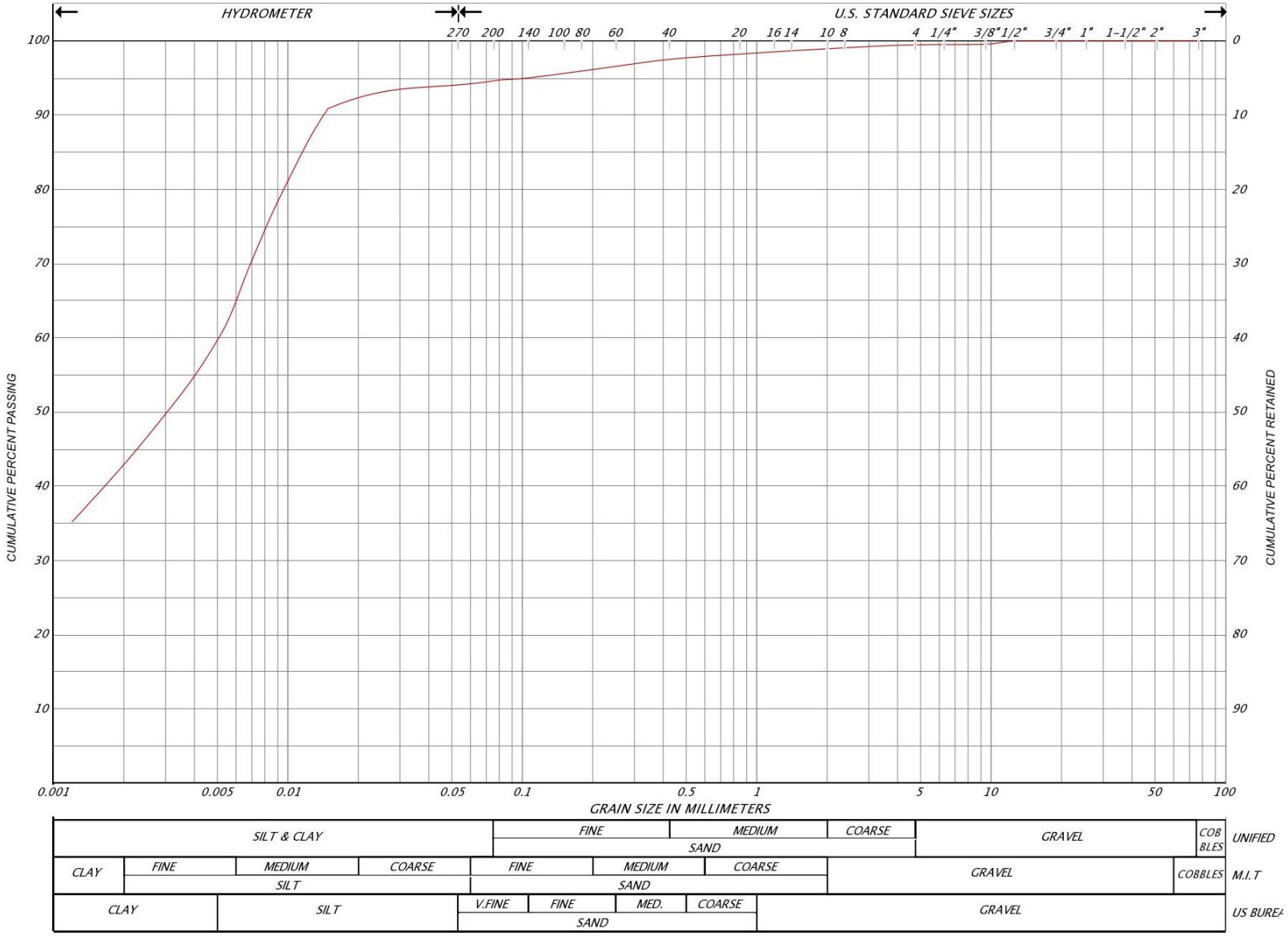
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 4



REMARKS Borehole MW107, Sample SS3, Depth 1.5 to 2.0 m

CLAYEY SILT

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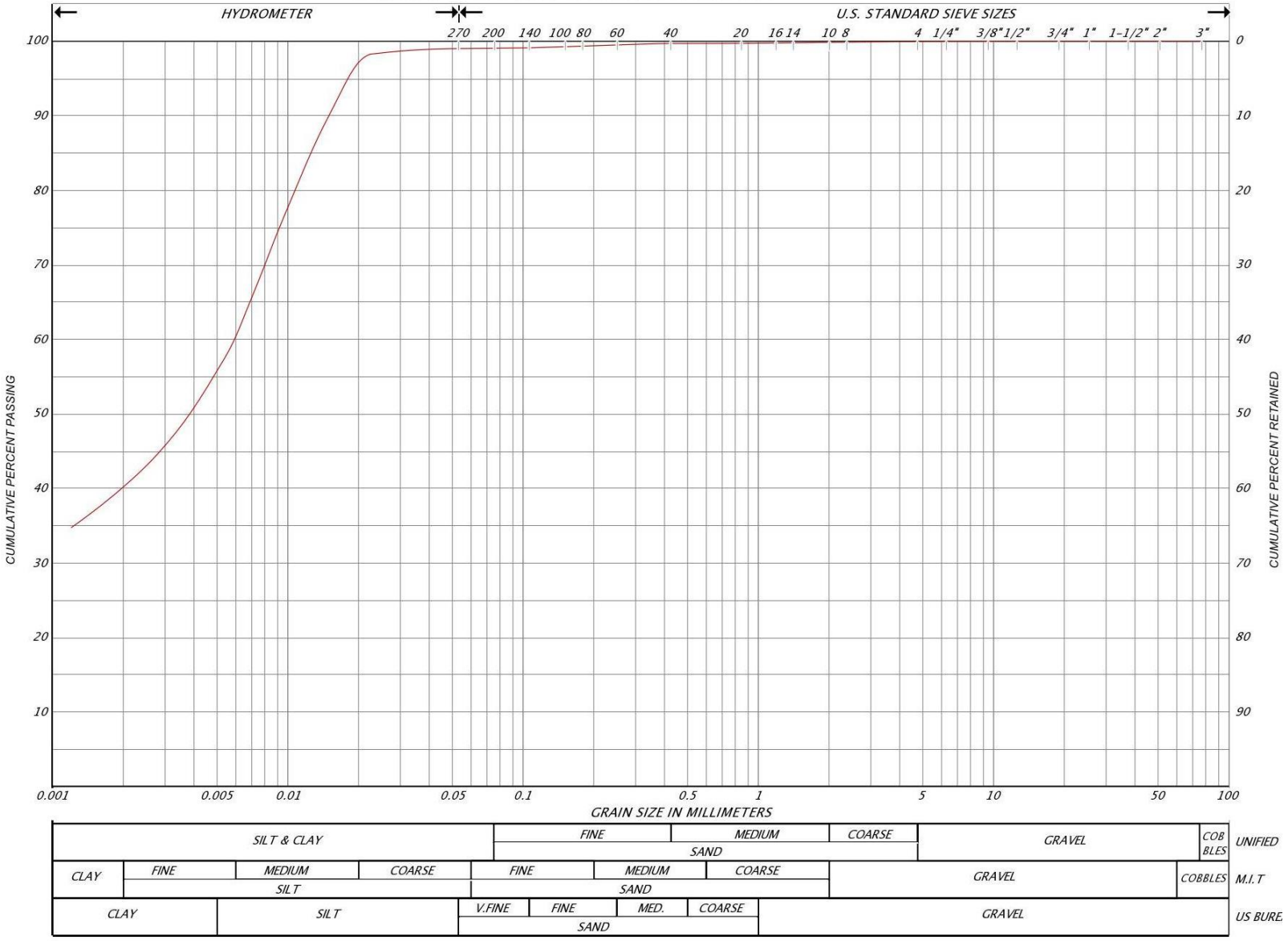
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 5



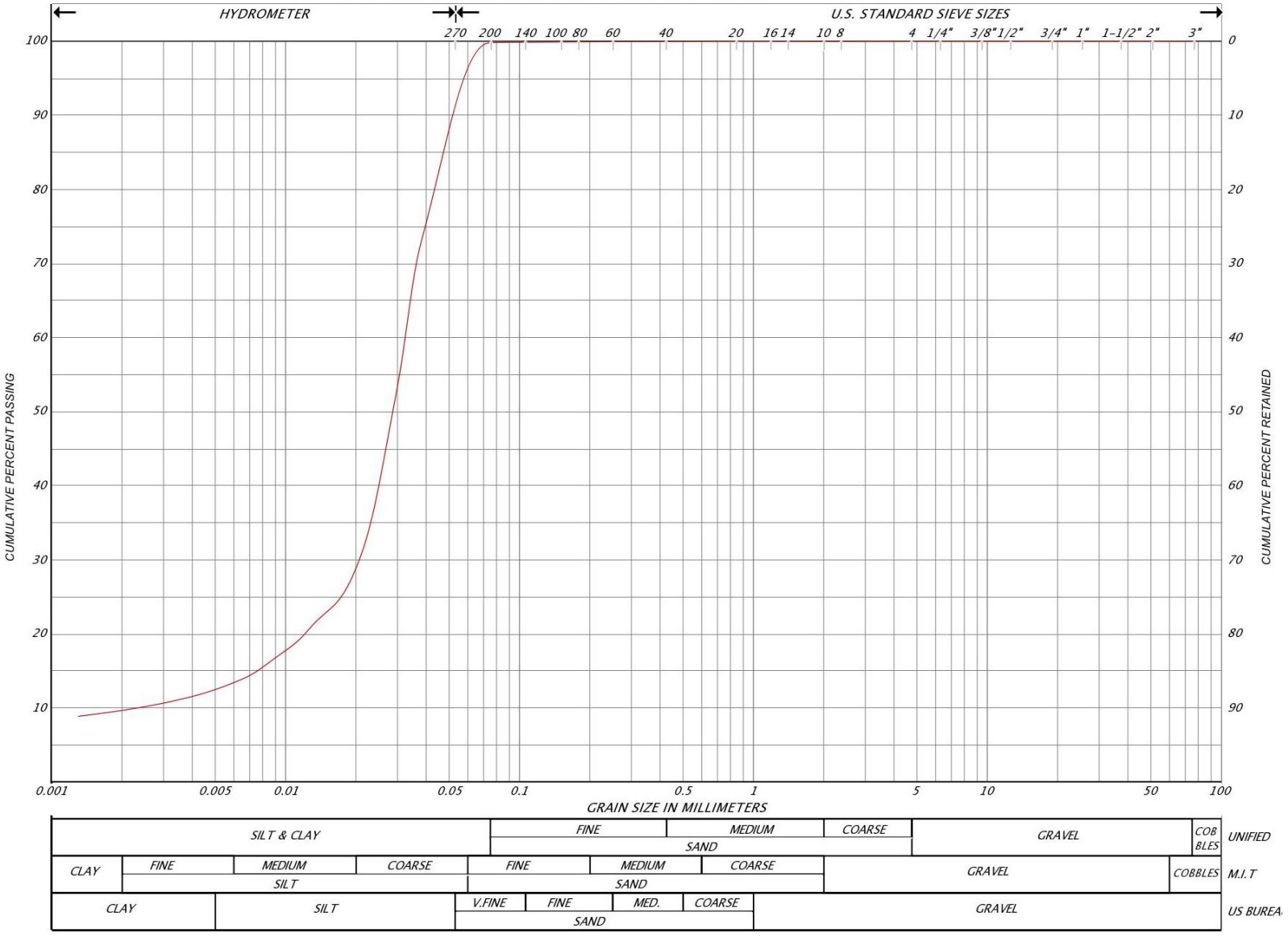
REMARKS Borehole MW107, Sample SS6, Depth 4.6 to 5.0 m

CLAYEY SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 6



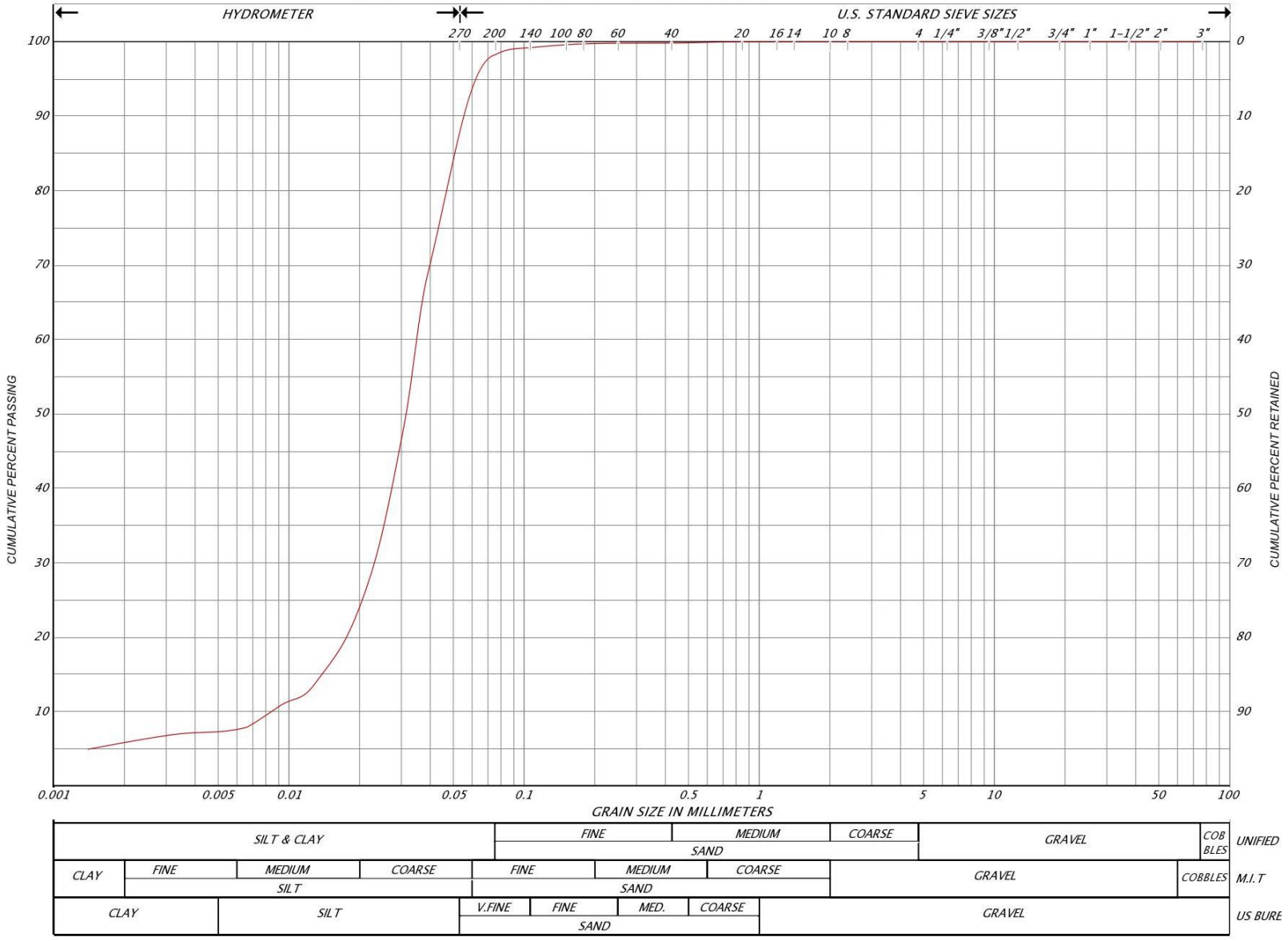
REMARKS Borehole MW109, Sample SS11, Depth 9.1 to 9.6 m

CLAYEY SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 7



REMARKS Borehole BH9, Sample SS3, Depth 1.5 to 2.0 m

SILT

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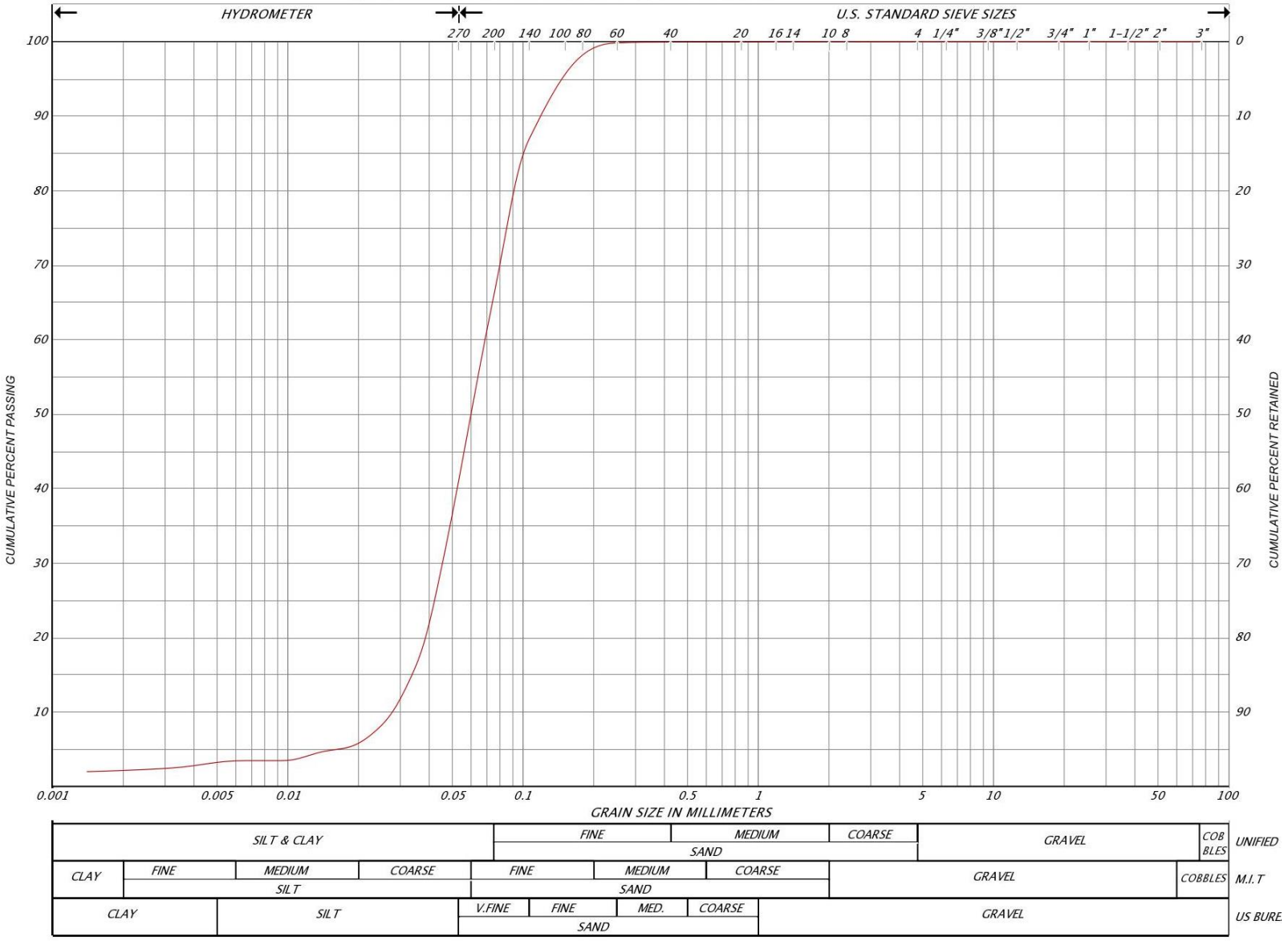
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 8



REMARKS Borehole MW102, Sample SS6, Depth 4.6 to 5.0 m

SANDY SILT

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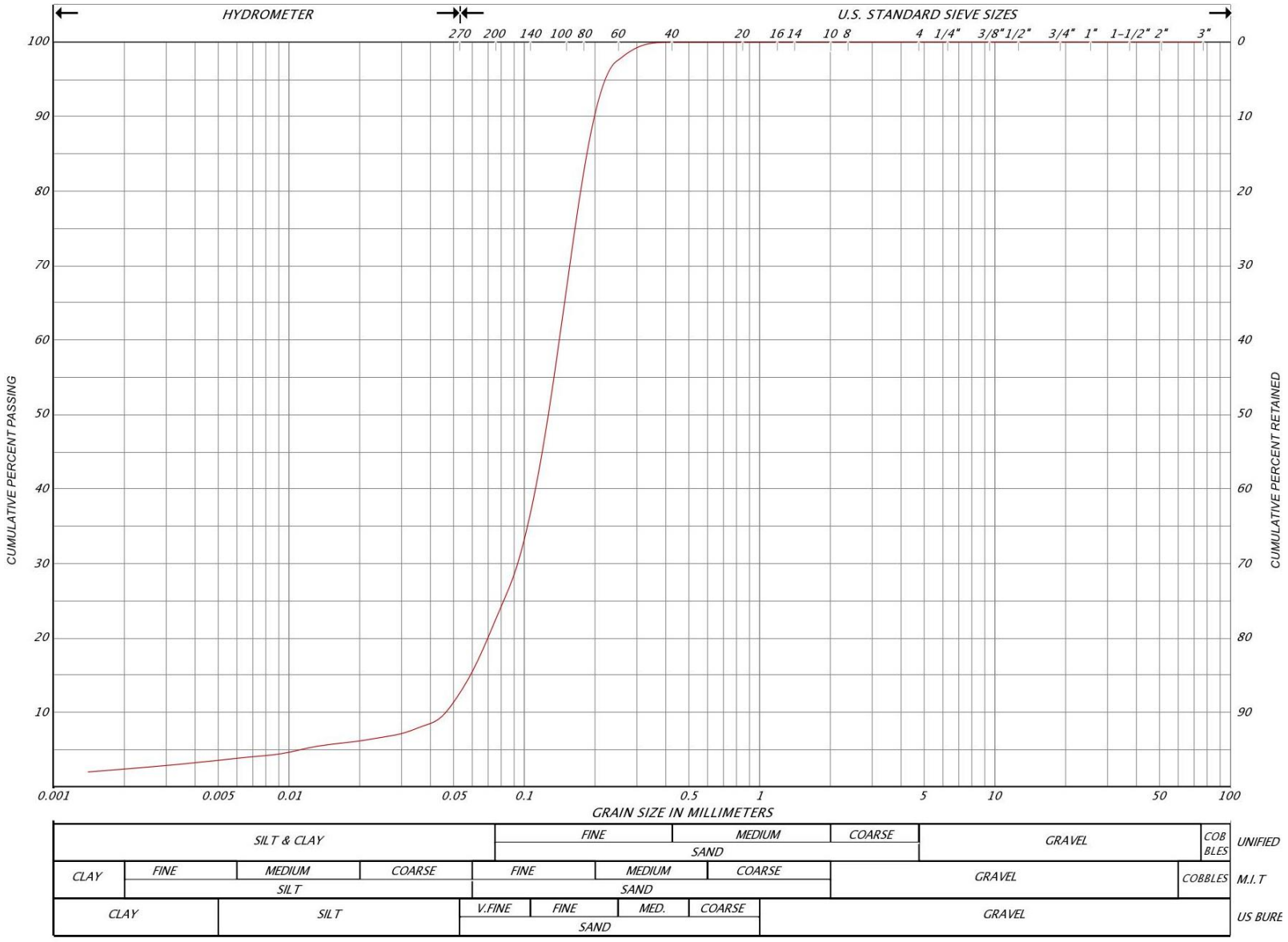
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 9



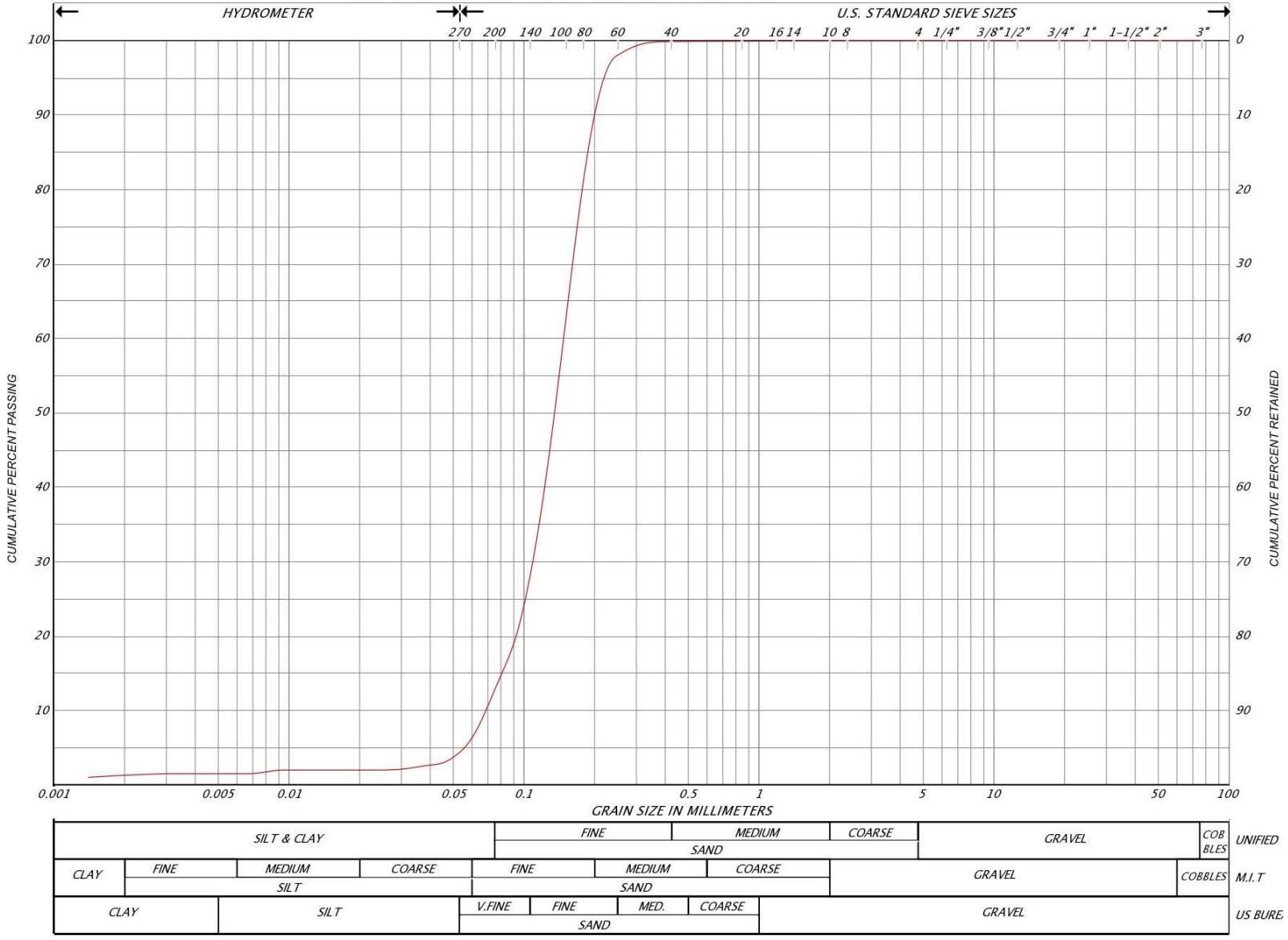
REMARKS Borehole BH9, Sample SS5, Depth 3.1 to 3.5 m

SILTY SAND

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 10



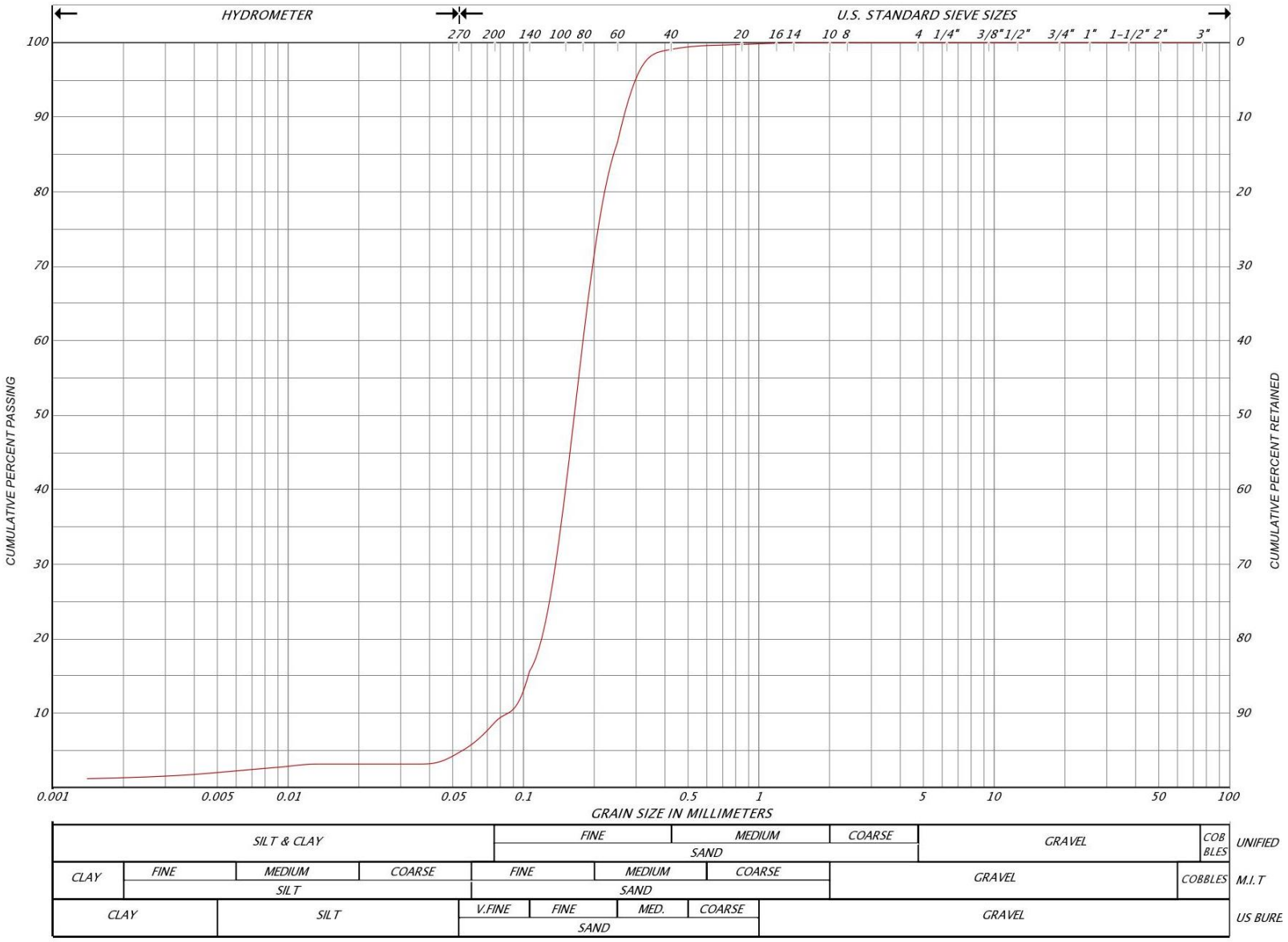
REMARKS Borehole BH6, Sample SS5, Depth 3.1 to 3.5 m

SAND

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 11



REMARKS Borehole MW102, Sample SS4, Depth 2.3 to 2.7 m

SAND

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. - Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

CONSISTENCY	N (blows/0.3 m)	c (kPa)	DENSENESS	N (blows/0.3 m)
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		

WTPL	Wetter Than Plastic Limit
APL	About Plastic Limit
DTPL	Drier Than Plastic Limit

TYPE OF SAMPLE

SS	Split Spoon	TW	Thinwall Open
WS	Washed Sample	TP	Thinwall Piston
SB	Scraper Bucket Sample	OS	Oesterberg Sample
AS	Auger Sample	FS	Foil Sample
CS	Chunk Sample	RC	Rock Core
ST	Slotted Tube Sample	USS	Undisturbed Shear Strength
PH	Sample Advanced Hydraulically	RSS	Remoulded Shear Strength
PM	Sample Advanced Manually		

SOIL TESTS

Qu	Unconfined Compression	LV	Laboratory Vane
Q	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	C	Consolidation
Qd	Drained Triaxial		

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 1

17T 523755E 4804492N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** September 24, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** M. Rapsey

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 339.37					
0.22	339.15	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist		1	SS	6	339
		CLAYEY SILT: Soft brown clayey silt, some sand, moist					
1.1				2	SS	3	
1.4	338.0	becoming WTPL becoming firm					338
				3	SS	7	
2.1	337.3	becoming stiff, numerous silt layers					
				4	SS	14	337
				5	SS	12	336
							335
				6	SS	11	
							334
				7	SS	12	
6.6	332.8	BOREHOLE TERMINATED AT 6.55 m					333

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 2

17T 523879E 4804339N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** September 24, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** M. Rapsey

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 341.42			
0.0	341.24	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, damp	1	SS	4
0.70	340.72	SAND: Loose brown sand, some silt, damp			
1.0		SANDY SILT: Loose brown sandy silt, moist	2	SS	6
1.4	340.0	becoming compact, saturated	3	SS	18
2.0			4	SS	17
3.0			5	SS	23
3.9	337.5	SILT: Compact grey silt, trace sand, occasional clayey silt seams, saturated			
4.0			6	SS	17
5.0					
6.0					
6.2	335.2	CLAYEY SILT: Very stiff grey clayey silt, trace sand, WTPL	7	SS	17
6.6	334.8	BOREHOLE TERMINATED AT 6.55 m			
7.0					
8.0					
9.0					
10.0					
11.0					
12.0					
13.0					
14.0					
15.0					

ELEVATION SCALE: 341, 340, 339, 338, 337, 336, 335

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Free water encountered after SS3

Upon completion of augering Wet cave at 2.0 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 3

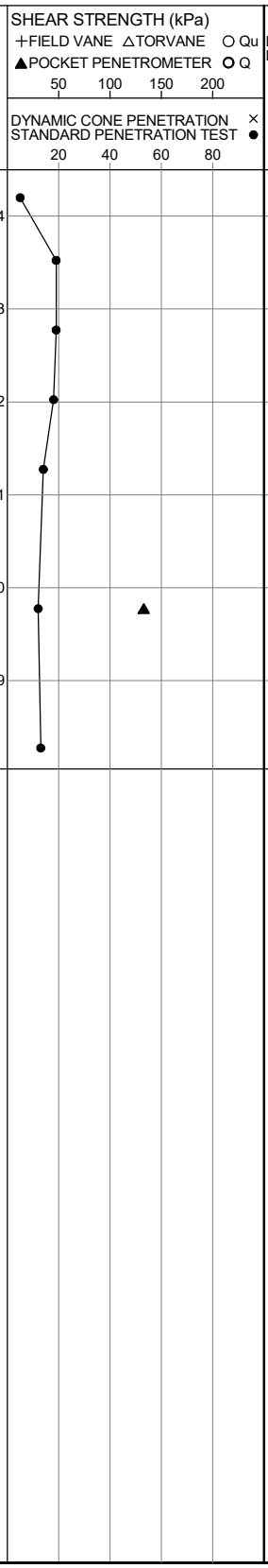
17T 524026E 4804185N

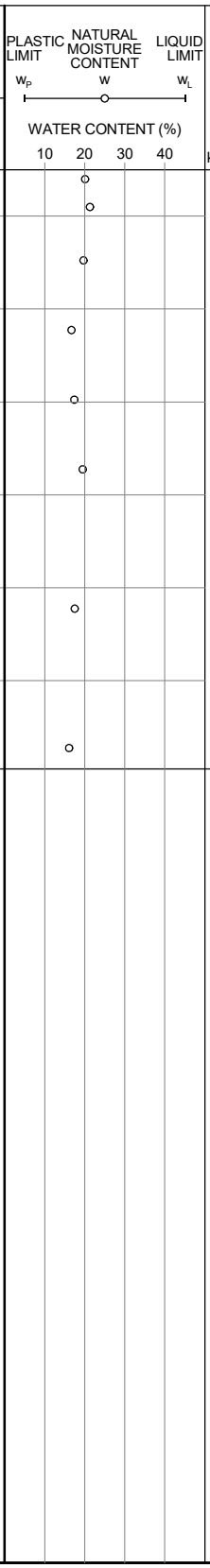
PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** July 31, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLE NUMBER	SAMPLE TYPE	"N" VALUES
		SURFACE ELEVATION 344.50				
0.0	344.50					
0.20	344.30	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	5
				1B		
		CLAYEY SILT: Very stiff brown clayey silt, some sand, WTPL, numerous silt layers		2	SS	19
1.0						
				3	SS	19
2.0						
				4	SS	18
2.9	341.6	becoming stiff, grey				
3.0				5	SS	14
4.0						
				6	SS	12
5.0						
6.0				7	SS	13
6.5	338.0	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						





UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS	GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	Upon completion of augering Open Dry	

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 4

17T 524118E 4804016N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** July 30, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
0.0		SURFACE ELEVATION 342.61					
0.24	342.37	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	7	342
				1B			
		CLAYEY SILT: Firm brown clayey silt, trace sand, DTPL		2	SS	6	
1.0							
				3	SS	6	341
2.1	340.5	becoming stiff, some sand, WTPL, numerous silt layers					
2.0				4	SS	15	340
3.0				5	SS	15	
4.0	338.6	becoming grey					339
				6	SS	11	338
5.0							
5.6	337.0	becoming very stiff					337
6.0				7	SS	16	
6.5	336.1	BOREHOLE TERMINATED AT 6.5 m					
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 5

17T 523995E 4804385N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031
LOCATION New Hamburg, Ontario — **BORING DATE** July 31, 2018 — **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 341.78					
0.0		TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	13	
0.31	341.47			1B			
		CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL		2	SS	11	341
1.0							
1.4	340.4	numerous silt layers		3	SS	13	340
2.0							
2.6	339.2	becoming grey, WTPL		4	SS	14	339
3.0				5	SS	9	
4.0							338
				6	SS	11	337
5.0							
6.0							336
6.5	335.3	BOREHOLE TERMINATED AT 6.5 m		7	SS	13	
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 6

17T 524153E 4804198N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** July 31, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
		SURFACE ELEVATION 343.61				
0.0	343.61					
0.25	343.36	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	7
				1B		
		SILTY SAND: Compact brown silty sand, trace gravel, damp				
1.0				2A	SS	17
1.1				2B		
1.4	342.2	SILT: Compact brown silt, trace clay, trace sand, wet				
		SAND: Compact brown sand, some silt, wet		3	SS	20
2.0						
2.1	341.5	becoming saturated		4	SS	19
3.0				5	SS	22
4.0						
				6	SS	28
5.0						
5.5	338.1	CLAYEY SILT: Very stiff grey clayey silt, WTPL, numersous silt layers				
6.0				7	SS	23
6.5	337.1	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 343, 342, 341, 340, 339, 338

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Cave at 2.1 m
Dry

NOTES

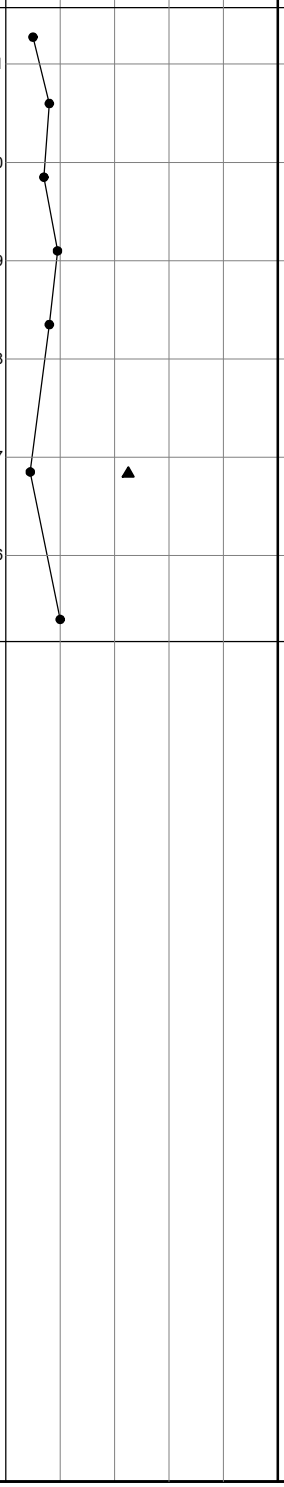
Peto MacCallum Ltd.
CONSULTING ENGINEERS

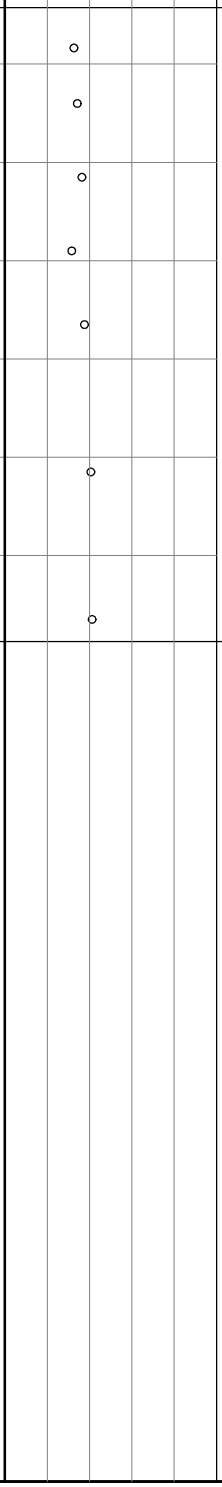
LOG OF BOREHOLE NO. 7

17T 524277E 4804038N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** July 30, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 341.57				
0.0	341.57					
	0.22	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist		1A	SS	10
	341.35			1B		
		CLAYEY SILT: Stiff to very stiff brown clayey silt, some sand, trace gravel, DTPL		2	SS	16
1.0						
	1.4					
	340.2	numerous silt layers		3	SS	14
2.0						
	2.1					
	339.5	becoming grey, WTPL		4	SS	19
3.0						
				5	SS	16
4.0						
				6	SS	9
5.0						
6.0				7	SS	20
	6.5					
	335.1	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						





UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 8

17T 524205E 4804333N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 343.37				
0.0 / 343.37	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist		1A	SS	5
0.39 / 342.98	SANDY SILT: Compact brown sandy silt, moist; with topsoil inclusions		1B		
0.95 / 342.42	CLAYEY SILT: Stiff brown clayey silt, some sand, WTPL, numerous silt layers		2A, 2B	SS	11
			3	SS	14
			4	SS	15
2.9 / 340.5	becoming grey		5	SS	12
			6	SS	15
			7	SS	9
6.5 / 336.9	BOREHOLE TERMINATED AT 6.5 m				

SHEAR STRENGTH (kPa): + FIELD VANE, △ TORVANE, ○ Qu, ▲ POCKET PENETROMETER, O Q; DYNAMIC CONE PENETRATION ×, STANDARD PENETRATION TEST ●

PLASTIC LIMIT (w_P) — NATURAL MOISTURE CONTENT (w) — LIQUID LIMIT (w_L); WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 9

17T 524349E 4804152N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** August 1, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 343.24			
0.27 / 342.97	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist	1A / 1B	SS	5
0.68 / 342.56	SILTY SAND: Compact brown silty sand, damp			
	SILT: Compact brown silt, trace sand, trace clay, moist to wet	2	SS	16
		3	SS	17
		4	SS	14
2.9 / 340.3	SILTY SAND: Compact brown silty sand, wet	5	SS	22
4.0 / 339.2	becoming saturated	6	SS	16
5.5 / 337.7	SANDY SILT: Compact grey sandy silt, trace clay, saturated	7	SS	26
6.5 / 336.7	BOREHOLE TERMINATED AT 6.5 m			

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L — WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Free water at 2.3 m
Cave at 2.4 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 10

17T 524328E 4804366N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031

LOCATION New Hamburg, Ontario | **BORING DATE** August 2, 2018 | **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH / ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 342.20					
0.27 / 341.93	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist		1A	SS	8	342
			1B			
	CLAYEY SILT: Firm brown clayey silt, DTPL, numerous silt layers		2	SS	5	341
1.4 / 340.8	becoming stiff		3	SS	10	
			4	SS	12	340
2.9 / 339.3	becoming grey, WTPL		5	SS	8	339
			6	SS	14	338
			7	SS	10	337
6.5 / 335.7	BOREHOLE TERMINATED AT 6.5 m					336

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 11

17T 524447E 4804190N

PROJECT Wilmot Woods Development
PML REF. 18KF031
LOCATION New Hamburg, Ontario
BORING DATE August 2, 2018
ENGINEER H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 346.37					
0.0	346.37	TOPSOIL: Dark brown clayey silt, trace sand, occasional rootlets, DTPL		1A	SS	9	346
0.30	346.07			1B			
		CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL		2	SS	14	
1.0							345
				3	SS	9	
2.0							
				4	SS	11	344
3.0							
				5	SS	12	343
4.0	342.4	becoming grey, WTPL					
				6	SS	11	342
5.0							
							341
6.0				7	SS	15	
6.5	339.9	BOREHOLE TERMINATED AT 6.5 m					340
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 12

17T 524560E 4804228N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** August 2, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH / ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 346.22					346
0.25 / 345.97	TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, DTPL		1A	SS	10	
	CLAYEY SILT: Stiff to very stiff brown clayey silt, some sand, DTPL to APL, numerous silt layers		1B			
			2	SS	14	345
			3	SS	17	
			4	SS	14	344
2.9 / 343.3	becoming grey, WTPL		5	SS	10	343
			6	SS	12	342
			7	SS	8	341
6.5 / 339.7	BOREHOLE TERMINATED AT 6.5 m					340

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 101

17T 523684.7E 4804597N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.04			
0.0	339.04	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist	1A	SS	7
0.38			1B		
0.68		SANDY SILT: Loose brown sandy silt, moist, occasional rootlets	2A	SS	8
0.98		SILT: Loose brown silt, some sand, trace clay, moist	2B		
1.0	338.06	SILTY SAND: Compact brown silty sand, wet	3	SS	11
2.1	336.9	CLAYEY SILT: Stiff to very stiff grey clayey silt, trace sand, WTPL, numerous silt layers	4	SS	17
3.0			5	SS	12
4.0					
5.0			6	SS	16
6.0					
6.5	332.5	BOREHOLE TERMINATED AT 6.5 m	7	SS	16
7.0					
8.0					
9.0					
10.0					
11.0					
12.0					
13.0					
14.0					
15.0					

ELEVATION SCALE: 338, 337, 336, 335, 334, 333

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200

DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete

Bentonite Seal

Filter Sand

Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	2.4	336.6
2018-08-03	1.8	337.2
2018-11-07	0.9	338.1
2018-11-26	0.9	338.1

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 102

17T 523788.7E 4804396N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLE NUMBER	SAMPLE TYPE	"N" VALUES
		SURFACE ELEVATION 340.00				
0.0		TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	8
0.30	339.70			1B		
		CLAYEY SILT: Firm brown clayey silt, trace sand, DTPL, numerous silt layers		2A	SS	6
1.0				2B		
1.1	338.9	SAND: Loose brown sand, trace silt, wet to saturated				
1.4	338.6	becoming compact		3	SS	14
2.0				4	SS	17
3.0				5	SS	15
4.0	336.0	SANDY SILT: Compact grey sandy silt, trace clay, saturated		6	SS	20
5.0						
6.0				7	SS	21
6.5	333.5	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 339, 338, 337, 336, 335, 334

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	1.7	338.3
2018-08-03	1.7	338.3
2018-11-07	1.4	338.6
2018-11-26	1.2	338.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 103

17T 523910.3E 4804249N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 343.23			
0.0	343.23				
	0.21	TOPSOIL: Dark brown sandy silt topsoil,	1A	SS	8
	343.02	some clay, occasional rootlets, moist	1B		
		CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers			
1.0			2	SS	10
			3	SS	13
2.0	2.1				
	341.1	becoming WTPL	4	SS	14
3.0			5	SS	18
4.0	4.0				
	339.2	becoming grey			
			6	SS	17
5.0					
6.0			7	SS	21
	6.5				
	336.7	BOREHOLE TERMINATED AT 6.5 m			
7.0					
8.0					
9.0					
10.0					
11.0					
12.0					
13.0					
14.0					
15.0					

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER O Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete

Bentonite Seal

Filter Sand

Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	4.0	339.2
2018-08-03	2.8	340.4
2018-11-07	2.3	340.9
2018-11-26	1.9	341.3

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 104

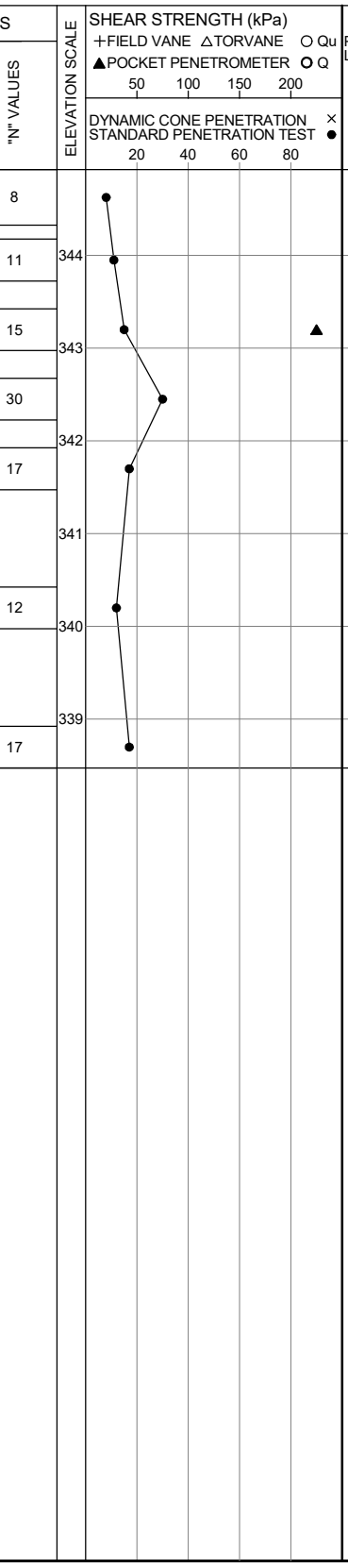
17T 524180E 4803929N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** July 30, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
	SURFACE ELEVATION 344.92				
0.18 / 344.74	FILL: Dark brown clayey silt, some sand, occasional rootlets, APL, occasional wood fragments		1A		
			1B	SS	8
0.68 / 344.24	FILL: Firm brown silty clay , some sand, WTPL, occasional wood fragments		2	SS	11
	CLAYEY SILT: Stiff to very stiff brown clayey silt, trace sand, DTPL, numerous silt layers		3	SS	15
2.1 / 342.8	becoming grey, WTPL		4	SS	30
			5	SS	17
			6	SS	12
			7	SS	17
6.5 / 338.4	BOREHOLE TERMINATED AT 6.5 m				



SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Water Level Readings:

Date	Depth	Elev.
2018-07-31	DRY	----
2018-08-03	3.3	341.6
2018-11-07	1.4	343.5
2018-11-26	0.8	344.1

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 105

17T 524125.6E 4804437N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	341.05	SURFACE ELEVATION 341.05			
0.0	341.05	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist	1A	SS	9
0.46	340.59	CLAYEY SILT: Firm brown clayey silt, trace sand, DTPL, numerous silt layers	1B		
			2	SS	7
1.4	339.6	becoming stiff			
			3	SS	10
2.1	338.9	becoming WTPL			
			4	SS	9
			5	SS	9
			6	SS	13
5.6	335.4	becoming very stiff			
			7	SS	17
6.5	334.5	BOREHOLE TERMINATED AT 6.5 m			

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	DRY	----
2018-08-03	1.4	339.6
2018-11-07	1.0	340.0
2018-11-26	0.8	340.2

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 106

17T 524544.9E 4804378N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 2, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 342.98			
0.20 / 342.78	TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, DTPL	1A	SS	11
	CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers	1B		
		2	SS	15
		3	SS	16
2.1 / 340.9	becoming firm, grey, WTPL	4	SS	7
		5	SS	8
4.0 / 339.0	becoming stiff to very stiff	6	SS	13
		7	SS	25
6.5 / 336.5	BOREHOLE TERMINATED AT 6.5 m			

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete

Bentonite Seal

Filter Sand

Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-02	4.3	338.7
2018-08-03	2.7	340.3
2018-11-07	1.5	341.5
2018-11-24	1.2	341.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 107

17T 524733E 4804139N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031
LOCATION New Hamburg, Ontario — **BORING DATE** August 2, 2018 — **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 346.96				
0.20 / 346.76	TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, DTPL		1A	SS	12
	CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers		1B		
			2	SS	11
			3	SS	12
			4	SS	12
2.9 / 344.1	becoming firm to stiff, grey, WTPL		5	SS	7
			6	SS	9
			7	SS	10
6.5 / 340.5	BOREHOLE TERMINATED AT 6.5 m				

SHEAR STRENGTH (kPa): +FIELD VANE △TORVANE ○ Qu; ▲POCKET PENETROMETER ○ Q; DYNAMIC CONE PENETRATION ×; STANDARD PENETRATION TEST ●

PLASTIC LIMIT (w_P) — NATURAL MOISTURE CONTENT (w) — LIQUID LIMIT (w_L); WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-02	DRY	----
2018-08-03	DRY	----
2018-11-07	2.5	344.5
2018-11-26	2.3	344.7

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 108

17T 524541.1E 4804122N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 2, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 345.32			
0.22 / 345.10	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist	1A / 1B	SS	9
	CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers	2	SS	17
		3	SS	12
		4	SS	14
		5	SS	12
4.0 / 341.3	becoming WTPL			
		6	SS	15
		7	SS	13
6.5 / 338.8	BOREHOLE TERMINATED AT 6.5 m			

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ● Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete

Bentonite Seal

Filter Sand

Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-02	DRY	----
2018-08-03	DRY	----
2018-11-07	5.9	339.4
2018-11-26	5.4	339.9

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 109

17T 524441.1E 4803985N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** August 2, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.93			
0.0		TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, APL to WTPL	1	SS	5
0.85	339.08	CLAYEY SILT: Soft to firm brown clayey silt, trace sand, DTPL, numerous silt layers, occasional cobbles	2A 2B	SS	3
			3	SS	7
2.1	337.8	becoming stiff	4	SS	11
2.9	337.0	becoming WTPL	5	SS	15
			6	SS	13
			7	SS	9
			8	SS	14
			9	SS	10
			10	SS	10
			11	SS	12
10.1	329.8	becoming very stiff	12	SS	16
			13	SS	15
12.5	327.4	BOREHOLE TERMINATED AT 12.5 m			

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200
DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30 40
UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-03	3.7	336.2
2018-11-07	0.1	339.8
2018-11-26	0.1	339.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 110

17T 524499.6E 4803961N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** October 15, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.98			
0.0		TOPSOIL: Dark brown silt, trace sand, occasional rootlets, moist to wet	1	SS	3
0.36	339.62	CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL, numerous silt layers			
0.70	339.28	becoming firm to stiff, occasional cobbles, WTPL	2	SS	10
1.0					
			3	SS	12
2.0					
			4	SS	16
2.9					
3.0	337.1	becoming firm to stiff grey, trace sand, WTPL	5	SS	8
4.0			6	SS	7
			7	SS	9
5.0					
			8	SS	9
6.0					
			9	SS	9
7.0					
7.0	333.0	becoming very stiff, occasional silt layers			
			10	SS	18
8.0					
8.5					
8.5	331.5	becoming stiff, numerous silt layers			
9.0					
			11	SS	12
10.0					
			12	SS	10
11.0					
			13	SS	13
12.0					
12.6					
12.6	327.4	BOREHOLE TERMINATED AT 12.6 m			
13.0					
14.0					
15.0					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

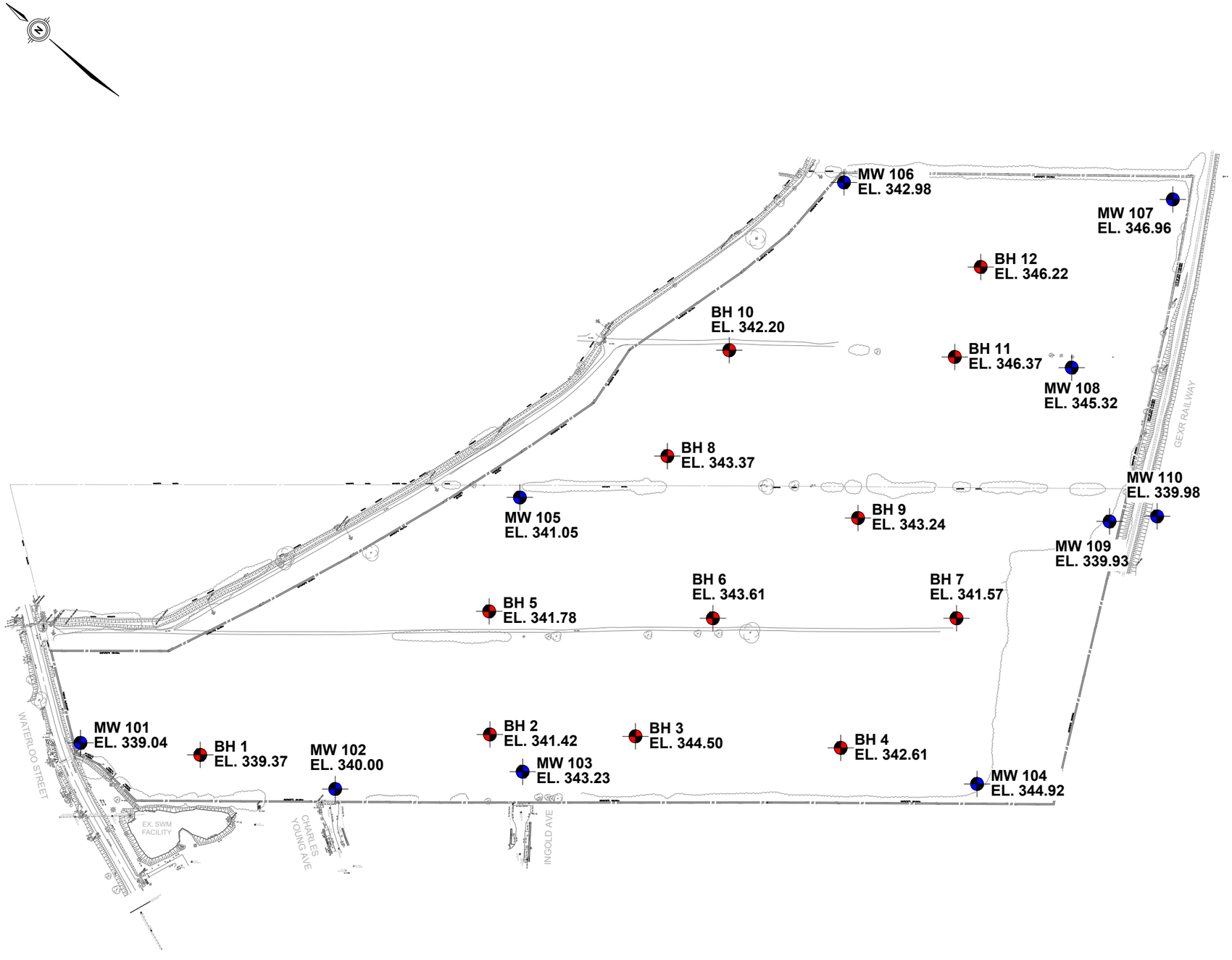
GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
50 mm pipe
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

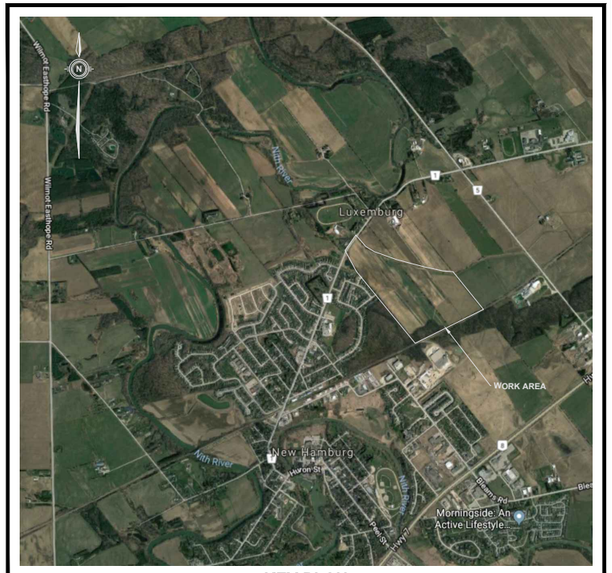
Date	Depth	Elev.
2018-10-15	DRY	----
2018-11-07	0.5	339.5
2018-11-26	0.2	339.8

NOTES



SCALE

0 m 100 m 200 m 300 m 400 m 500 m



KEY PLAN

LEGEND:

- BOREHOLE LOCATION
- MONITORING WELL LOCATION

REFERENCE:

BOREHOLE LOCATION PLAN REPRODUCED FROM DRAWING SUPPLIED BY CLIENT.

NOTE:

THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BOREHOLES MAY VARY.

WILMOT WOODS DEVELOPMENT INC.

PROPOSED WILMOT WOODS DEVELOPMENT

NEW HAMBURG

NEW HAMBURG, ONTARIO

BOREHOLE LOCATION PLAN

Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	D. BRICE	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	W. LOGHRIN	FEBRUARY 2022	AS SHOWN	18KF031	1
APPROVED	G. MITCHELL				

APPENDIX A

ENGINEERED FILL

ENGINEERED FILL

The information presented in this appendix is intended for general guidance only. Site specific conditions and prevailing weather may require modification of compaction standards, backfill type or procedures. Each site must be discussed, and procedures agreed with Peto MacCallum Ltd. prior to the start of the earthworks and must be subject to ongoing review during construction. This appendix is not intended to apply to embankments. Steeply sloping ravine residential lots require special consideration.

For fill to be classified as engineered fill suitable for supporting structural loads, a number of conditions must be satisfied, including but not necessarily limited to the following:

1. Purpose

The site specific purpose of the engineered fill must be recognized. In advance of construction, all parties should discuss the project and its requirements and agree on an appropriate set of standards and procedures.

2. Minimum Extent

The engineered fill envelope must extend beyond the footprint of the structure to be supported. The minimum extent of the envelope should be defined from a geotechnical perspective by:

- at founding level, extend a minimum 1.0 m beyond the outer edge of the foundations, greater if adequate layout has not yet been completed as noted below; and
- extend downward and outward at a slope no greater than 45° to meet the subgrade

All fill within the envelope established above must meet the requirements of engineered fill in order to support the structure safely. Other considerations such as survey control, or construction methods may require an envelope that is larger, as noted in the following sections.

Once the minimum envelope has been established, structures must not be moved or extended without consultation with Peto MacCallum Ltd. Similarly, Peto MacCallum Ltd. should be consulted prior to any excavation within the minimum envelope.

3. Survey Control

Accurate survey control is essential to the success of an engineered fill project. The boundaries of the engineered fill must be laid out by a surveyor in consultation with engineering staff from Peto MacCallum Ltd. Careful consideration of the maximum building envelope is required.

During construction it is necessary to have a qualified surveyor provide total station control on the three dimensional extent of filling.

4. Subsurface Preparation

Prior to placement of fill, the subgrade must be prepared to the satisfaction of Peto MacCallum Ltd. All deleterious material must be removed and in some cases, excavation of native mineral soils may be required.

Particular attention must be paid to wet subgrades and possible additional measures required to achieve sufficient compaction. Where fill is placed against a slope, benching may be necessary and natural drainage paths must not be blocked.

5. Suitable Fill Materials

All material to be used as fill must be approved by Peto MacCallum Ltd. Such approval will be influenced by many factors and must be site and project specific. External fill sources must be sampled, tested and approved prior to material being hauled to site.

6. Test Section

In advance of the start of construction of the engineered fill pad, the Contractor should conduct a test section. The compaction criterion will be assessed in consultation with Peto MacCallum Ltd. for the various fill material types using different lift thicknesses and number of passes for the compaction equipment proposed by the Contractor.

Additional test sections may be required throughout the course of the project to reflect changes in fill sources, natural moisture content of the material and weather conditions.

The Contractor should be particularly aware of changes in the moisture content of fill material. Site review by Peto MacCallum Ltd. is required to ensure the desired lift thickness is maintained and that each lift is systematically compacted, tested and approved before a subsequent lift is commenced.

7. Inspection and Testing

Uniform, thorough compaction is crucial to the performance of the engineered fill and the supported structure. Hence, all subgrade preparation, filling and compacting must be carried out under the full time inspection by Peto MacCallum Ltd.

All founding surfaces for all buildings and residential dwellings or any part thereof (including but not limited to footings and floor slabs) on structural fill or native soils must be inspected and approved by PML engineering personnel prior to placement of the base/subbase granular material and/or concrete. The purpose of the inspection is to ensure the subgrade soils are capable of supporting the building/house foundation and floor slab loads and to confirm the building/house envelope does not extend beyond the limits of any structural fill pads.

8. Protection of Fill

Fill is generally more susceptible to the effects of weather than natural soil. Fill placed and approved to the level at which structural support is required must be protected from excessive wetting, drying, erosion or freezing. Where adequate protection has not been provided, it may be necessary to provide deeper footings or to strip and recompact some of the fill.

9. Construction Delay Time Considerations

The integrity of the fill pad can deteriorate due to the harsh effects of our Canadian weather. Hence, particular care must be taken if the fill pad is constructed over a long time period.

It is necessary therefore, that all fill sources are tested to ensure the material compactability prior to the soil arriving at site. When there has been a lengthy delay between construction periods of the fill pad, it is necessary to conduct subgrade proof rolling, test pits or boreholes to verify the adequacy of the exposed subgrade to accept new fill material.

When the fill pad will be constructed over a lengthy period of time, a field survey should be completed at the end of each construction season to verify the areal extent and the level at which the compacted fill has been brought up to, tested and approved.

In the following spring, subexcavation may be necessary if the fill pad has been softened attributable to ponded surface water or freeze/thaw cycles.

A new survey is required at the beginning of the next construction season to verify that random dumping and/or spreading of fill has not been carried out at the site.

10. Approved Fill Pad Surveillance

It should be appreciated that once the fill pad has been brought to final grade and documented by field survey, there must be ongoing surveillance to ensure that the integrity of the fill pad is not threatened.

Grading operations adjacent to fill pads can often take place several months or years after completion of the fill pad.

It is imperative that all site management and supervision staff, the staff of Contractors and earthwork operators be fully aware of the boundaries of all approved engineered fill pads.

Excavation into an approved engineered fill pad should never be contemplated without the full knowledge, approval and documentation by the geotechnical consultant.

If the fill pad is knowingly built several years in advance of ultimate construction, the areal limits of the fill pad should be substantially overbuilt laterally to allow for changes in possible structure location and elevation and other earthwork operations and competing interests on the site. The overbuilt distance required is project and/or site specified.

Iron bars should be placed at the corner/intermediate points of the fill pad as a permanent record of the approved limits of the work for record keeping purposes.

11. Unusual Working Conditions

Construction of fill pads may at times take place at night and/or during periods of freezing weather conditions because of the requirements of the project schedule. It should be appreciated therefore, that both situations present more difficult working conditions. The Owner, Contractor, Design Consultant and Geotechnical Engineer must be willing to work together to revise site construction procedures, enhance field testing and surveillance, and incorporate design modifications as necessary to suit site conditions.

When working at night there must be sufficient artificial light to properly illuminate the fill pad and borrow areas.

Placement of material to form an engineered fill pad during winter and freezing temperatures has its own special conditions that must be addressed. It is imperative that each day prior to placement of new fill, the exposed subgrade must be inspected and any overnight snow or frozen material removed. Particular attention should be given to the borrow source inspection to ensure only nonfrozen fill is brought to the site.

The Contractor must continually assess the work program and have the necessary spreading and compacting equipment to ensure that densification of the fill material takes place in a minimum amount of time. Changes may be required to the spreading methods, lift thickness, and compaction techniques to ensure the desired compaction is achieved uniformly throughout each fill lift.

The Contractor should adequately protect the subgrade at the end of each shift to minimize frost penetration overnight. Since water cannot be added to the fill material to facilitate compaction, it is imperative that densification of the fill be achieved by additional compaction effort and an appropriate reduced lift thickness. Once the fill pad has been completed, it must be properly protected from freezing temperatures and ponding of water during the spring thaw period.

If the pad is unusually thick or if the fill thickness varies dramatically across the width or length of the fill pad, Peto MacCallum Ltd. should be consulted for additional recommendations. In this case, alternative special provisions may be recommended, such as providing a surcharge preload for a limited time or increase the degree of compaction of the fill.

APPENDIX B

STATEMENT OF LIMITATIONS

STATEMENT OF LIMITATIONS

This report is prepared for and made available for the sole use of the client named. Peto MacCallum Ltd. (PML) hereby disclaims any liability or responsibility to any person or entity, other than those for whom this report is specifically issued, for any loss, damage, expenses, or penalties that may arise or result from the use of any information or recommendations contained in this report. The contents of this report may not be used or relied upon by any other person without the express written consent and authorization of PML.

This report shall not be relied upon for any purpose other than as agreed with the client named without the written consent of PML. It shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. A portion of this report may not be used as a separate entity: that is to say the report is to be read in its entirety at all times.

The report is based solely on the scope of services which are specifically referred to in this report. No physical or intrusive testing has been performed, except as specifically referenced in this report. This report is not a certification of compliance with past or present regulations, codes, guidelines and policies.

The scope of services carried out by PML is based on details of the proposed development and land use to address certain issues, purposes and objectives with respect to the specific site as identified by the client. Services not expressly set forth in writing are expressly excluded from the services provided by PML. In other words, PML has not performed any observations, investigations, study analysis, engineering evaluation or testing that is not specifically listed in the scope of services in this report. PML assumes no responsibility or duty to the client for any such services and shall not be liable for failing to discover any condition, whose discovery would require the performance of services not specifically referred to in this report.

The findings an comments made by PML in this report are based on the conditions observed at the time of PML's site reconnaissance. No assurances can be made and no assurances are given with respect to any potential changes in site conditions following the time of completion of PML's field work. Furthermore, regulations, codes and guidelines may change at any time subsequent to the date of this report and these changes may effect the validity of the findings and recommendations given in this report.

STATEMENT OF LIMITATIONS

The results and conclusions with respect to site conditions are therefore in no way intended to be taken as a guarantee or representation, expressed or implied, that the site is free from any contaminants from past or current land use activities or that the conditions in all areas of the site and beneath or within structures are the same as those areas specifically sampled.

Any investigation, examination, measurements or sampling explorations at a particular location may not be representative of conditions between sampled locations. Soil, ground water, surface water, or building material conditions between and beyond the sampled locations may differ from those encountered at the sampling locations and conditions may become apparent during construction which could not be detected or anticipated at the time of the intrusive sampling investigation.

Budget estimates contained in this report are to be viewed as an engineering estimate of probable costs and provided solely for the purposes of assisting the client in its budgeting process. It is understood and agreed that PML will not in any way be held liable as a result of any budget figures provided by it.

The Client expressly waives its right to withhold PML's fees, either in whole or in part, or to make any claim or commence any action or bring any other proceedings, whether in contract, tort, or otherwise against PML in anyway connected with advice or information given by PML relating to the cost estimate or Environmental Remediation/Cleanup and Restoration or Soil and Ground Water Management Plan Cost Estimate.

GEOTECHNICAL INVESTIGATION
PROPOSED WILMOT WOODS DEVELOPMENT
CN RAILWAY CROSSING
NEW HAMBURG, ONTARIO

for

WILMOT WOODS DEVELOPMENT INC.

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1 cc: Wilmot Woods Development Inc.
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1 cc: PML Kitchener

PML Ref.: 18KF031
Report: 2
February 24, 2022

Peto MacCallum Ltd.
CONSULTING ENGINEERS

February 24, 2022

PML Ref.: 18KF031
Report: 2

Mr. Adam Belksy
Wilmot Woods Development Inc.
310 Fairway Road South, P.O. Box 45016
Kitchener, Ontario
N2C 2R6

Dear Mr.Belksy

Geotechnical Investigation
Proposed Wilmot Woods Development
CN Railway Crossing
New Hamburg, Ontario

Peto MacCallum Ltd. (PML) is pleased to report the results of the geotechnical investigation recently completed at the above noted project site. Authorization to proceed with this assignment was provided by Mr. Galbraith in email dated July 9, 2018.

In general, the project involves the proposed installation of a proposed trunk sanitary sewer extending from the proposed Pfenning Farm development southward under the railway, and will connect to a proposed trunk sewer on the neighboring property (the Wilmot employment Lands). The railway which runs along the south side of the Pfenning Farm development site is located on top of an embankment at about Elevation 345. It is understood that a trenchless installation using jack and bore or pipe ramming methods is being considered for the railway crossing. Detailed design of the crossing has not been provided. However, in general, sewer crossing under the railway will comprise a 400 mm dimeter pipe with inverts at about Elevation 335.7, about 9 m below the railway and 4 to 5 m depth below existing grade beyond the railway.

The purpose of this geotechnical report is to assess the existing subsurface soil and ground water information, and provide preliminary geotechnical engineering recommendations for the proposed trenchless installation of the trunk sanitary sewer under the railway.

Recommendations for the proposed construction of a residential subdivision are provided under separate cover, PML Ref. 18KF031, Report 1.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are for the current project only. Any changes in plans will require review by PML to assess the applicability of the report, and may require modified recommendations, additional analysis and / or investigation. When the project design is complete, the general recommendations given in this report should be reviewed by PML to ensure their applicability.

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BARRIE, COLLINGWOOD, HAMILTON, KITCHENER, LONDON, TORONTO

Investigation

The field work for this geotechnical investigation was conducted on August 2, 2018 and October 15, 2018 as part of the investigation for the entire development. The investigation program for the railway crossing comprised two boreholes (MW109 and MW110) advanced to between 12.5 and 12.6 m depth, with monitoring wells installed in both of the boreholes, at the locations shown on the appended Drawing 1. Details of the geotechnical investigation are presented under separate cover in our previous report PML Ref 18KF031 Report 1. Reference is given to Appendix A for the Log of Borehole Sheets, and particle size analyses applicable to the current Railway crossing.

The borehole locations were established in the field by PML. Borehole locations were surveyed by PML using Global Navigation Satellite System (GNSS). The survey equipment was provided by SOKKIA Canada, model GCX-2.

The boreholes were advanced using a Diedrich D-50 track mounted drillrig fitted with continuous flight solid and hollow stem augers and automatic hammer, supplied and operated by a specialist drilling contractor. The work was carried out under the full-time supervision of a PML engineering staff member who directed the drilling and sampling operations, documented the soil stratigraphy, monitored ground water conditions and processed the recovered samples.

Representative samples of the overburden were recovered at regular intervals throughout the depths explored. Standard penetration tests (SPT) were carried out during sampling operations of the boreholes using conventional split spoon equipment. Pocket penetrometer testing was carried out on the recovered samples to determine the undrained shear strength of the cohesive soils. Ground water observations were made in the boreholes during and upon completion of drilling. The boreholes were backfilled and compacted in accordance with O.Reg.903 upon completion of drilling.

Monitoring wells were installed in Boreholes MW109 and MW110 to more accurately measure ground water levels. The monitoring wells comprised 50 mm diameter PVC pipe, filter sand,

All of the recovered samples were returned to PML's laboratory for detailed visual examination, classification, and routine moisture content determinations. The laboratory testing also included particle size distribution analyses on samples of the major soil type encountered.

Summarized Subsurface Conditions

Reference is made to the appended Log of Borehole sheets for details of the field work including soil descriptions, inferred stratigraphy, standard penetration test (SPT) N values, dynamic cone penetration test values, ground water observations and laboratory moisture content determinations.

Due to the soil sampling procedures and the limited size of samples, the depth / elevation demarcations on the borehole logs must be viewed as "transitional" zones, and cannot be construed as exact geologic boundaries between layers.

In general, the soil stratigraphy encountered comprised surficial topsoil, underlain by an extensive clayey silt deposit containing numerous cohesionless silt layers.

Surficial topsoil was contacted in both boreholes and was between 850 mm and 360 mm thick in Boreholes MW109 and MW110, respectively.

An extensive clayey silt deposit was encountered below the surficial topsoil, in both boreholes, and extended to the 12.5 to 12.6 m borehole termination depths. The cohesive clayey silt deposit was generally firm to very stiff based on standard penetration N values between 7 and 18 blows per 0.3 m penetration of the split spoon sampler. Pocket penetrometer shear strengths of the clayey silt ranged between 75 and 125 kPa. Moisture content ranged between 18 and 28% indicating drier than plastic limit (DTPL) to wetter than limit (WTPL) conditions in the cohesive clayey silt soils. Occasional cobbles and boulders are present in the clayey silt deposit.

Ground Water Conditions

Ground water observations carried out during and upon completion of drilling are presented on the appended Log of Borehole Sheets.

During drilling, WTPL conditions were generally encountered in the clayey below 2.9 m depth (Elevation 337.0 and 337.1).

On November 26, 2018 water level measurements from the monitoring wells installed in Boreholes 109 and 110 ranged between 0.1 to 0.2 m depth below existing grade (about Elevation 339.8).

The ground water levels at the site are subject to seasonal fluctuations and precipitation patterns. It should be noted that the relatively impermeable nature of the clayey silt deposits could contribute to the development of perched water conditions following short term and seasonal participation events.

Discussion and Recommendations

As noted previously, the project involves the proposed installation of a trunk sewer below the railway tracks which will extend southward from the Pfenning Farm to the Wilmot employment Lands. The crossing will house a 400 mm diameter pipe inside a steel casing with proposed inverts about Elevations 335.7. The sewer pipe and casing invert will be about 9 m below the railway tracks and 4 to 5 m below the existing grades on each side of the railway. For discussion purposes a maximum 900 mm diameter steel casing is envisioned. Therefore, the top of the steel pipe crossing will be about 4 m below ground on the lands beside the railway, and about 8 m below the railway tracks.

In general, the soil stratigraphy encountered comprised surficial topsoil, underlain by an extensive clayey silt deposit containing numerous cohesionless silt layers and occasional cobbles. The cohesive clayey silt deposit was generally firm to very stiff. The ground water level is at about Elevation 339.8, and above the proposed trunk sewer depth. Considering the subsurface conditions encountered and details proposed for the crossing, both jack and bore and pipe ramming methods were evaluated, and further details on both methods are provided in the sections below.

Regardless of the method used, it is recommended that the contractor prepare a plan in advance of construction outlining the details of the installation to provide instructions for the construction crews and provide a possible contingency action plan should difficulties occur during the tunnelling operations. The plan should also be reviewed by the project proponent and the railway authorities prior to construction. Upon request, PML can assist in reviewing the plan to check that assumptions regarding soil and ground water conditions are appropriate.

Reference is also given to Ontario Provincial Standard Specifications (OPSS) 415, Construction Specifications for Pipeline and Utility Installation by Tunnelling.

Jack and Bore

Jack and bore (or cased auger boring) typically involves the simultaneous advancement of a continuous flight auger and conduit pipe. The auger is used to excavate soil in advance of the casing and transport cuttings back to the receiving pit where they are removed. Rotary power to auger and pushing force is provided by a drill rig located within a jacking pit. Jack and bore is a common method of trenchless installation and in appropriate site and soil conditions may be preferable from a cost perspective.

Jack and bore installation(s) should be conducted in accordance with OPSS 416, Construction Specifications for Pipeline and Utility Installation by Jacking and Boring.

A jack and bore installation is technically feasible for the installations provided the work is carried out by contractors experienced with tunneling in clayey silt with layered silt conditions, and provided adequate measures are used to prevent loss of ground.

The sanitary sewer installation will be below the ground water level in the clayey silt, and ground water conditions could hinder or prevent a jack and bore installation. In wet soils there is potential for ground surface subsidence due to wet soil flowing into the bore, which could result in voids. Dewatering the clayey silt with numerous silt layers is not likely to be effective, therefore the risk of ravelling soil cannot be entirely eliminated.

The jacking forces should be estimated to select the suitable jacks. Suitable jacking head and suitable bracing between jacks and jacking head should be used to assure that pressure will be applied to the pipe uniformly around the ring of the pipe. Utilizing an effective lubrication system may minimize pipe friction during advance. A suitable face pressure or soil plug should be maintained to minimize loss of ground during advance. Any over-cut during augering and pipe advance which potentially create soil disturbance, space or voids outside the pipe should be grouted or filled to avoid potential ground movements.

The proposed crossing may encounter cobbles and boulders during installation. Contractors working on this assignment should provide measures to break up or remove cobbles and boulders if they are encountered during the jack and bore installation.

Pipe Ramming

Pipe ramming installation is analogous to driving an open-ended tube pile horizontally. Impact forces from a percussive hammer (mole) are used to advance a conduit pipe from an entry pit to a receiving pit. During the advance, most of the soil being penetrated fills the conduit rather than being excavated. The rammed conduit is terminated in a receiving pit at which point the soil contained in the pipe is removed.

When the driving has been completed, soil within the pipe can be removed via augering or a pipe shovel. Augering is expected to be the preferred method, however if soil within the pipe cannot be augered, use of a pipe shovel will be necessary. A pipe shovel is essentially a special scoop made from a pipe which fits inside the liner. Excavation via pipe shovel involves advancing the shovel into the soil plug using impact hammer (mole), then pulling the shovel and its contents out with a chain or cable, the process is repeated as required.

Reference is given to the following section for recommendations pertaining to the construction of entry and receiving pits. Dewatering measures will be required at the entry and receiving pits. Ideally, dewatering measures for the staging works should be established to such that the zone of influence includes as much of the tunnel area as possible as this will generally reduce potential ground water seepage through the tunnel during construction.

A pipe ramming installation is technically feasible for the sanitary sewer installation provided the work is carried out by contractors experienced with tunneling in clayey silt conditions, and adequate ground water control is achieved.

It is noted that grade adjustments cannot be completed once pipe ramming has started. It will be necessary to increase the slope of the crossing due to the potential for uncontrolled deflection during pipe ramming installation.

The proposed crossing may encounter cobbles and boulders during installation. Contractors working on this assignment should provide measures to break up cobbles and boulders if they are encountered during the pipe ramming installation.

The effects of the percussive forces on the railway must also be considered and assessed.

In summary, jack and bore is technically feasible for the proposed crossings, however pipe ramming is generally recommended as an alternative given the ground water conditions within the proposed tunneling depths.

Entry and Receiving Pit Excavation and Ground Water Control

Provided adequate ground water control is achieved, the subsurface soils encountered at the borehole locations are classified as Type 3 soils as defined in the Occupational Health and Safety Act (OHSA). For temporary unsupported excavations within Type 3 soils that are to be entered by workers, the excavation side slopes should be maintained no steeper than 1 horizontal to 1 vertical (1H:1V) from the base of shallow excavations. Workers should not enter an unprotected excavation if there is evidence of ongoing seepage in the banks or base of the excavation. An adequate temporary support system (i.e., trench boxes) should be provided at all locations where space limitations prevent construction of sufficiently shallow slopes.

It will also be important to ensure that the excavations do not undermine possible existing in-ground structures, roads and or other services in their proximity. The need for underpinning and utility support can be established according to criteria illustrated on the appended Figure 1. It should be noted that a trench liner box may not be relied on for bracing purposes.

The envisaged excavations for the sending and receiving pits of the sanitary sewer crossing will extend about 6.5 m into clayey silt with numerous wet silt seams. Excavations are anticipated to require dewatering to control of ground water seepage or surface water entering the excavation, and sump pumps along with a more sophisticated dewatering system such as well points, or eductor wells, or water tight sheet pile or secant caisson cut-off may be required.

Regardless of the dewatering method chosen, the hydraulic head and ground water inflow must be properly controlled to ensure stable and safe excavation and to facilitate construction. The design of the dewatering system should be left to the contractor's discretion, and the system should meet a performance specification to maintain and control ground water at least 0.30 m below the excavation base level, in order to provide a stable excavation base throughout construction.

It should be noted that, under the Ontario Water Resources Act, the Water Taking and Transfer Regulation 387/04, a Permit to Take Water (PTTW) from the Ministry of Environment Conservation and Parks (MECP) is required if the dewatering discharge is greater than 50,000 L/day. In accordance with the above noted regulatory requirements and in compliance with the MECP's PTTW Manual (April 2005), and application should be filed to the MECP for the subject property construction dewatering PTTW, if the dewatering discharge is greater than 400,000 L/day, or about 4.6 L/S. If the dewatering discharge is between 50,000 L/day (or about 0.6 L/S) and 400,000 L/day (or about 4.6 L/S) dewatering activities need to be registered on the Environmental Activity and Sector Registry (EASR). PML would be happy to assist with this process, if required.

The depth of excavations for trunk sewer installation are expected to extend to a maximum 6.5 m depth into clayey silt deposits with wet to saturated layers of silt. Due to the presence of numerous water bearing silt layers in the native deposits, excavations for the sending and receiving pits might have pumping rates that exceed 50,000 L/day, and a PTTW or EASR may be required, along with a hydrogeological investigation in support of the application. The estimated construction dewatering volumes should be reassessed once more detailed design information has been established. Upon request, PML would be please to provide further recommendations in this regard.

It is recommended that test pits be carried out during the tendering stage of the project in order that prospective contractors may familiarize themselves with soil and ground water conditions to be expected. Also, the dewatering requirements should be established by the contractor in the context of a performance specification.

Braced Excavations

If space is not available for an enlarged unsupported open cut excavation then consideration should be given to using an engineered system (timber lagging, sheet piling or caisson wall) to support the excavation walls. The soil parameters presented in the following table may be used for the design of braced excavation systems. The parameters are based on the Rankin method of analysis which ignores wall friction.

SOIL TYPE	**CLAYEY SILT**
Coefficient of Active Earth Pressure K_a	0.33
Coefficient of Passive Earth Pressure K_p	3.00
Angle of Internal Friction Ø	30
Cohesive Strength c_u	50 kPa
Unit Weight γ (kN/m^3)	21

For the soil stratigraphy encountered, the bracing system may be designed as a multi-braced system using a rectangular stress distribution in accordance with methods outlined in the latest Canadian Foundation Engineering Manual (CFEM) and summarized on the appended Figure 2, or as a singly-braced system using a triangular stress distribution and summarized on the appended Figure 3. The system design should also consider load effects from ground water, the adjacent embankments, structures and construction equipment.

The ground surface adjacent to a braced excavation is expected to experience some inward movement and vertical settlement. The magnitude of movements adjacent to a braced cut can be limited by proper selection of the lateral earth pressure coefficient, provided good quality workmanship and construction practices are employed.

The maximum allowable movements of braced excavations must be established in a performance specification, and should be determined through agreement with the railway authority.

Backfill

In general, conventional bedding and cover will be suitable for sewer installation and backfilling of the sending and receiving pits. Material containing stones larger than 50 mm size should not be used in the bedding or cover layers. The bedding should be constructed in accordance with applicable Ontario Provincial Standard Drawings (OPSD) and / or local standards. The bedding and cover material should be placed in 150 mm lifts and compacted to at least 95% standard Proctor maximum dry density (SPMDD).

Backfill materials should comprise approved imported granular soil. The backfill materials should be placed in 300 mm maximum lifts and compacted to a minimum of 95% SPMDD.

Should construction extend to the winter months, care must be taken to ensure that frozen material is not used as backfill.

Excavated materials intended for backfilling purposes should not be exposed to the elements for prolonged time periods, as they might be rendered unsuitable for reuse.

Monitoring

The ground surface over the tunnel route may become distorted and distressed by tunnelling. The most common type of distress is settlement caused by loss of ground around the tunnel. Heave of the ground surface is also possible depending on the type of installation. Monitoring of lateral movement of ground near excavations may also be necessary. Mitigation of the distress or distortion on the railway would be a major inconvenience and possibly a safety issue.

Distress at the ground surface is generally prevented or minimized by good construction practices and proper planning. In this regard, preparation of an installation plan as noted above is recommended.

It is also recommended that the project proponent implement a monitoring program to check the condition of the ground over the tunnel before, during and upon completion of construction. The monitoring program should be carried out by a qualified geotechnical consulting firm that is familiar with the proposed work and subsurface conditions. The monitoring period should begin prior to tunnelling, extend throughout the duration and continue at least 2 weeks after completion of tunnelling. More specific monitoring procedures may also be required by the railway authorities.

Monitoring points should be marked using a method approved by the railway authority. Monitoring points should also be functional throughout the monitoring period and should not deteriorate because of traffic, maintenance activities, and weather conditions.

If distress is observed during construction, the contractor should be informed and corrective action should be undertaken immediately. Specific corrective action will be dependent on the nature of the distress and type of installation. Regardless, the process should be outlined in the monitoring program and be part of the contingency actions in the contractor's installation plan.

In general, settlement or heave of the railway from a properly constructed jack and bore or pipe ramming installation carried out in accordance with the recommendations noted in this report, should be less than 10 mm. If settlement or heave of the ground surface exceeds 10 mm, the construction process should be reviewed and adjusted to mitigate further disturbances for the remainder of the tunnelling work.

If total settlement or heave exceeds 15 mm, tunnelling operations should be terminated, the site secured against further deterioration and mitigative action should be undertaken immediately to reinstate the railway and existing utilities

All actions to prevent, secure, or mitigate destruction or damage to the highway and associated features should be done in accordance with, and approved by the railway authorities.

Geotechnical Review and Construction Inspection and Testing

When development design is complete, it is recommended that the design drawings be submitted to PML for general geotechnical review for compatibility with site conditions and recommendations of this report.

Earthworks operations should be carried out under the supervision of PML to approve subgrade preparation, backfill materials, placement and compaction procedures, and verify the specified degree of compaction is achieved uniformly throughout fill materials.

The comments and recommendations provided in the report are based on the information revealed in the boreholes. Conditions away from and between boreholes may vary, particularly where service trenches exist. Geotechnical review during construction should be on going to confirm the subsurface conditions are substantially similar to those encountered in the boreholes, which may otherwise require modification to the original recommendations.

This report is subject to the Statement of Limitations that is included in Appendix B, which must be read in conjunction with the report.

Closure

We trust the information presented in this report is sufficient for your immediate requirements. If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.

William Loghrin, P.Eng.
Manager Engineering Service

Gerry Mitchell, MEng, P.Eng.
Senior Consultant

WL/GM:tm

Enclosures:
Figure 1 – General Recommendations Regarding Underpinning
Figure 2 – Lateral Earth Pressure Distribution Multi-Braced Cuts in Cohesionless Soils
Figure 3 – Lateral Earth Pressure Distribution Singly-Braced Cuts in Cohesionless Soils
Drawing 1 - Borehole Location Plan
Appendix A – Figure 6 and Borehole Logs BH/MW109 and BH/MW110
Appendix B – Statement of Limitations

Closure

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Appendix B – Statement of Limitations

NOTES

1. The need to underpin existing footings/utilities is dependent upon soil type, proximity of the existing facility to the face of the excavation, loads imposed on the foundation and permissible movements.

   ZONE A:
   Foundations of relatively heavy and/or settlement sensitive structures/ utilities located in Zone A generally require underpinning.

   ZONE B:
   Foundations of structures located within Zone B generally do not require underpinning. Consideration should be given to underpinning of settlement sensitive utilities or heavy foundation units located in this zone.

   ZONE C:

   Utilities and foundations located within Zone C do not normally require underpinning.

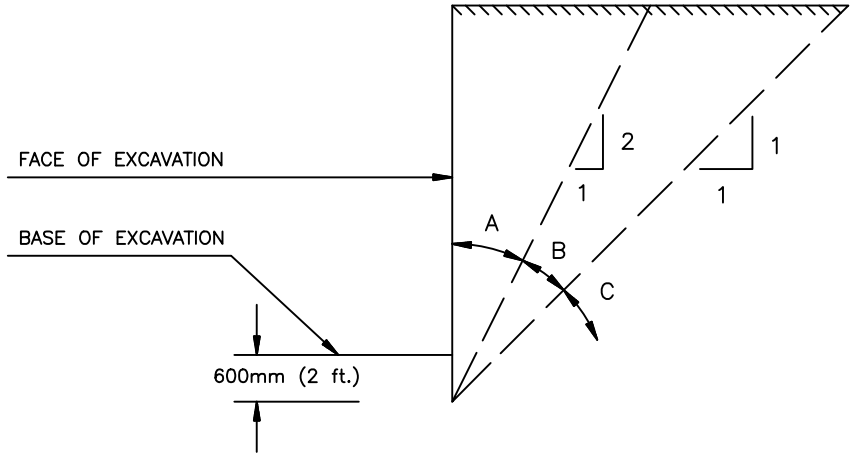
   Underpinning of foundations located in Zones A and B should extend at least into Zone C.

2. As an alternative to underpinning, it may be possible to control movement of existing utilities and foundations by supporting the face of the excavation with bracing/tiebacks or a rigid (caisson) wall. Horizontal and vertical earth pressures imposed on the excavation wall by non–underpinned foundations must be considered in the design of the support system.

3. A condition survey should be conducted prior to construction and appropriate monitoring (surface and insitu) carried out during construction to monitor any movement which may occur.

4. All work should be carried out in accordance with the Occupational Health and Safety Act and local regulations. Good quality workmanship and construction practices are to be employed.

5. This sheet is to be read in conjunction with text of report for this project. Additional comments and recommendations concerning these general guidelines will be provided if required.



Peto MacCallum Ltd. CONSULTING ENGINEERS

STANDARD DRAWING

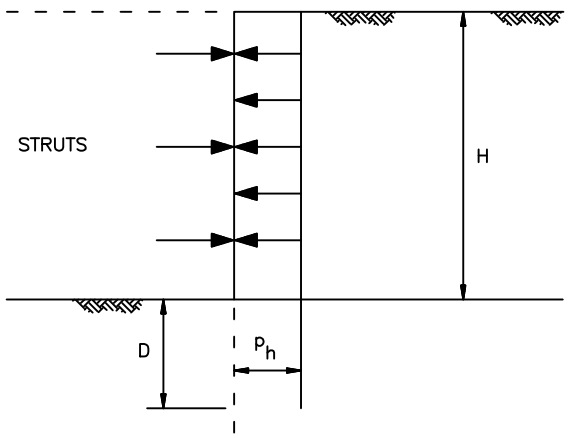
GENERAL RECOMMENDATIONS REGARDING UNDERPINNING OF FOUNDATIONS/UTILITIES LOCATED CLOSE TO EXCAVATION

DATE	JOB NUMBER	FIGURE NO.
FEB 2022	18KF031	1

NOTES

1. The actual magnitude and distribution of the horizontal earth pressures which will act on the bracing system are dependent upon the permissible lateral/vertical movements adjacent to the excavation, the soil type, groundwater conditions, drainage provisions, temporary/permanent surcharge loads, the type of bracing system adopted, weather conditions, quality of workmanship and length of time the excavation will be supported. Hence, the recommended pressure diagram and design parameters should be reviewed when construction details, schedule and type of support system are established.
2. Stability of base of excavation must be confirmed when bracing system design, excavation geometry and surcharge loads are established. If groundwater table is well above base of excavation and/or artesian conditions exist, local lowering of the groundwater level will be necessary to prevent bottom heave/piping of the base of the excavation.
3. Earth pressure diagram is applicable to maximum depth of cut of 12m (40 ft.).
4. Structural components of bracing system should be confirmed adequate for each level of excavation.
5. If sheeting will not permit drainage, bracing system must be designed to resist water pressure.
6. Surcharge loads such as street/construction traffic, supported utilities, adjacent foundations, temporary stockpiles and other loads carried by bracing system are not included in earth pressure diagram.
7. Temporary surcharge loading should not be closer to the face of the excavation than half the depth of excavation unless accounted for in bracing design.
8. If settlement sensitive structures are located near the excavation, special measures should be undertaken to control settlements. A condition survey should be conducted prior to construction and appppropriate monitoring (surface and insitu) carried out during construction.
9. Earth pressure diagram is applicable for relatively short construction periods. If excavation is to be open for long periods, monitoring of deformation is essential, earth pressure diagram must be reviewed, and remedial works may be required.
10. Earth pressure diagram does not account for extended periods of exposure of the excavation to freezing temperatures.
11. Bracing system should be regularly examined for signs of distress.
12. All work should be carried out in accordance with the Occupational Health and Safety Act and local regulations. Good quality workmanship and construction practices are to be employed.
13. This sheet should be read in conjunction with text of report for this project. Additional comments and recommendations concerning these general guidelines will be provided if required.

EARTH PRESSURE DIAGRAM



p_h = design lateral earth pressure
= 0.65 $K\gamma H$

K = lateral earth pressure coefficient

γ = unit weight of soil

H = depth of excavation

D = depth of embedment of soldier piles (if used).

RECOMMENDED DESIGN PARAMETERS

γ = 21.0 kN/m^3

K = 0.33 (movement of retained soil acceptable)
0.50 (movement of adjacent structures/facilities unacceptable)

Peto MacCallum Ltd. CONSULTING ENGINEERS	LATERAL EARTH PRESSURE DISTRIBUTION MULTI–BRACED CUTS IN COHESIONLESS SOILS	DATE FEB 2022	JOB NUMBER 18KF031	FIGURE NO. 2

NOTES

1. The actual magnitude and distribution of the horizontal earth pressures which will act on the bracing system are dependent upon the permissible lateral/vertical movements adjacent to the excavation, the soil type, groundwater conditions, drainage provisions, temporary/permanent surcharge loads, the type of bracing system adopted, weather conditions, quality of workmanship and length of time the excavation will be supported. Hence, the recommended pressure diagram and design parameters should be reviewed when construction details, schedule and type of support system are established.
2. Stability of base of excavation must be confirmed when bracing system design, excavation geometry and surcharge loads are established. If groundwater table is well above base of excavation and/or artesian conditions exist, local lowering of the groundwater level will be necessary to prevent bottom heave/piping of the base of the excavation.
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6. Surcharge loads such as street/construction traffic, supported utilities, adjacent foundations, temporary stockpiles and other loads carried by bracing system are not included in earth pressure diagram.
7. Temporary surcharge loading should not be closer to the face of the excavation than half the depth of excavation unless accounted for in bracing design.
8. If settlement sensitive structures are located near the excavation, special measures should be undertaken to control settlements. A condition survey should be conducted prior to construction and apppropriate monitoring (surface and insitu) carried out during construction.
9. Earth pressure diagram is applicable for relatively short construction periods. If excavation is to be open for long periods, monitoring of deformation is essential, the earth pressure diagram must be reviewed, and remedial works may be required.
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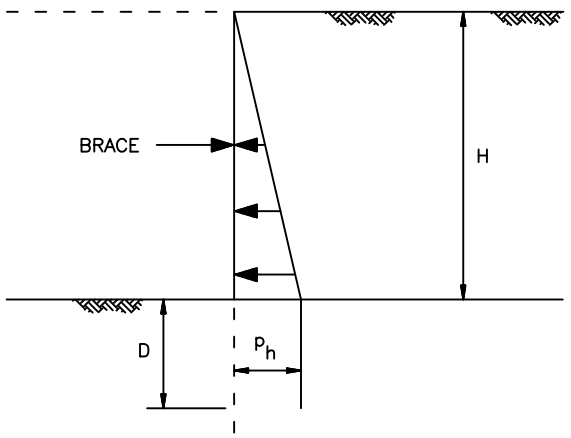
11. Bracing system should be regularly examined for signs of distress.
12. All work should be carried out in accordance with the Occupational Health and Safety Act and local regulations. Good quality workmanship and construction practices are to be employed.
13. This sheet should be read in conjunction with text of report for this project. Additional comments and recommendations concerning these general guidelines will be provided if required.

EARTH PRESSURE DIAGRAM



p_h = design lateral earth pressure
= $K\gamma H$

K = lateral earth pressure coefficient

γ = unit weight of soil

H = depth of excavation

D = depth of embedment of soldier piles (if used).

RECOMMENDED DESIGN PARAMETERS

γ = 21.0 kN/m^3

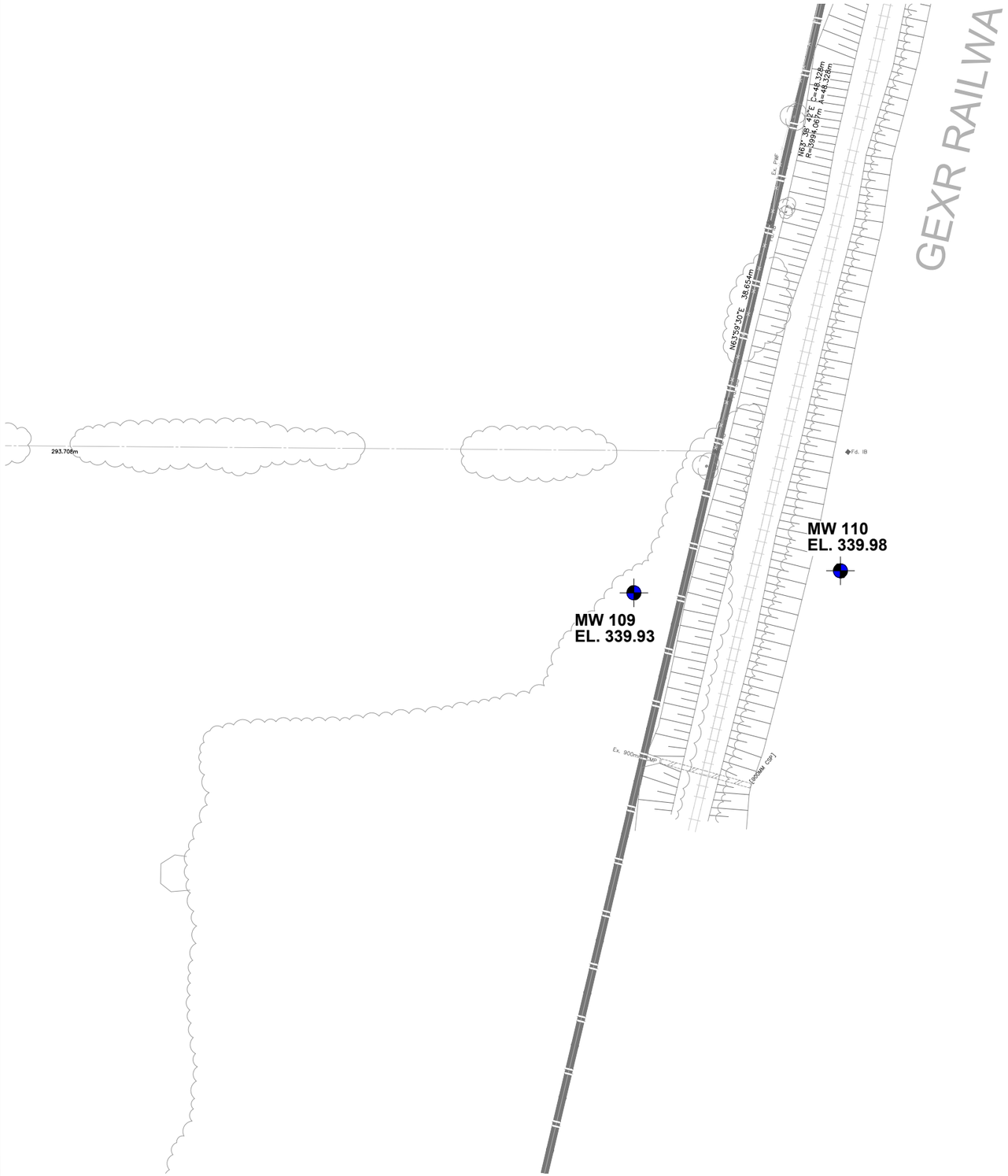
K = 0.33 (movement of retained soil acceptable)
0.50 (movement of adjacent structures/facilities unacceptable)

Peto MacCallum Ltd
CONSULTING ENGINEERS

LATERAL EARTH PRESSURE DISTRIBUTION

SINGLY–BRACED CUTS IN COHESIONLESS SOILS

DATE	JOB NUMBER	FIGURE NO.
FEB 2022	18KF031	3



KEY PLAN

LEGEND:

- BOREHOLE LOCATION
- MONITORING WELL LOCATION

REFERENCE:

BOREHOLE LOCATION PLAN REPRODUCED FROM DRAWING SUPPLIED BY CLIENT.

NOTE:

THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BOREHOLES MAY VARY.

WILMOT WOODS DEVELOPMENT INC.

PROPOSED WILMOT WOODS DEVELOPMENT

NEW HAMBURG

NEW HAMBURG, ONTARIO

BOREHOLE LOCATION PLAN

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	D. BRICE	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	W. LOGHRIN	FEBRUARY 2022	AS SHOWN	18KF031	1
APPROVED	G. MITCHELL				

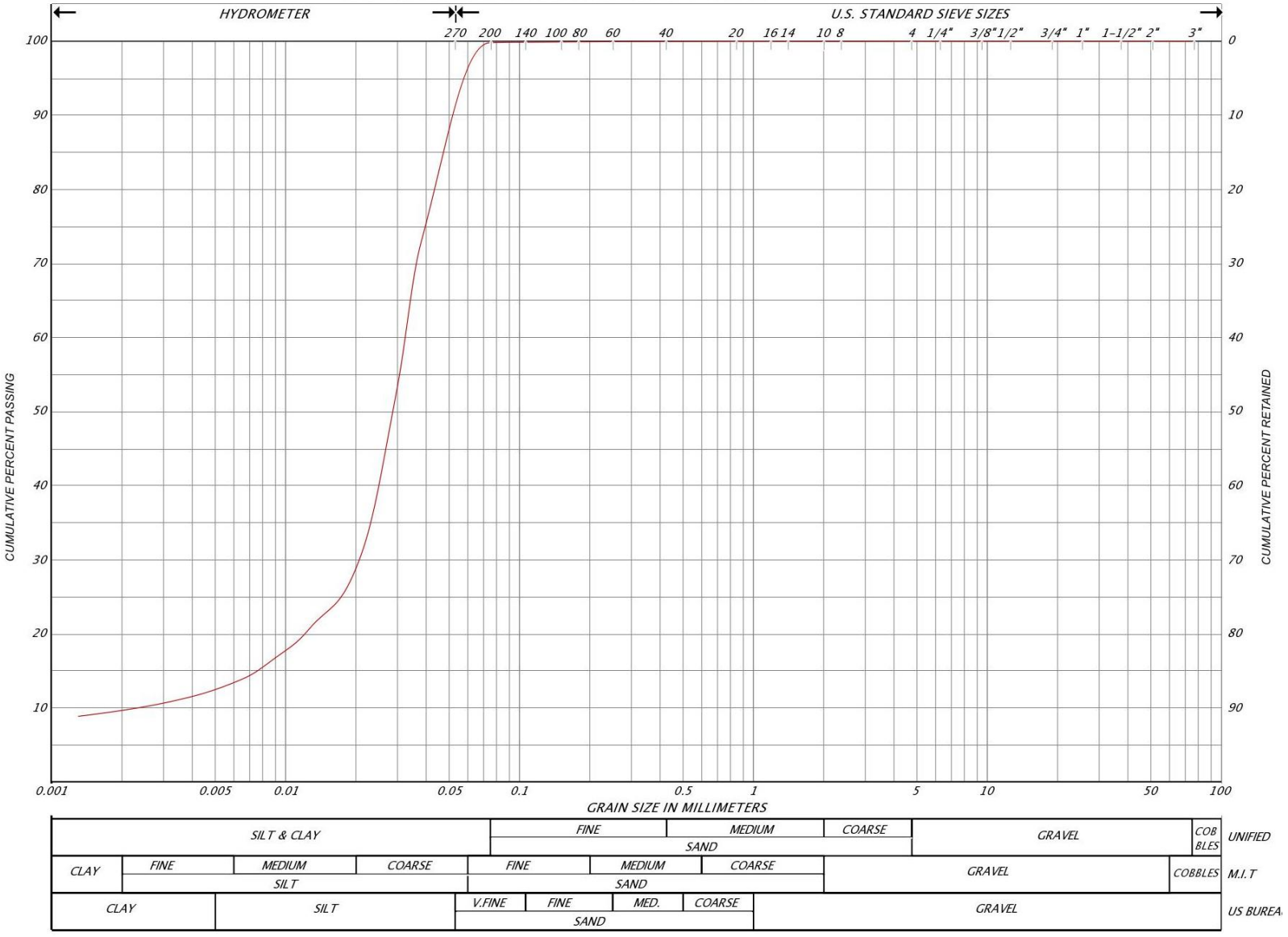
APPENDIX A

FIGURE 6 AND BOREHOLE LOGS 109 AND 110
FROM PREVIOUS REPORT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 6



REMARKS Borehole MW109, Sample SS11, Depth 9.1 to 9.6 m

CLAYEY SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 109

17T 524441.1E 4803985N

PROJECT Wilmot Woods Development
PML REF. 18KF031
LOCATION New Hamburg, Ontario
BORING DATE August 2, 2018
ENGINEER H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.93			
0.0		TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, APL to WTPL	1	SS	5
0.85	339.08	CLAYEY SILT: Soft to firm brown clayey silt, trace sand, DTPL, numerous silt layers, occasional cobbles	2A 2B	SS	3
			3	SS	7
2.1	337.8	becoming stiff	4	SS	11
2.9	337.0	becoming WTPL	5	SS	15
			6	SS	13
			7	SS	9
			8	SS	14
			9	SS	10
			10	SS	10
			11	SS	12
10.1	329.8	becoming very stiff	12	SS	16
			13	SS	15
12.5	327.4	BOREHOLE TERMINATED AT 12.5 m			

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-03	3.7	336.2
2018-11-07	0.1	339.8
2018-11-26	0.1	339.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 110

17T 524499.6E 4803961N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** October 15, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.98			
0.0		TOPSOIL: Dark brown silt, trace sand, occasional rootlets, moist to wet	1	SS	3
0.36	339.62	CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL, numerous silt layers			
0.70	339.28	becoming firm to stiff, occasional cobbles, WTPL	2	SS	10
1.0					
			3	SS	12
2.0					
			4	SS	16
2.9	337.1	becoming firm to stiff grey, trace sand, WTPL			
3.0			5	SS	8
4.0			6	SS	7
			7	SS	9
5.0					
			8	SS	9
6.0					
			9	SS	9
7.0	333.0	becoming very stiff, occasional silt layers			
			10	SS	18
8.0					
8.5	331.5	becoming stiff, numerous silt layers			
9.0					
			11	SS	12
10.0					
			12	SS	10
11.0					
			13	SS	13
12.6	327.4	BOREHOLE TERMINATED AT 12.6 m			
13.0					
14.0					
15.0					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

ELEVATION SCALE: 339, 338, 337, 336, 335, 334, 333, 332, 331, 330, 329, 328

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
50 mm pipe
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-10-15	DRY	----
2018-11-07	0.5	339.5
2018-11-26	0.2	339.8

NOTES

APPENDIX B

STATEMENT OF LIMITATIONS

STATEMENT OF LIMITATIONS

This report is prepared for and made available for the sole use of the client named. Peto MacCallum Ltd. (PML) hereby disclaims any liability or responsibility to any person or entity, other than those for whom this report is specifically issued, for any loss, damage, expenses, or penalties that may arise or result from the use of any information or recommendations contained in this report. The contents of this report may not be used or relied upon by any other person without the express written consent and authorization of PML.

This report shall not be relied upon for any purpose other than as agreed with the client named without the written consent of PML. It shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. A portion of this report may not be used as a separate entity: that is to say the report is to be read in its entirety at all times.

The report is based solely on the scope of services which are specifically referred to in this report. No physical or intrusive testing has been performed, except as specifically referenced in this report. This report is not a certification of compliance with past or present regulations, codes, guidelines and policies.

The scope of services carried out by PML is based on details of the proposed development and land use to address certain issues, purposes and objectives with respect to the specific site as identified by the client. Services not expressly set forth in writing are expressly excluded from the services provided by PML. In other words, PML has not performed any observations, investigations, study analysis, engineering evaluation or testing that is not specifically listed in the scope of services in this report. PML assumes no responsibility or duty to the client for any such services and shall not be liable for failing to discover any condition, whose discovery would require the performance of services not specifically referred to in this report.

The findings an comments made by PML in this report are based on the conditions observed at the time of PML's site reconnaissance. No assurances can be made and no assurances are given with respect to any potential changes in site conditions following the time of completion of PML's field work. Furthermore, regulations, codes and guidelines may change at any time subsequent to the date of this report and these changes may effect the validity of the findings and recommendations given in this report.

STATEMENT OF LIMITATIONS

The results and conclusions with respect to site conditions are therefore in no way intended to be taken as a guarantee or representation, expressed or implied, that the site is free from any contaminants from past or current land use activities or that the conditions in all areas of the site and beneath or within structures are the same as those areas specifically sampled.

Any investigation, examination, measurements or sampling explorations at a particular location may not be representative of conditions between sampled locations. Soil, ground water, surface water, or building material conditions between and beyond the sampled locations may differ from those encountered at the sampling locations and conditions may become apparent during construction which could not be detected or anticipated at the time of the intrusive sampling investigation.

Budget estimates contained in this report are to be viewed as an engineering estimate of probable costs and provided solely for the purposes of assisting the client in its budgeting process. It is understood and agreed that PML will not in any way be held liable as a result of any budget figures provided by it.

The Client expressly waives its right to withhold PML's fees, either in whole or in part, or to make any claim or commence any action or bring any other proceedings, whether in contract, tort, or otherwise against PML in anyway connected with advice or information given by PML relating to the cost estimate or Environmental Remediation/Cleanup and Restoration or Soil and Ground Water Management Plan Cost Estimate.

Peto MacCallum Ltd.
CONSULTING ENGINEERS

February 24, 2022

PML Ref.: 18KF031
Report: 3 Revised

Mr. Adam Belksy
Wilmot Woods Development Inc.
310 Fairway Road South, P.O. Box 45016
Kitchener, Ontario
N2C 2R6

Dear Mr. Belksy

Monitoring Well Water Level Reading
Proposed Wilmot Woods Development
New Hamburg, Ontario

Peto MacCallum Ltd. is pleased to submit our report regarding the ground water monitoring program of Proposed Wilmot Woods Development, New Hamburg, Ontario.

A record of water monitoring completed since September 2018 to February 2021 is presented in Table 1, attached.

We trust that this report has been completed within our terms of reference, and is sufficient for your immediate requirements. If you have any questions, or require further information, please do not hesitate to contact our office

Sincerely

Peto MacCallum Ltd.

William Loghrin, P.Eng.
Manager, Engineering Services

WL:tm

Enclosure:
Table 1: Ground Water Level Readings in Monitoring Wells

Distribution:
1 cc: Wilmot Woods Development Inc.
1 cc: MTE Consultants Inc. (+ email – jcabral@mte85.com).
1 cc: PML Kitchener

16 Franklin Street South, Kitchener, Ontario N2C 1R4
Tel: (519) 893-7500 Fax: (519) 893-0654
E-mail: kitchener@petomaccallum.com
BARRIE, COLLINGWOOD, HAMILTON, KITCHENER, LONDON, TORONTO

TABLE 1

GROUND WATER LEVEL READINGS IN MONITORING WELLS

MONITORING WELL No.	GROUND SURFACE ELEVATION[1]	MID-SCREEN ELEVATION[2] (DEPH, m)	HYDROSTATIC GROUND WATER LEVEL ELEVATION (DEPTH, m) [2]								
			SEPTEMBER 19, 2018	OCTOBER 10, 2018	NOVEMBER 7, 2018	NOVEMBER 26, 2018	FEBRUARY 8, 2019	NOVEMBER 19, 2020	DECEMBER 18, 2020	JANUARY 30, 2021	FEBRUARY 26, 2021
101	339.0	333.8 (5.2)	337.2 (1.80)	337.7 (1.34)	338.2 (0.85)	337.8 (1.24)	338.1 (0.96)	337.572 (1.46)	337.832 (1.20)	337.172 (1.86)	337.152 (1.88)
102	340.0	334.8 (5.2)	338.3 (1.71)	338.5 (1.48)	338.8 (1.23)	338.8 (1.24)	338.6 (1.41)	338.404 (1.69)	338.594 (1.50)	338.484 (1.61)	338.794 (1.30)
103	343.2	338.0 (5.2)	340.0 (3.22)	340.6 (2.66)	340.9 (2.33)	341.3 (1.91)	341.5 (1.70)	340.326 (3.00)	340.666 (2.66)	341.466 (1.86)	340.746 (2.58)
104	344.9	339.7 (5.2)	341.8 (3.17)	342.5 (2.45)	343.5 (1.41)	344.1 (0.83)	343.9 (1.03)	341.708 (3.23)	343.168 (1.77)	343.678 (1.26)	343.358 (1.58)
105	341.1	335.9 (5.2)	339.7 (1.31)	340.0 (1.08)	340.1 (0.91)	340.3 (0.77)	340.2 (0.84)	339.874 (1.26)	340.024 (1.11)	340.554 (0.58)	339.284 (1.85)
106	343.0	337.8 (5.2)	340.9 (2.13)	341.7 (1.25)	341.7 (1.31)	341.8 (1.15)	341.3 (1.65)	339.523 (3.47)	341.303 (1.69)	341.753 (1.24)	342.283 (0.71)
107	347.0	341.8 (5.2)	343.9 (3.07)	-	344.7 (2.30)	344.6 (2.33)	344.8 (2.20)	341.475 (5.52)	343.175 (3.82)	346.415 (0.58)	346.245 (0.75)
108	345.3	340.1 (5.2)	339.4 (5.94)	-	339.6 (5.68)	339.9 (5.40)	339.7 (5.63)	339.387 (6.00)	Dry	344.877 (0.51)	344.647 (0.74)
109	339.9	330.8 (9.1)	339.4 (0.53)	339.4 (0.53)	339.7 (0.19)	339.9 (0.04)	339.7 (0.20)	327.355 (0.48)	327.495 (0.34)	327.185 (0.65)	327.375 (0.46)
110	340.0	328.4 (11.6)	-	-	339.8 (0.43)	339.8 (0.17)	339.7 (0.26)	332.442 (0.84)	332.282 (1.00)	332.652 (0.63)	332.782 (0.50)

Notes:

(1) Ground surface elevations at the monitoring well locations were surveyed by PML and are geodetic.
(2) Water levels measured using a Solinst flat tape water level reader.

Appendix G

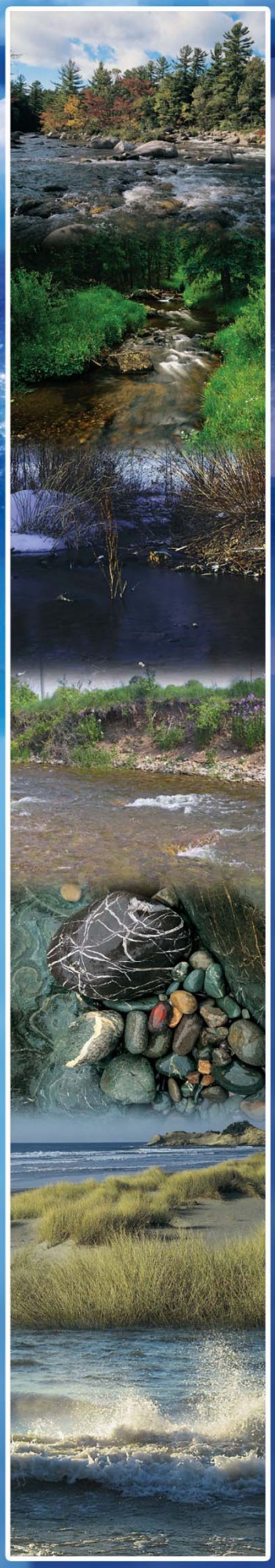
Monitoring Table

TABLE G1 SURFACE AND GROUNDWATER MONITORING PROGRAM - WILMOT WOODS

Monitoring Component	Type of Monitoring	Development Phase	Sampling Frequency	Location(s)	Methodology / Timing
SWM Facilities	Water Quality	During/Post-Construction	Event-based (>15mm rain events)	SW1, SW2, SW3, SW4 - Forebays and Outlet of SWMF1 and SWMF2	TSS samples captured seasonally following significant rainfall events
Wetland Feature	Water Quality	All	4x per year (seasonally)	Wetland north of CN Railway	Grab samples will be taken 4 times per year (once per season) under base flow conditions. Samples will be analyzed for chlorides, nitrates, total phosphorous, and TSS.
	Water Temperature	All	Continuous (6 hour interval)	Wetland north of CN Railway	Water temperatures will be continuously measured with recordings taken every 1 hour.
	Water Levels	All	Continuous (6 hour interval)	Wetland north of CN Railway	Water levels will be continuously measured with recordings taken every 1 hour.
Groundwater	Water Levels	Pre-Construction	4x per year	On site monitoring wells MW101, MW102, MW104, MW105, MW106, MW107, MW108, MW109, MW110, MW201-21, MW202-21, MW203A-21, MW203B-21, MP101-22	Monitored on a quarterly basis (either with manual water level measurements or with electronic data loggers) for two continuous years. It is noted that the datalogger within MP101-22 is removed during periods of below zero temperatures and is reinstalled when temperatures are consistently above zero degrees.
		During/Post-Construction	4x per year	On site monitoring wells MW101, MW104, MW105, MW106, MW109, MW110	Monitored on a quarterly basis (either with manual water level measurements or with electronic data loggers). It is recognized that as development of a Phase progresses, some monitoring wells will be decommissioned (per O. Reg. 903) due to their locations. It is noted that the datalogger within MP101-22 is removed during periods of below zero temperatures and is reinstalled when temperatures are consistently above zero degrees.
	Chemistry	Pre-Construction	1x per year	On site monitoring wells MW101, MW102, MW107, MW110, MW202-21, MW203B-21	Sampled on an annual basis and analyzed for general chemistry parameters (including major anions, cations, nutrients, metals, e-coli and fecal coliforms).
		During/Post-Construction	1x per year	On site monitoring well MW101, MW110	Sampled on an annual basis and analyzed for general chemistry parameters.
Surface Water	Water Levels and Temperature	Pre-Construction	4x per year	Ivan Gingerich Municipal Drain (IGMD) (270P).	Monitored on a quarterly basis (either with manual water level measurements or with electronic data loggers) for two continuous years.
		During/Post-Construction	4x per year	Ivan Gingerich Municipal Drain (IGMD) (270P).	Monitored on a quarterly basis (either with manual water level measurements or with electronic data loggers).
	Water Quality	All	4x per year (seasonally)	Ivan Gingerich Municipal Drain (IGMD) at 270P location.	Grab samples will be taken 4 times per year (once per season) under base flow conditions. Samples will be analyzed for chlorides, nitrates, total phosphorous, and TSS.

Appendix H

Water's Edge Erosion Threshold Assessment



water's edge
ENVIRONMENTAL SOLUTIONS TEAM LTD.

Wilmot Woods
New Hamburg, ON

Fluvial Geomorphic & Erosion Threshold Assessment

February 15, 2022

File Number: 21005
February 24, 2023

Mr. Jason Cabral, C.E.T.
Project Manager
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, Ontario
N2B 3X9

Dear Mr. Cabral:

RE: Wilmot Woods, New Hamburg
Fluvial Geomorphological and Erosion Threshold Assessment

1. INTRODUCTION

Water's Edge was retained by MTE Consultants Inc. to complete an Erosion Threshold Analysis (ETA) for the Ivan Gingrich Drain (IGD) and its tributaries in New Hamburg. This erosion threshold will be used to confirm the maximum velocity and allowable discharge from the proposed Stormwater Management Facility (SWMF) that supports the planned Wilmot Woods development.

The proposed SWMF will discharge to a pipe with 750 mm diameter and 84 m in length. This pipe outlets across Street Two into a drainage swale in the open space block that conveys the flows directly into the IGD. The existing SWMF from the existing development to the west discharges into a tributary of the Ivan Gingrich Drain. The tributary as well as the main channel for the Ivan Gingrich Drain were evaluated between the SWMF and the Nith River as part of the geomorphological investigation. The flowpath between the outlet of SWMF and the Nith River is about 1120 m. Moderate localized erosion was observed in the study reaches, particularly the Ivan Gingrich Drain downstream of the confluence with the tributary and upstream of the forested area. **Figure 1** shows the general location of the proposed development, and **Figure 2** shows the location of the study reaches.

This report characterizes the existing watercourse and watershed conditions within the study area based on the desktop assessments and field investigations. The analyses used to approximate were done by utilizing industry-standard and published methods within fluvial geomorphology. Recommended measures to prevent or mitigate issues caused by erosion are discussed.

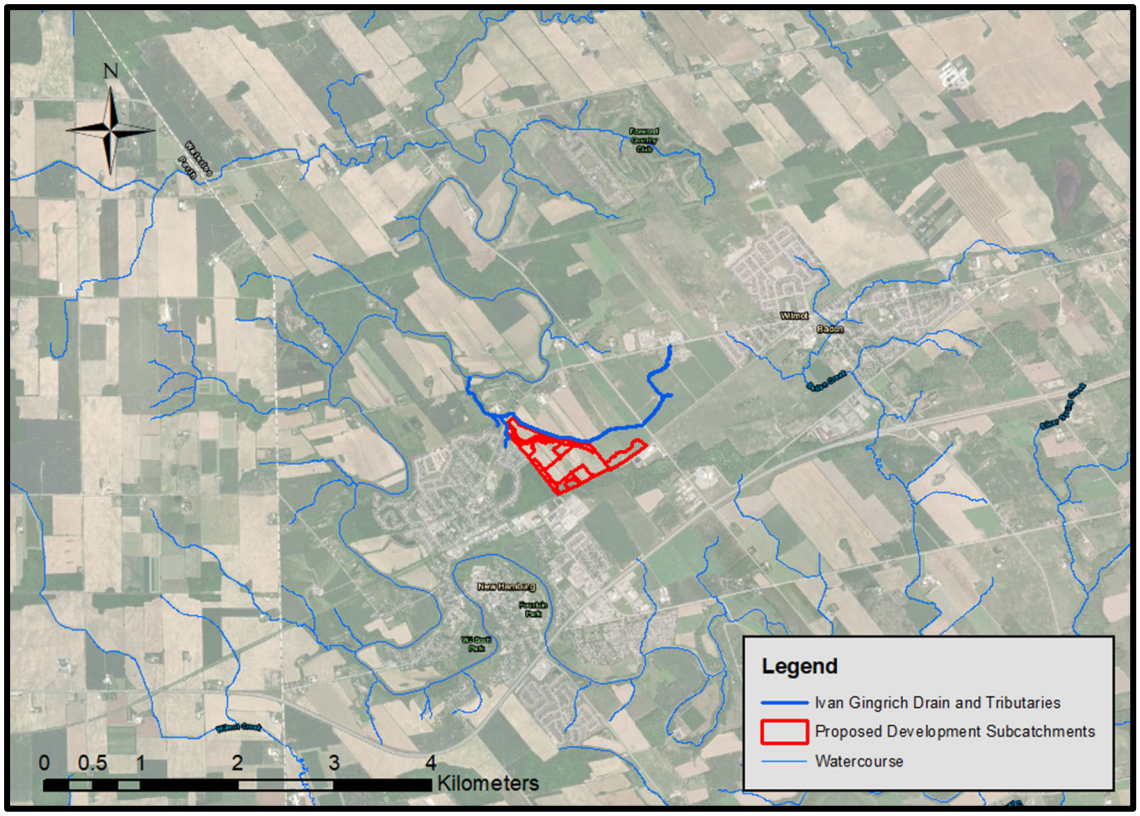


Figure 1: Location of the Study Area

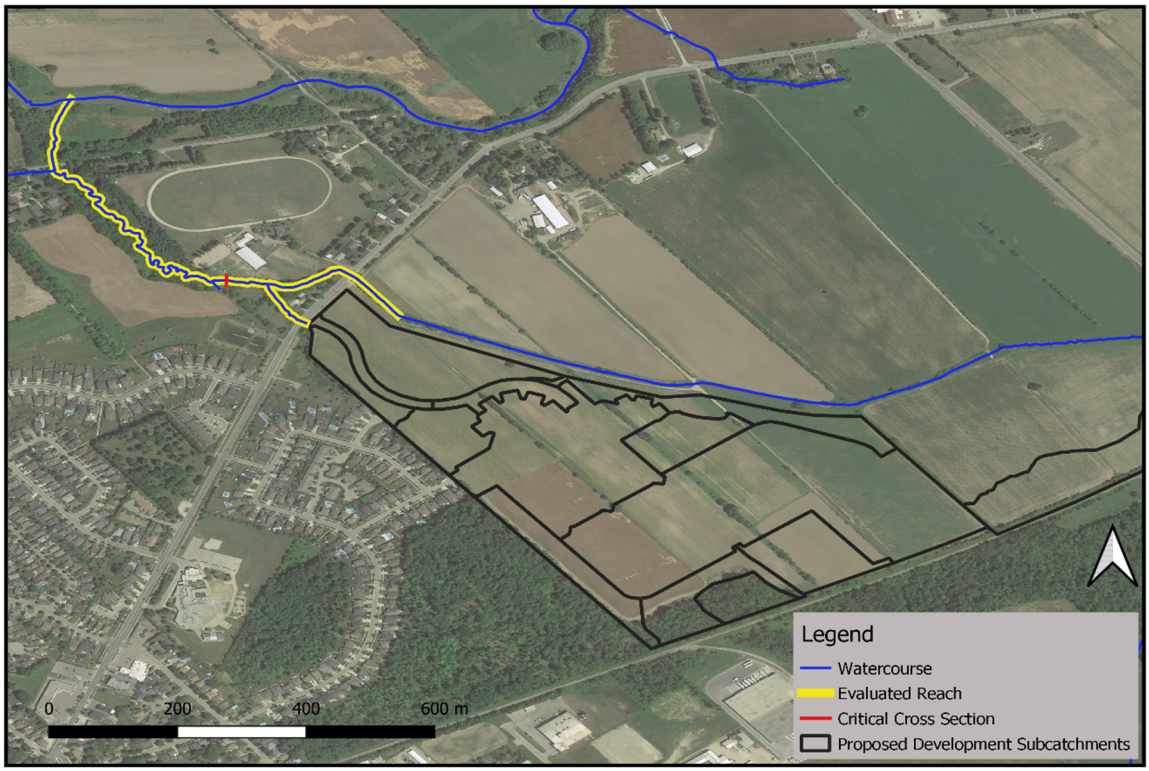


Figure 2: Identification of Study Area and Reaches

2. BACKGROUND INFORMATION

Our preliminary assessment of the Ivan Gingrich Drain for an ETA included a review of the following resources, terms of reference and background information:

- Engineering Drawings (November 2021) by MTE:
  - Post-Development Drainage Area Plan
  - Stage-Storage-Discharge Relationship – North SWMF
- Physiography of Southern Ontario by Chapman & Putnam (digital data from Ministry of Northern Development and Mines (MNDM));
- Ontario Flow Assessment Tool (OFAT);
- Ontario Base Mapping (OBM); and,
- Site Survey and Field Assessments (detailed further in Section 3).

2.1 Physiography and Surficial Geology

Understanding the surficial and underlying geology for the study area provides insight into the geological influence on channel geometry, expected rates of erosion, and helps define the quantity and type of sediment available for watercourses to transport and deposit. The northern half of the watershed is located in the Waterloo Hills physiographic region, while the southern half of the watershed including most of the study reach is located in the Stratford Till Plain.

3. FIELD INVESTIGATION & ASSESSMENT

Water's Edge visited the study site in March and November 2021 to collect field information and assess existing conditions to understand local trends and conduct rapid assessments. The rapid assessments provide general classifications of the stream stability and overall health. Erosion assessments aim to determine threshold values that define the initiation of sediment motion such as flows, depths, or velocities.

Critical locations or reaches were selected based on the proposed outfall location for the SWMF. Runoff from the proposed development will mostly flow into the proposed SWMF before being discharged into the Ivan Gingrich Drain. Critical reaches were specifically selected to assess potential impacts related to the increased runoff volume and attenuation from the proposed SWMF.

Surveying was used to collect topographic and cross-sectional information for the evaluated reaches. Signs of erosion, bankfull channel characteristics, channel alignment, as well as natural features were studied to characterize each reach. Pebble counts and sediment samples were collected for particle analysis to determine the average grainsize of the bed.

Appendix A contains a series of ground photography taken during the site visits. **Appendix B** contains figures of the longitudinal profiles and the cross sections.

3.1 Reach Delineation

Channel morphology and substrate characteristics can change along a watercourse. It is necessary to account for this variation by delineating lengths of a watercourse that exhibit representative planform, sediment substrate, land use, local geology, valley confinement, hydrology and gradient. Reaches are typically comprised of at least two meander bends and can range in length up to thousands of meters.

For this study, two reaches were considered. The Ivan Gingrich Drain tributary between the existing SWMF and the main channel was the first reach and the main branch of the Ivan Gingrich Drain between the proposed SWMF outlet and the Nith River was the second reach.

3.2 Geomorphic Characteristics

Both reaches are single threaded channels with well-defined cross-sections and banks. The main channel reach is about 9500 m long, while the tributary is about 170 m long. There is minimal riparian vegetation along the tributary, while the main channel has riparian areas on both sides through most of the reach except for the upstream end. The tributary is mostly lined with stone between the existing SWMF and Waterloo Street and is primarily exposed soil between Waterloo Street and the confluence with the main channel. Upstream of Waterloo Street, the channel is well-defined with a u-shaped cross-section, while between Waterloo Street and the confluence the cross-section is v-shaped with very low side slopes which allows flows to easily spill into the floodplains. In one portion of the tributary between Waterloo Street and the confluence, the channel had been excavated creating a narrow and deep cross-section that would reduce access to floodplains. Additionally, immediately upstream of the excavated area a large tree had been cut down which has dammed the channel and directs flows outside of the natural channel. Several small, informal culvert crossings were present

Downstream of the confluence, the main channel has very steep banks with minimal riparian vegetation and fine sediment, leading to instabilities. About 100 m downstream of the confluence, the riparian area is primarily forested, the channel has shallower banks, sediment sizes were more varied, and fewer signs of erosion were present. The representative geomorphic characteristics of the surveyed reaches surveyed are shown in **Table 1**.

Table 1: Summary of Study Area Geomorphic Parameters

Parameter	IGD Tributary	Ivan Gingrich Drain
Bankfull Width (m)	4.82	4.35
Bankfull Mean Depth (m)	0.15	0.5
Bankfull Max Depth (m)	0.31	0.88
Bankfull Area (m^2)	0.72	2.19
Wetted Perimeter (m)	4.88	4.85
Hydraulic Radius (m)	0.15	0.45
Width-Depth Ratio	32.13	8.7
Entrenchment Ratio	2.76	3.42
Bankfull Slope (m/m)	0.01	0.01
Channel Substrate D_{50} (mm)	5.84	1.1
Channel Substrate D_{84} (mm)	52.8	15.1
Rosgen Classification	C	E

3.3 Stream Assessment Scores

In addition to classification of a stream system, various techniques for geomorphic assessments are used to better understand general stream conditions (stability, habitat, erosion/degradation, riparian, etc.). Rapid field assessments provide an indication of the channel stability and ecological stream condition, while also identifying primary processes in action (e.g. widening). The Rapid Geomorphic Assessment (RGA) and the Rapid Stream Assessment Technique (RSAT) together provide a thorough description of the existing channel conditions. The field sheets of these assessments are provided in **Appendix C**.

The RGA assessment focuses entirely on the geomorphic component of a river system. The RGA method consists of four factors that summarize various components of channel adjustment. The RGA check sheet documents indicators of different modes of channel adjustment: widening, aggradation, degradation, and planform adjustment. These observations are quantified to produce

a value that indicates the state of channel stability: "In Regime/Stable" (<0.20), "Transitional/Stressed" (0.21-0.40), or "In Adjustment/Unstable" (>0.40).

Results for the RGA (**Table 2**) show that the study reach is in a state of adjustment which indicates that the channel morphology is not within the range of variance and evidence of instability is widespread. The primary indicators of geomorphic change were noted to be those of widening and degradation.

Table 2: RGA Results

Reach	Form of Adjustment				Stability Index	Condition
	Aggradation	Degradation	Widening	Planform Adjustment		
Ivan Gingrich Drain	0.43	0.4	0.3	0.14	0.32	Transitional / Stressed
Tributary	0	0	0.1	0.14	0.06	In Regime/Stable

The RSAT is a semi-quantitative approach to characterize stream conditions where 6 different criteria are scored and evaluated. Abiotic and biotic indicators which influence overall stream quality have been streamlined and weighted appropriately within each of the evaluation criteria.

The six criteria are:

1. Channel stability;
2. Channel scouring and sediment deposition;
3. Physical in-stream habitat;
4. Water quality;
5. Riparian habitat conditions; and
6. Biological conditions

River channel stability and cross-sectional characterization is a critical component of RSAT. The entire channel was inspected for signs of instability (such as bank sloughing, recently exposed non-woody tree roots, general absence of vegetation within the bottom third of the bank, recent tree falls, etc.) and channel degradation or downcutting (such as high banks in small headwater streams and erosion around man-made structures). Observations were noted and cross-section measurements were made.

A rapid assessment of soil conditions along the riverbanks was also conducted to determine soil texture and potential erodibility of the watercourse bank. Qualitative water quality measurements were also made (temperature, turbidity, colour and odour) along with an indication accumulation of sediment or substrate fouling. The RSAT typically involves a quantitative sampling or observation and evaluation of benthic organisms. As no benthic sampling was undertaken, the score was based on site conditions and general water quality observations. Each category is ranked against the maximum possible score. The sum of scores provides an indication of the watercourse's overall condition, stability and health. **Table 3** details the range of scores and rankings with a higher score suggesting a healthier system.

For the main channel of the Ivan Gingrich Drain, the score was 25.5 which corresponds to a "fair" condition. The scores were generally in the middle of the range for each category. For the tributary of the Ivan Gingrich Drain, the score was 31, which corresponds to a "good" condition. The tributary ranked highly in channel stability and channel scour and sediment deposition categories due to the rip rap lined channel as well as vegetation that stabilized the channel elsewhere. The tributary also ranked low in physical in-stream habitat, riparian habitat conditions and biological indicators. Most of these scores were related to the ephemeral nature of the tributary which was dry when it was evaluated.

Table 3: RSAT Summary Results

Category	Ivan Gingrich Drain	Tributary	Max Possible Score
Channel Stability	4.4	11	11
Channel Scour & Sediment Deposition	4.6	8	8
Physical In-Stream Habitat	3.75	3	8
Water Quality	5.25	8	8
Riparian Habitat Conditions	2.5	1	7
Biological Indicators	5	0	8
Total Score	**25.5**	**31**	**50**
Condition	**Fair**	**Good**	

4. EROSION THRESHOLD ASSESSMENT

An erosion threshold assessment is used to determine the critical flow rate at which sediment transport is initiated for a representative grain size.

4.1 General

A fluvial geomorphological survey was completed using GPS on November 16, 2021. For the purpose of an erosion threshold assessment, bankfull cross-sections were surveyed at select locations where signs of ongoing or historical erosion were present. Channel velocities and shear stresses on the bed are expected to be greatest through these sections therefore providing the best representation of critical values. The longitudinal profile was also surveyed to determine the channel slopes. Sediment samples were analyzed to determine the D_{50} and D_{84} particle sizes.

This detailed field data (cross-section, gradient, and particle distribution) is used to estimate the bankfull discharge, shear stress, and critical discharge values. Specifically, the critical discharge indicates the point at which sustained flows will tend to entrain and transport sediment. In this analysis, the D_{84} particle was used as index sizes.

Typically, to determine the critical shear stress for particle entrainment, the methods presented by Komar (1987) and Fischenich (2001) are used. These methods adapt and update the work of Shields (1936). The Komar method is most appropriate to gravel sized material, while Fischenich also incorporates finer material (sands). A modified Shields approach is also presented based on dimensionless Shields parameters presented in Julien's (1995) work. Based on the critical shear stress determined by each method, a critical depth is back-calculated and a critical discharge is determined. This critical discharge can then be applied as an erosion threshold target when controlling effluent input to the watercourse.

4.2 Erosion Threshold Considerations and Discussion

Specific cross-section locations were surveyed within the study reaches that will be impacted by the proposed SWMF. Critical threshold parameters were computed for those cross sections where bankfull indicators were considered to be reliable. Attempts were made to locate naturally formed riffles for cross-sectional surveys as these provide locations where flows are concentrated, and their composition is indicative of the type of material that becomes mobilized under frequent flow conditions below and up to the bankfull discharge.

Using the data collected during the field investigation and desktop analysis, bankfull characteristics for cross-sections were summarized. The bankfull energy gradient, bed materials, and channel classification are also summarized (**Table 1**). Related hydraulic parameters were determined; including stream power, unit stream power, and bed shear stress. These parameters were established at each cross-section and the results are summarized in **Table 4.**

Table 4: **Summary Hydraulics**

Parameter	Critical Cross-Section
Relative Roughness (m/m)	31.6
Shear Velocity (m/s)	0.14
Velocity based on FF/RR (m/s)	1.6
Bankfull Q (cms)	3.48
Froude #	0.72
Stream Power (W/m)	170.6
Unit Stream Power (W/m^2)	39.2
Bed Shear $_{To}$ (N/m^2)	19.9

Erosion threshold values for the critical reach using three different methods are shown in **Table 5**. Four cross-sections were surveyed to determine the erosion threshold, but only the cross-sections in the main channel produced reasonable values due to the stabilization and well-connected floodplains in the tributary. In the main channel, cross-sections were generally stable in the forested areas and were unstable close to the confluence with the tributary where riparian vegetation is minimal. Flows were modeled through each cross-section up to the critical depth until the representative particle size (D_{50}) is mobilized, then the critical discharge is calculated. These values generally vary with respect to the slope, roughness, and grain size. Influencing factors such as prevailing flows, land use, geology, human intervention, and in-channel structures will cause variation along the channel and need careful consideration when observing natural thresholds of erosion. As the substrate size increases, the critical flow also increases. A critical flow of 0.36 m^3/s was selected as the critical flow for erosion threshold as a conservative estimate and is based on critical shear stresses acting on the bed under bankfull conditions.

Table 5: Threshold Results

Method	Parameter	Critical Cross-Section
Komar (1987)	Critical Shear (N/m^2)	9.36
	Ratio of Bed Shear/Critical Shear	2.13
	Critical Radius (m)	0.19
	Critical Flow (m^3/s)	***0.38***
Fischenich (2001)	Critical Shear (N/m^2)	9.07
	Ratio of Bed Shear/Critical Shear	2.20
	Critical Radius (m)	0.18
	Critical Flow (m^3/s)	***0.36***
Modified Shields	Critical Shear (N/m^2)	9.15
	Ratio of Bed Shear/Critical Shear	2.18
	Critical Radius (m)	0.19
	Critical Flow (m^3/s)	***0.37***

4.3 Continuous Modelling

A continuous hydrologic model was developed using HEC-HMS 4.9 to evaluate the erosion under existing and proposed conditions. The LIDAR-based 2017 Lake Erie DTM data (Package S) was used for the terrain, Ontario Soil Survey data was used to define the hydrologic runoff conditions of the soil, and SOLRIS v3.0 was used to define the landuse in the existing conditions model. The SCS Curve Number Method was used to define runoff conditions based on the soil and landuse data. The Clark Unit Hydrograph was used to define the hydrograph transforms from the subcatchment headwaters to the outlet and is based on the physical characteristics of the subcatchment including the longest flowpath, channel length, slope, and roughness characteristics. The Muskingum-Cunge method was used for channel routing based on the slope, channel cross-section, and roughness for each reach.

Subcatchments were delineated based on the LiDAR surface using HEC-GeoHMS. Several subcatchments were manually divided so their outlets would match key locations from the SWM Report and facilitate adjustments to represent proposed conditions. The proposed conditions were initially based on the Stormwater Management Report from MTE from January 2022. Revisions to the original model including attenuating storm flows in the northern SWM pond and redirecting into the drain were completed in February 2023.

57 years of continuous daily precipitation data was obtained from 1959-2016 for the Stratford WWTP gauge, which is about 24 km from the site. The models were run for the entire period using 1-hour computation time-steps. The resulting hydrograph with hourly flow data was then analyzed to determine the number of erosion hours, cumulative effective shear stress, and cumulative effective work for existing and proposed conditions. The results of the analysis are shown in **Table 6**.

Table 6: Continuous Modelling Erosion Analysis Results

Parameter	Existing	Proposed	Percent Reduction
Erosion Hours	11,841	10,712	9.53
Cumulative Effective Shear Stress Index (Ns/m2)	1,052,792	1,026,671	2.48
Cumulative Effective Work Index (N/m)	833,104	801,674	3.77

The results show that all of the erosion indicators will be reduced under proposed conditions, particularly erosion hours. The erosion hours will be reduced by 9.53 % or 1,129 hours over 57 years. The erosion hours only consider the duration of erosion threshold exceedances, while the cumulative indices consider both the duration and magnitude of exceedances and are therefore more representative of the actual erosion potential of the critical reach. The cumulative indices show a smaller percent reduction than the erosion hours, which indicates that the duration of flows just above the erosion threshold will be reduced more, while erosion resulting from higher flows will be reduced less. This result indicates that no increase in erosion is expected in the receiving channel and that the SWM controls for the proposed site are adequate.

5. RECOMMENDATIONS AND MONITORING

During our site visit, we did note some ongoing erosion issues, particularly in the main channel of the Ivan Gingrich Drain upstream of the forested area to the confluence with the tributary. Since the proposed SWMF outlets to this part of the main channel, monitoring of these sites is necessary to prevent degradation through the construction and post-construction phases.

The following monitoring program is recommended:

1. A monumented cross-section should be established at the critical cross-section location prior to construction of the proposed SWM facility and subdivision;
2. Erosion pins should be installed on degrading and relatively stable banks in order to compare rates and prior to construction of the proposed SWM facility and subdivision;
3. The site is to be inspected each Spring and Fall during the monitoring period;
4. During each Spring inspection, photos should be taken, erosion pins measured, and site conditions observed and noted;
5. During each Fall inspection, a survey should be conducted of the monumented cross-sections and the longitudinal profile of the reach in addition to photos, erosion pin measurements, and observation of site conditions;
6. Photos are to be taken from the same locations to facilitate comparison;

7. The monitoring be carried out on an annual basis through the construction of the SWM facility and build-out of the adjacent industrial buildings and for two (2) years following 90% catchment build-out; and,
8. Annual reports summarizing the field visits including erosion pin measurements, survey data, photos, observations, and recommendations for remedial work should be provided to the agencies.

6. CONCLUSIONS

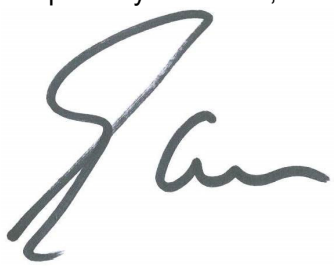
To carry out an erosion threshold assessment for the proposed development, a geomorphic survey was completed at the site, including pebble counts and sieve analyses to characterize channel materials. An erosion threshold flow rate was determined for the Ivan Gingrich Drain downstream of the proposed SWMF outfall. A monitoring program also proposed to mitigate erosion issues that may arise.

Based on our site investigations, assessments, and analyses, we conclude that:

1. Two cross-sections were identified in the study reach where erosion threshold parameters could be identified;
2. Several methods of computing erosion threshold parameters were used in the study to determine the critical flow at which incipient motion occurs;
3. The calculated erosion threshold is 0.36 m^3/s; and,
4. Continuous modelling over a 57-year period showed a reduction of Erosion Hours, Cumulative Effective Shear Stress Index, and Cumulative Effective Work Index under proposed conditions. This result indicates that additional erosion in the Ivan Gingrich Drain is unlikely and the proposed SWM controls are sufficient.

As such, we recommend that the proposed monitoring program be adopted to monitor the existing channel, ensure that post-development flows do not impact the channel and to ensure that any emerging issues are quickly identified and addressed.

Respectfully submitted,



Ed Gazendam, Ph.D., P. Eng.,
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Water Resources Engineer

Water's Edge Environmental Solutions Team Ltd.

ATTACHMENTS

Appendix A: Photographs
Appendix B: Profile and Cross Sections
Appendix C: Stream Assessment Worksheet
Appendix D: HEC-HMS Summary Tables

ADDITIONAL REFERENCES & RESOURCES

Digital data from Ministry of Northern Development and Mines (MNDM)

Fischenich. 2001. Stability Thresholds for Stream Restoration Materials. EMRRP Technical Notes Collection (ERDC TN-EMRRP-SR-29), U.S. Army Engineer Research and Development Center, Vicksburg, M.S. www.wes.army.mil/e/emrrp

Julien, P. (1995). Erosion and Sedimentation. Cambridge: Cambridge University Press.

Komar, Paul D. 1987. Selective grain entrainment and the empirical evaluation of flow competence. Sedimentology, 34: 1165-1176.

APPENDIX A:

Site Photography

PHOTOGRAPH NO.: 1
FROM: Ivan Gingrich Drain Tributary at proposed SWMF outfall location
LOOKING: Upstream at Forest Glenn SWMF

PHOTOGRAPH NO.:2
FROM: Ivan Gingrich Drain Tributary at proposed SWMF outfall location
LOOKING: Downstream

PHOTOGRAPH NO.: 3
FROM: Ivan Gingrich Drain Tributary downstream of Waterloo Street
LOOKING: Upstream at box culvert crossing

PHOTOGRAPH NO.: 4
FROM: Ivan Gingrich Drain Tributary downstream of Waterloo Street
LOOKING: Upstream, typical bed material between Waterloo Street and Ivan Gingrich Drain

PHOTOGRAPH NO.: 5
FROM: Ivan Gingrich Drain Tributary downstream of Waterloo Street
LOOKING: Downstream at trees blocking channel

PHOTOGRAPH NO.: 6
FROM: Ivan Gingrich Drain Tributary downstream of Waterloo Street
LOOKING: Downstream at excavated channel

PHOTOGRAPH NO.: 7
FROM: Ivan Gingrich Drain Tributary downstream of Waterloo Street
LOOKING: Upstream at informal culvert crossings

PHOTOGRAPH NO.: 8
FROM: Ivan Gingrich Drain at confluence with tributary
LOOKING: Upstream

PHOTOGRAPH NO.: 9
FROM: Ivan Gingrich Drain
LOOKING: At critical cross-section location

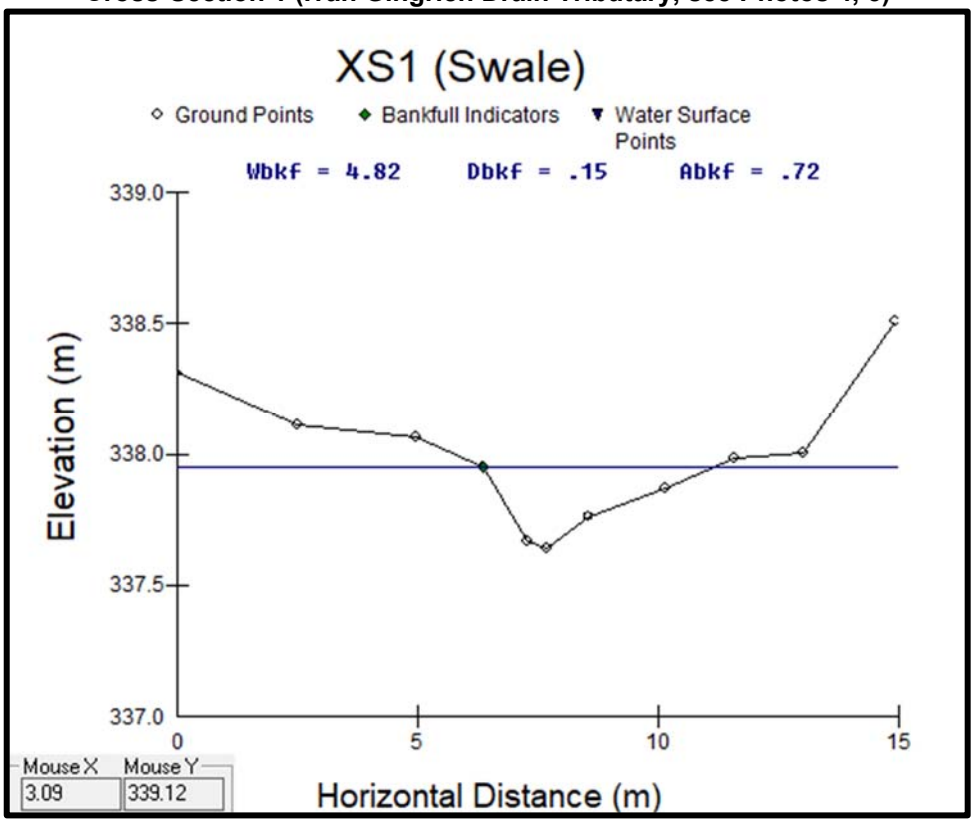
PHOTOGRAPH NO.: 10
FROM: Ivan Gingrich Drain
LOOKING: Upstream from critical cross-section

PHOTOGRAPH NO.: 11
FROM: Ivan Gingrich Drain
LOOKING: Downstream at critical cross-section

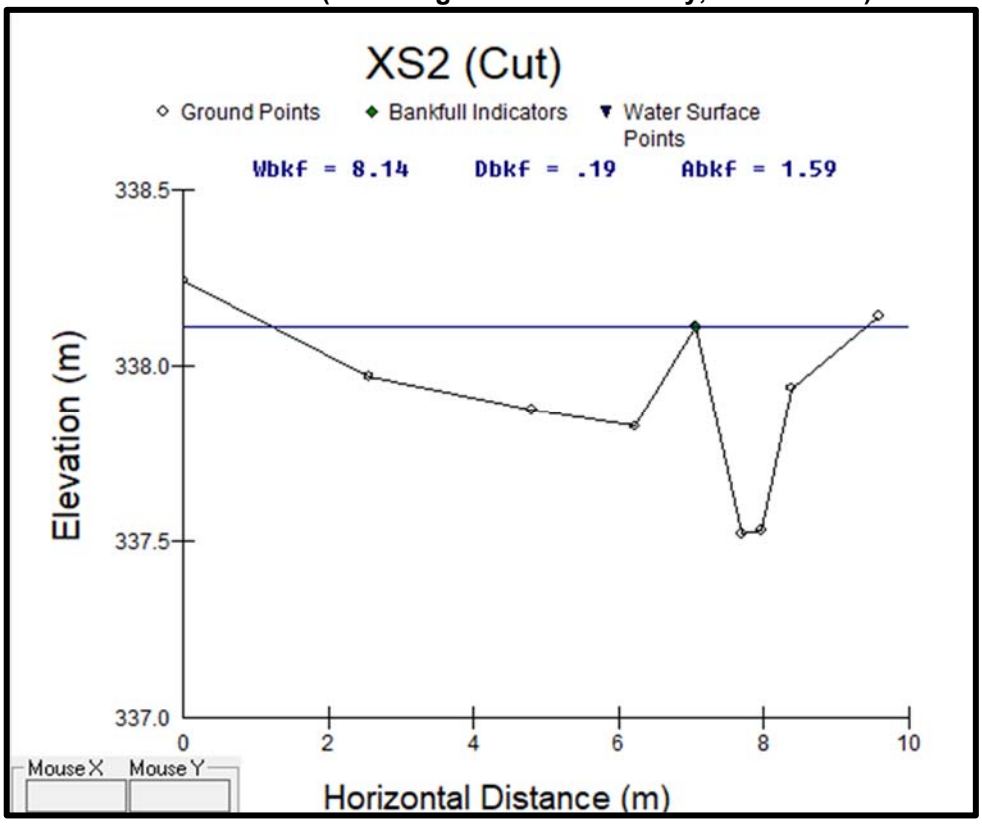
APPENDIX B:

Cross Sections

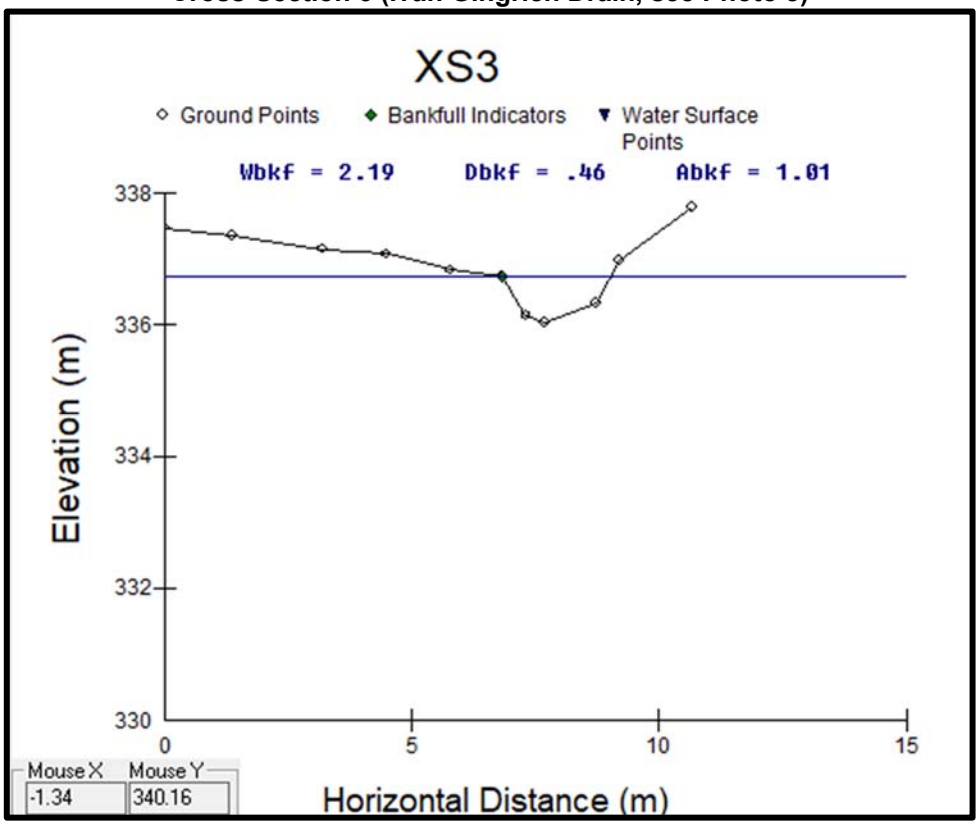
Cross-Section 1 (Ivan Gingrich Drain Tributary, see Photos 4, 5)



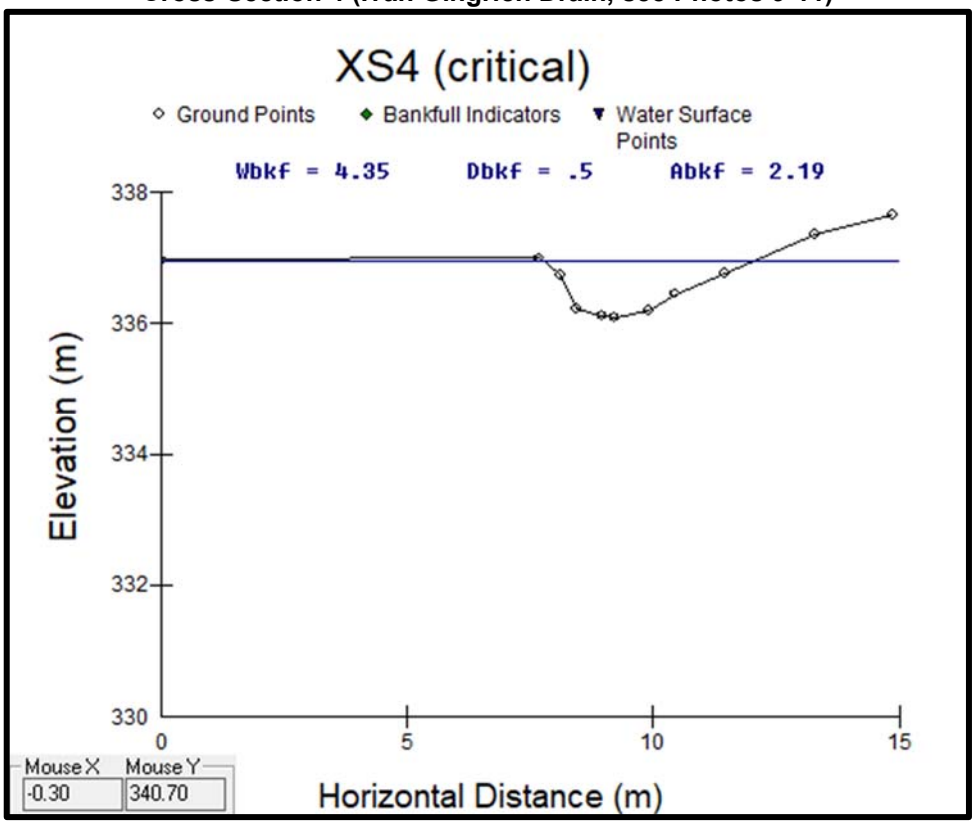
Cross-Section 2 (Ivan Gingrich Drain Tributary, see Photo 6)



Cross-Section 3 (Ivan Gingrich Drain, see Photo 8)



Cross-Section 4 (Ivan Gingrich Drain, see Photos 9-11)



APPENDIX C:

RGA and RSAT Assessment Sheets

Rapid Geomorphic Assessment

Date: 16-Nov-21
Evaluator: RG
Stream: Ivan Gingrich Drain Main Channel
Conditions: Overcast

Form / Process (1)	Geomorphic Indicator No (2)	Description (3)	Present No (4)	Present Yes (5)	Factor Value (6)
Evidence of Aggradation	1	Lobate bar	0	0	
	2	Coarse material in riffles embedded	0	0	
	3	Siltation in pools	0	1	
	4	Medial bars	0	1	
	5	Accretion on point bars	0	0	
	6	Poor longitudinal sorting of bed materials	0	1	
	7	Deposition in the overbank zone	0	0	
		Sum of Indices	0	3	0.43
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	0	0	
	2	Exposed sanitary/storm sewer/pipeline/etc.	0	0	
	3	Elevated storm sewer outfall(s)	0	0	
	4	Undermined gabion baskets/concrete aprons/etc.	0	0	
	5	Scour pools d/s of culverts/storm sewer outlets	0	0	
	6	Cut face on bar forms	0	1	
	7	Head cutting due to knick point migration	0	1	
	8	Terrace cut through older bar material	0	1	
	9	Suspended armour layer visible in bank	0	1	
	10	Channel worn into undisturbed overburden/bedrock	0	0	
		Sum of Indices	0	4	0.40
Evidence of Widening (WI)	1	Fallen/leaning trees/fence posts/etc.	0	0	
	2	Occurrence of large organic debris	0	0	
	3	Exposed tree roots	0	1	
	4	Basal scour on inside meander bends	0	1	
	5	Basal scour on both sides of channel through riffle	0	1	
	6	Gabion baskets/concrete walls/etc. out flanked	0	0	
	7	Length of basal scour >50% through subject reach	0	0	
	8	Exposed length of previously buried pipe/cable/etc.	0	0	
	9	Fracture lines along top of bank	0	0	
	10	Exposed building foundation	0	0	
		Sum of Indices	0	3	0.30
Evidence of Planimetric Form Adjustment (PI)	1	Formation of cut (s)	0	0	
	2	Single thread channel to multiple channel	0	0	
	3	Evolution of pool-riffle form to low bed relief form	0	0	
	4	Cutoff channel(s)	0	0	
	5	Formation of island(s)	0	0	
	6	Thalweg alignment out of phase meander form	0	1	
	7	Bar forms poorly formed/reworked/removed	0	0	
		Sum of Indices	0	1	0.14
Stability Index (SI) = (AI + DI+ WI+ PI) /m					**0.32**
			Condition:	Transitional/Stressed	

General Comments:
"In Regime/Stable" (<0.20), "Transitional/Stressed" (0.21-0.40), or "In Adjustment/Unstable" (>0.40).

Rapid Geomorphic Assessment

Date: 16-Nov-21
Evaluator: RG
Stream: Ivan Gingrich Drain Tributary (SWMF Outflow Channel)
Conditions: Overcast

Form / Process (1)	Geomorphic Indicator No (2)	Description (3)	Present No (4)	Present Yes (5)	Factor Value (6)
Evidence of Aggradation	1	Lobate bar	0	0	
	2	Coarse material in riffles embedded	0	0	
	3	Siltation in pools	0	0	
	4	Medial bars	0	0	
	5	Accretion on point bars	0	0	
	6	Poor longitudinal sorting of bed materials	0	0	
	7	Deposition in the overbank zone	0	0	
		Sum of Indices	0	0	0.00
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	0	0	
	2	Exposed sanitary/storm sewer/pipeline/etc.	0	0	
	3	Elevated storm sewer outfall(s)	0	0	
	4	Undermined gabion baskets/concrete aprons/etc.	0	0	
	5	Scour pools d/s of culverts/storm sewer outlets	0	0	
	6	Cut face on bar forms	0	0	
	7	Head cutting due to knick point migration	0	0	
	8	Terrace cut through older bar material	0	0	
	9	Suspended armour layer visible in bank	0	0	
	10	Channel worn into undisturbed overburden/bedrock	0	0	
		Sum of Indices	0	0	0.00
Evidence of Widening (WI)	1	Fallen/leaning trees/fence posts/etc.	0	0	
	2	Occurrence of large organic debris	0	0	
	3	Exposed tree roots	0	1	
	4	Basal scour on inside meander bends	0	0	
	5	Basal scour on both sides of channel through riffle	0	0	
	6	Gabion baskets/concrete walls/etc. out flanked	0	0	
	7	Length of basal scour >50% through subject reach	0	0	
	8	Exposed length of previously buried pipe/cable/etc.	0	0	
	9	Fracture lines along top of bank	0	0	
	10	Exposed building foundation	0	0	
		Sum of Indices	0	1	0.10
Evidence of Planimetric Form Adjustment (PI)	1	Formation of cut (s)	0	0	
	2	Single thread channel to multiple channel	0	0	
	3	Evolution of pool-riffle form to low bed relief form	0	0	
	4	Cutoff channel(s)	0	0	
	5	Formation of island(s)	0	0	
	6	Thalweg alignment out of phase meander form	0	1	
	7	Bar forms poorly formed/reworked/removed	0	0	
		Sum of Indices	0	1	0.14
Stability Index (SI) = (AI + DI+ WI+ PI) /m					**0.06**
			Condition:	IN REGIME / STABLE	

General Comments:
"In Regime/Stable" (<0.20), "Transitional/Stressed" (0.21-0.40), or "In Adjustment/Unstable" (>0.40).

RAPID STREAM ASSESSMENT TECHNIQUE (RSAT) Evaluation

Creek Name: Ivan Gingrich Drain
New Hamburg, ON

RSAT Section #: 3,4

Assessor: RG

Date: November 16, 2021

Coordinates:

Evaluation Category	Relative Significance	Criteria	Rating: Excellent	Good	Fair	Poor	Score
1 Channel Stability	Indicative of hydrologic/flow regime alteration and general condition of physical aquatic habitat. Provides insight into past, present and possible future changes in channel morphometry	Bank Stability	>80%	71-80 %	50-70 %	< 50 %	5
		Stream Bend Stability Outer bank height/bank overhang	<0.60 m / <0.60m	0.60 to 0.90 m / 0.60 to 0.75 m	0.90 to 1.20 m / 0.75 to 0.90 m	>1.20 m / >0.90 m	2
		Exposed roots and falls	old and large / 0-1	some young / 2-3	young common / 4-5	young abundant / >6	5
		Bottom 1/3 of Bank	resistant plant/soil	resistant plant/soil	highly erodable plant/soil	highly erodable plant/soil	6
		Cross-Section	V or U	V or U	Trapezoidal	Trapezoidal	4
		Typical Score:	**9 to 11**	**6 to 8**	**3 to 5**	**0 to 2**	**4.4**
	NOTES:						
2 Channel Scour and Sediment Deposition	Relates to level of uncontrolled stormwater runoff, sediment load and transport and degradation of instream habitat.	Riffle Embeddedness	<25% sand & silt	25-50%	50-75%	>75%	4
		# of deep pools / substrate	high # / <30% fines	mod # / 30-60% fines	low-mod # / 60-80% fines	few # / >80 % fines	4
		Streak marks/sediment deposits absent	marks / dep absent	uncommon	common	common	4
		large sand deposits/fresh	rare / no fresh dep.	uncommon and small localized dep	common and small localized dep.	common and heavy dep along major portion	5
		Point bar/vege/sand	few / well vege / none	small/well vege/little	mod-large& unstable/high am't of sand common	mod-large& unstable/high am't of sand at most bends	6
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**4.6**
	NOTES:						
3 Physical In-stream Habitat	Relates to the ability of a stream to meet basic physical requirements necessary for the support of a well-balanced aquatic community (eg: depth of flow, water velocity, water temperature, substrate type and quality, etc).	Wetted Perimeter	> 85% of bottom width	61-85%	40 - 60 %	< 40 %	7
		Diversity of structure, velocity and depth of flow	All forms present, diverse vel. and depth of flow	Good mix of form, rel. diverse velocity and depth	Few pools, riffles and runs dominant, vel & depth gen shallow/slow	dominated by 1 type (usually runs) and 1 vel/depth (usually slow & shallow	5
		Riffle substrate	cobble, gravel, rubble, boulder mix with little sand & >50 % cobble	Good mix of gravel, cobble and rubble & 25-49% cobble	predominantly small cobble, gravel and sand & 5 - 24 % cobble	Predominantly gravel with high % sand & <5% cobble	2
		Riffle depth	>0.20 m	0.15 - 0.19 m	0.10 - 0.14 m	< 0.10 m	2
		Large Pool Depth	> 0.60 m	0.45 - 0.59 m	0.30 - 0.44 m	< 0.30 m	2
		Channel Process	No channel alteration of significant point bar formation or enlargement	Slight increase in point bar formation or slight amount of channel mod.	Mod. increase in point bars and / or channel mod.	extensive channel alteration or point bar formation / enlargement	5
		Riffle-Pool Ratio	0.9 - 1.1 to 1	0.7 - 0.89 to 1 or 1.11 - 1.3 to 1	0.5 - 0.69 to 1 or 1.31 - 1.5 to 1	< 0.49 to 1 or > 1.51 to 1	3
		Stream Temp. on a Summer Afternoon	< 20 ○ C	20 to 24 ○ C	24 to 26 ○ C	>27 ○ C	4
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**3.75**
	NOTES:						
4 Water Quality	Indicative of watershed perturbations / general level of human activity, point and non-point source loads, and aquatic habitat conditions.	Substrate Fouling (on rock underside)	None: 0 -10%	Light: 11-20%	Mod: 21 - 50 %	High >50%	3
		Total Dissolved Solids (TDS)	<50mg/L	50-100 mg/L	101-150 mg/L	>150 mg/L	5
		Clearness of Water	>0.90 m visibility	0.45 - 0.89 m	0.15 - 0.44 m	<0.15 m visible	5
		Odour	None	Slight organic odour	Slight - Moderate odour	Moderate to strong odour	8
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**5.25**
	NOTES:						
5 Riparian Habitat Conditions	Provides insight into change(s) in stream energetics, temperature regime, and both aquatic and terrestrial habitat conditions	Width of Riparian Buffer	Wide > 200' with mature forests on both sides	Forested buffer >100' along major portion	Predom. Wooded but major localized gaps	Mostly non-wooded vegetation, narrow width.	3
		Canopy coverage (Shading)	>80% shading	60-79% shading	50-60 % shading	<50 % shading	1
		Typical Score:	**6 to 7**	**4 to 5**	**2 to 3**	**0 to 1**	**2**
	NOTES:						
6 Biological Indicators	Best overall indication of stream health and level of watershed perturbation	Diversity of macro-invert community	Diverse community present (mayflies, stoneflies, and cased caddisflies (few snails or leeches)	Mayflies and caddisflies (stoneflies absent)	Pollution-tolerant species; aquatic worms dominant	Poor diversity dominated by midgeflies, aquatic worms and snails.	5
		Number of Individuals	Mod to High #	Mod to High #	Low - Mod #	Low #	5
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**5**
	NOTES:						

TOTAL SCORE:	**25**
CONDITION:	**Fair**

RAPID STREAM ASSESSMENT TECHNIQUE (RSAT) Evaluation

Creek Name: Ivan Gingrich Drain Tributary
New Hamburg, ON

RSAT Section #: 1,2

Assessor: RG

Date: November 16, 2021

Coordinates:

Evaluation Category	Relative Significance	Criteria	Rating: Excellent	Good	Fair	Poor	Score
1 Channel Stability	Indicative of hydrologic/flow regime alteration and general condition of physical aquatic habitat. Provides insight into past, present and possible future changes in channel morphometry	Bank Stability	>80%	71-80 %	50-70 %	< 50 %	11
		Stream Bend Stability Outer bank height/bank overhang	<0.60 m / <0.60m	0.60 to 0.90 m / 0.60 to 0.75 m	0.90 to 1.20 m / 0.75 to 0.90 m	>1.20 m / >0.90 m	11
		Exposed roots and falls	old and large / 0-1	some young / 2-3	young common / 4-5	young abundant / >6	11
		Bottom 1/3 of Bank	resistant plant/soil	resistant plant/soil	highly erodable plant/soil	highly erodable plant/soil	11
		Cross-Section	V or U	V or U	Trapezoidal	Trapezoidal	11
		Typical Score:	**9 to 11**	**6 to 8**	**3 to 5**	**0 to 2**	**11**
NOTES:							
2 Channel Scour and Sediment Deposition	Relates to level of uncontrolled stormwater runoff, sediment load and transport and degradation of instream habitat.	Riffle Embeddedness	<25% sand & silt	25-50%	50-75%	>75%	8
		# of deep pools / substrate	high # / <30% fines	mod # / 30-60% fines	low-mod # / 60-80% fines	few # / >80 % fines	8
		Streak marks/sediment deposits absent	marks / dep absent	uncommon	common	common	8
		large sand deposits/fresh	rare / no fresh dep.	uncommon and small localized dep	common and small localized dep.	common and heavy dep along major portion	8
		Point bar/vege/sand	few / well vege / none	small/well vege/little	mod-large& unstable/high am't of sand common	mod-large& unstable/high am't of sand at most bends	8
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**8**
NOTES:							
3 Physical In-stream Habitat	Relates to the ability of a stream to meet basic physical requirements necessary for the support of a well-balanced aquatic community (eg: depth of flow, water velocity, water temperature, substrate type and quality, etc).	Wetted Perimeter	> 85% of bottom width	61-85%	40 - 60 %	< 40 %	0
		Diversity of structure, velocity and depth of flow	All forms present, diverse vel. and depth of flow	Good mix of form, rel. diverse velocity and depth	Few pools, riffles and runs dominant, vel & depth gen shallow/slow	dominated by 1 type (usually runs) and 1 vel/depth (usually slow & shallow	0
		Riffle substrate	cobble, gravel, rubble, boulder mix with little sand & >50 % cobble	Good mix of gravel, cobble and rubble & 25-49% cobble	predominantly small cobble, gravel and sand & 5 - 24 % cobble	Predominantly gravel with high % sand & <5% cobble	8
		Riffle depth	>0.20 m	0.15 - 0.19 m	0.10 - 0.14 m	< 0.10 m	0
		Large Pool Depth	> 0.60 m	0.45 - 0.59 m	0.30 - 0.44 m	< 0.30 m	0
		Channel Process	No channel alteration of significant point bar formation or enlargement	Slight increase in point bar formation or slight amount of channel mod.	Mod. increase in point bars and / or channel mod.	extensive channel alteration or point bar formation / enlargement	8
		Riffle-Pool Ratio	0.9 - 1.1 to 1	0.7 - 0.89 to 1 or 1.11 - 1.3 to 1	0.5 - 0.69 to 1 or 1.31 - 1.5 to 1	< 0.49 to 1 or > 1.51 to 1	8
		Stream Temp. on a Summer Afternoon	< 20 ○ C	20 to 24 ○ C	24 to 26 ○ C	>27 ○ C	0
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**3**
NOTES:							
4 Water Quality	Indicative of watershed perturbations / general level of human activity, point and non-point source loads, and aquatic habitat conditions.	Substrate Fouling (on rock underside)	None: 0 -10%	Light: 11-20%	Mod: 21 - 50 %	High >50%	8
		Total Dissolved Solids (TDS)	<50mg/L	50-100 mg/L	101-150 mg/L	>150 mg/L	8
		Clearness of Water	>0.90 m visibility	0.45 - 0.89 m	0.15 - 0.44 m	<0.15 m visible	8
		Odour	None	Slight organic odour	Slight - Moderate odour	Moderate to strong odour	8
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**8**
NOTES:							
5 Riparian Habitat Conditions	Provides insight into change(s) in stream energetics, temperature regime, and both aquatic and terrestrial habitat conditions	Width of Riparian Buffer	Wide > 200' with mature forests on both sides	Forested buffer >100' along major portion	Predom. Wooded but major localized gaps	Mostly non-wooded vegetation, narrow width.	1
		Canopy coverage (Shading)	>80% shading	60-79% shading	50-60 % shading	<50 % shading	1
		Typical Score:	**6 to 7**	**4 to 5**	**2 to 3**	**0 to 1**	**1**
NOTES:							
6 Biological Indicators	Best overall indication of stream health and level of watershed perturbation	Diversity of macro-invert community	Diverse community present (mayflies, stoneflies, and cased caddisflies (few snails or leeches)	Mayflies and caddisflies (stoneflies absent)	Pollution-tolerant species; aquatic worms dominant	Poor diversity dominated by midgeflies, aquatic worms and snails.	0
		Number of Individuals	Mod to High #	Mod to High #	Low - Mod #	Low #	0
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**0**
NOTES:							

TOTAL SCORE:	**31**
CONDITION:	**Good**

APPENDIX D:

HEC-HMS Summary Tables

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (MM)
W180	0.110	0.175	28Jul.1983, 00:00	59003
Sugarlane Ridge SWMF	0.110	0.166	28Jul.1983, 00:00	58994
W230	0.266	0.423	28Jul.1983, 00:00	58975
214	0.018	0.028	28Jul.1983, 00:00	58985
W270c	0.011	0.018	28Jul.1983, 00:00	59044
Forest Glenn SWMF	0.295	0.477	27Jul.1983, 06:00	59082
R290	0.295	0.475	27Jul.1983, 06:00	59080
205	0.006	0.009	28Jul.1983, 00:00	59055
207	0.009	0.015	28Jul.1983, 00:00	59020
Infiltration Gallery	0.006	0.009	27Jul.1983, 14:00	59045
W270b	0.003	0.005	28Jul.1983, 00:00	58985
W280	0.002	0.003	28Jul.1983, 00:00	59015
UserPoint5	0.314	0.506	27Jul.1983, 06:00	59076
W320	0.217	0.346	28Jul.1983, 00:00	59029
W80	0.271	0.431	28Jul.1983, 00:00	59028
J109	0.565	0.898	27Jul.1983, 10:00	59028
W340	0.076	0.121	28Jul.1983, 00:00	59031
Adam Beck PS SWMF	0.076	0.122	27Jul.1983, 04:00	59041
R330	0.076	0.122	27Jul.1983, 04:00	59025
R440	0.565	0.898	27Jul.1983, 10:00	59018
W430	0.419	0.667	28Jul.1983, 00:00	59025
UserPoint8	0.984	1.565	27Jul.1983, 10:00	59021
R500	0.984	1.565	27Jul.1983, 12:00	59022
W480	0.215	0.341	28Jul.1983, 00:00	59034
UserPoint9	1.198	1.906	27Jul.1983, 12:00	59024
R40	1.198	1.906	27Jul.1983, 12:00	59024
206	0.019	0.029	28Jul.1983, 00:00	59020
204	0.015	0.023	28Jul.1983, 00:00	58997
Junction-1	1.232	1.959	27Jul.1983, 12:00	59024
IGMD	1.232	1.959	27Jul.1983, 12:00	59025
201	0.069	0.109	28Jul.1983, 00:00	59059
203	0.014	0.022	28Jul.1983, 00:00	59042
202	0.007	0.011	28Jul.1983, 00:00	59055
Proposed SWMF	0.090	0.142	28Jul.1983, 00:00	59053
Reach-1	0.090	0.142	28Jul.1983, 00:00	59053
Junction-3	0.090	0.142	28Jul.1983, 00:00	59053
SWALE	0.090	0.142	28Jul.1983, 00:00	59053
208	0.033	0.053	28Jul.1983, 00:00	59020
Junction-2	1.354	2.154	28Jul.1983, 00:00	59026
IGDM-Middle	1.354	2.154	28Jul.1983, 00:00	59027
W470	0.345	0.549	28Jul.1983, 00:00	59002
R50	0.314	0.501	27Jul.1983, 06:00	59069
W270a	0.007	0.012	28Jul.1983, 00:00	58992
J124	2.022	3.215	28Jul.1983, 00:00	59029

R150	2.022	3.215	28Jul.1983, 00:00	59030
R170	0.110	0.166	28Jul.1983, 00:00	58992
W160	0.006	0.009	28Jul.1983, 00:00	58964
W140	0.013	0.021	28Jul.1983, 00:00	58920

Appendix I

GRCA Comments and Response Letter

Alex Cressman

From: Trevor Heywood <theywood@grandriver.ca>
Sent: Monday, December 5, 2022 12:13 PM
To: Jason Cabral
Cc: Paul Britton; Adam@capitalhomes.ca; Tricia Radburn; Paul Grespan; Jeff Martens; Garett Korber; Alex Cressman
Subject: RE: Wilmot Woods Developments - Draft Plan 30T-22601 - GRCA Response

Some people who received this message don't often get email from theywood@grandriver.ca. Learn why this is important

Hi Jason,

We find the submissions to be satisfactory. Prior to providing our formal recommendation to approve the draft plan, we wish to request the following:

- Payment of the remaining 30% of our subdivision fee ($9,000)
- Revised draft plan (if required)
- Final revised SWM report reflecting the updated responses
- Shapefiles of the pre- and post-development floodplain

Thank you. Regards,

Trevor Heywood
Resource Planner
Grand River Conservation Authority

400 Clyde Road, PO Box 729
Cambridge, ON N1R 5W6
Phone: 519-621-2763 ext. 2292
Email: theywood@grandriver.ca
www.grandriver.ca | Connect with us on social media

From: Jason Cabral <JCabral@mte85.com>
Sent: Friday, November 4, 2022 3:17 PM
To: Trevor Heywood <theywood@grandriver.ca>
Cc: Paul Britton <pbritton@mhbcplan.com>; Adam@capitalhomes.ca; Tricia Radburn <Tricia.Radburn@rjburnside.com>; Paul Grespan <pgrespan@mgbwlaw.com>; Jeff Martens <jmartens@mte85.com>; Garett Korber <gkorber@mte85.com>; Alex Cressman <ACressman@mte85.com>
Subject: Wilmot Woods Developments - Draft Plan 30T-22601 - GRCA Response

Good afternoon Trevor,

Please find link below to our response package to your comments dated May 31, 2022 and our meeting with the GRCA on June 23, 2022, with regards to the above noted Draft Plan of Subdivision for your review and comment.

Please click on the following link to download the attachments: https://files.mte85.ca/message/IHlPXGB74JPUJLdlvLfU5N
The attachments are available until: **Friday, 25 November.**

FILES ATTACHED TO THIS LINK:
35056_104_ltr_2022_11_04_GRCA Comments Response.pdf 10.9 MB

MTE Consultants
520 Bingemans Centre Drive, Kitchener, Ontario N2B 3X9

November 4, 2022
MTE File No.: 35056-104

Trevor Heywood
Resource Planner
Grand River Conservation Authority
400 Clyde Road
Cambridge, ON N1R 5W6
theywood@grandriver.ca

Dear Trevor:

RE: Draft Plan of Subdivision 30T-22601
Zoning Bylaw Amendment 05/22
Waterloo Street, New Hamburg, Township of Wilmot
Wilmot Woods Developments

Further to your letter dated May 31, 2022 with regards to the above noted application addressed to David Welwood and Andrew Martin, we offer the following responses. These responses are also based on our meeting with GRCA staff on June 23, 2022. For ease of reference, GRCA's engineering comments have been incorporated within this letter and MTE's corresponding responses are in *italics* thereafter. Please note that the Natural Heritage comments will be dealt with separately by Burnside.

GRCA Comments

The GRCA has reviewed this application as per our Provincial delegated responsibility to review natural hazards identified in Section 3.1 of the Provincial Policy Statement (PPS, 2020), as a public body under the Planning Act, and in accordance with Ontario Regulation 150/06, GRCA's Board approved policies, and our MOU with the Region of Waterloo.

We recommend deferring draft plan approval until our comments with respect to the floodplain and stormwater management below are addressed.

Floodplain

1. The 100-year flows in the HEC-RAS model generate higher floodplain elevations than the Regional storm. Therefore, the 100-year floodplain is the regulatory floodplain. Please revise the draft plan and all figures accordingly.

   a. Part of Blocks 17 and 18 are currently drawn in the floodplain. All development blocks must be re-drawn outside of the floodplain in the revised draft plan.

MTE Response

Correct, the Regulatory floodplain upstream of Waterloo Street is based on flows from the 100-year event. Figures/Drawings within the Preliminary SWM Report and the FSR will be updated to reflect this GRCA Policy 8.1.28 states that development may be permitted within the floodplain in backwater areas subject to less than 0.5m of flooding which have been artificially created as a result of undersized infrastructure such as culverts (ie Waterloo Street crossing). We believe the minor grading and filling within the floodplain in the vicinity of Blocks 17 and 18 falls within this policy.

2. Please provide a Floodplain Analysis Brief or equivalent, documenting the floodplain delineation. Please include the following documents, and any further documentation to support the floodplain delineation:
   - Hydrologic modeling, complete with modeling files, catchment area delineation and hydrologic parameter characterization;
   - Explanation of flow change locations;
   - Revised cross-section location plan that corresponds to the modeling provided (labels and section extent);
   - Discussion of crossing locations design;
   - Discussion of boundary conditions. We note the modeling uses a known water surface elevation for boundary conditions, but there is not clarification of how this elevation was determined;
   - Summary of results (water surface elevations and velocities);
   - Discussion of loss of flood storage in the floodplain;
   - Discussion of impact of floodplain on the outlet channel conveying discharge from Stormwater Management (SWM) Facility 1; and,
   - Review of errors in the model.

MTE Response

A Floodplain Analysis Brief has been prepared and is attached (Attachment A).

Stormwater Management

3. We acknowledge that the Wilmot Employment Lands SWM facility also captures and treats discharge from the proposed subdivision; however, given the immediate outlet of SWM Facility 2 is the woodlot and wetland, we request enhanced quality control treatment (80% total suspended solids [TSS] removal) within SWM Facility 2.

MTE Response

SWM Facility 2 has been revised from a dry pond to a wet pond design to provide 80% TSS removal. A preliminary figure is attached to show the revised configuration (Attachment B).

4. The water balance assessment for the site has not been provided due to the recommendations from the Enhanced Master Drainage Plan (EMDP; MTE, May 2012). The study area for the EMDP did not include all of the subject property and cannot be used as justification to forego a water balance for the entire site. Please provide site-specific justification as to why water balance is not provided. Site-specific soil information provided in the geotechnical investigation suggests there may be areas conducive to infiltration.

MTE Response

The EMDP established that due to the fine grained nature of the subsurface material within the study area, infiltration will not be feasible for the majority of the study area, however there may be silty sand lenses which may be accessible on some sites for rooftop infiltration.

The fine-grained soil characteristics have been confirmed through the majority of the subject lands based on the information gathered from the geotechnical and hydrogeological investigations completed to date. These investigations have concluded that the majority of the

underlying soils within the subject lands include extensive deposits of clayey silt. The prevalence of low-permeability clayey silt deposits limits on-site infiltration.

Although the soils in the northern portion of the site are conducive to infiltration (sand and silty sand material), the presence of high groundwater eliminates the widespread potential to provide infiltration in these areas.

5. Please note that the GRCA will credit a maximum of 50% TSS removal for an oil-grit separator (OGS) unit. An OGS will be accepted as a quality control measure for Catchment 205 as part of a treatment train.

MTE Response

An OGS, infiltration gallery and outlet swale treatment train is proposed to treat runoff from Drainage Area 205.

6. There appears to be an OGS unit (202) at the outlet of Catchment 202 to SWM Facility 1. This is not documented in the SWM report. Please confirm. The GRCA is supportive of the use of an OGS as part of a treatment train.

MTE Response

An OGS is proposed as part of a treatment train for runoff Drainage Area 202.

7. We note that the areas for the catchments for the surface water balance assessment (101, 103, 104 and 102) add up to 2.25 hectares, whereas the pre-development drainage area plan catchments (104, 105 and 106) add up to 2.83 hectares. This same discrepancy exists in post-development conditions. Please review and clarify.

MTE Response

The purpose of this water balance is to define the impact of surface water inputs to the woodland and wetland under pre- and post-development conditions. The pre-development drainage area of 2.83 ha includes portions of the wetland/wooded area that drains directly into the ditch with very short flow lengths east of the ditch. Since the flow length areas east of the channel are small, they are not considered part of the surface water balance.

8. Please provide a calculation confirming the sizing of the outlet from SWM Facility 1 to Ivan Gingrich Drain, accounting for existing flows in the channel.

MTE Response

Please see attached FlowMaster calculations confirming capacity of the existing and proposed channels (Attachment C). Since the channel will be under a flooded condition in the 100-year event, the 50-year event was used to confirm flows within the channel. Based on the existing survey, the existing channel has an average width of approximately 1.25m with an average slope of 0.45% from the proposed channel outlet to the existing culvert. With flows from the existing SWM Facility (~0.11cms) and the proposed SWMF (~0.40cms), the existing channel will be flowing at an approximate depth of 355mm under the 50-year event.

9. Please provide the SWMHYMO modeling files (input and output) for review.

MTE Response

SWMHYMO modelling files are provided within the revised SWM Report.

10. The Erosion Threshold Analysis (Water's Edge, February 2022) refers to the Nith River as the Grand River. Please revise.

MTE Response

The Erosion Threshold Analysis will be revised, and submitted under separate cover.

Natural Heritage

11. The environmental impact study (EIS) does not capture the trail network's impact on woodland and wetland buffers. Please revise and propose any required mitigation measures.

MTE Response

A response from RJ Burnside has been provided under separate cover and is attached (Attachment D). Preliminary trail network design plans are attached (Attachment E).

12. The draft plan shows a 15m buffer around the wetlands. The buffer should be shown as 30 metres, except where it is proposed to be encroached by development and servicing blocks.

A response from RJ Burnside has been provided under separate cover and is attached (Attachment D). The draft plan will be revised as requested.

Advisory Comment

A. The extent of the Ivan Gingerich floodplain is large at the north end of the subject property due to the low and flat nature of the existing topography. There may be opportunities to reduce the floodplain extent by improving the drainage corridor's conveyance. If it is supported by the Township from a drainage perspective, we would entertain a discussion to reduce the floodplain through these means if the proposed improvements:
    a. Are not flood protection works or bank stabilization works as prohibited by GRCA policy 8.1.35(e);
    b. Improve the hydrologic and ecological function of the drain corridor, consistent with GRCA policy 9.1.7;
    c. Maintain a minimum 15 metre setback from the banks of the watercourse; and
    d. Do not exacerbate the flooding hazard upstream or downstream.

MTE Response

Due to the large flows at the Waterloo Street crossing under the Regulatory event, the floodplain upstream of the crossing is primarily a function of the road elevation, and not the culvert. During significant flooding events (including the 100 year and Regional events) Waterloo Street acts as a weir structure, and as such the backwater upstream of the culvert crossing is essentially set by the road elevation. Increasing the size of the culvert would have a negligible impact on the Regulatory floodplain. The hydraulic modelling of the IGMD is provided within the attached Floodplain Analysis Brief.

Conclusion

We have received the required 70% of the subdivision fee ($21,000). The remaining 30% ($9,000) is required prior to the GRCA issuing conditions of draft plan approval. Additional fees will be required for final clearance, and a separate fee will be required for any GRCA permits.

We trust that the above responses are in order. Should you have any comments or questions please contact the undersigned.

Yours truly,

MTE Consultants Inc.

Alex Cressman, P.Eng.
Design Engineer
519-743-6500 ext. 1279
acressman@mte85.com

AJC:jng
cc: Paul Britton, MHBC Planning (email)
Adam Belsky, Wilmot Woods Developments Inc. (email)
Tricia Radburn, RJ Burnside (email)
Paul Grespan, McCarter Grespan Lawyers (email)
Jeff Martens / Jason Cabral / Garett Korber, MTE Consultants Inc

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Appendix J

Wetland Surface Water Balance

Runoff Water Balance Analysis to Wetland
Wilmot Woods Subdivision, Township of Wilmot

Project: 35056-104

Date: March 6, 2023

By:AJC

Q:\35056\104\SWM\35056-104 Wetland Water Balance.xls

Hydrologic Cycle Component Values

Annual Precipitation (mm) [2] = 844.8

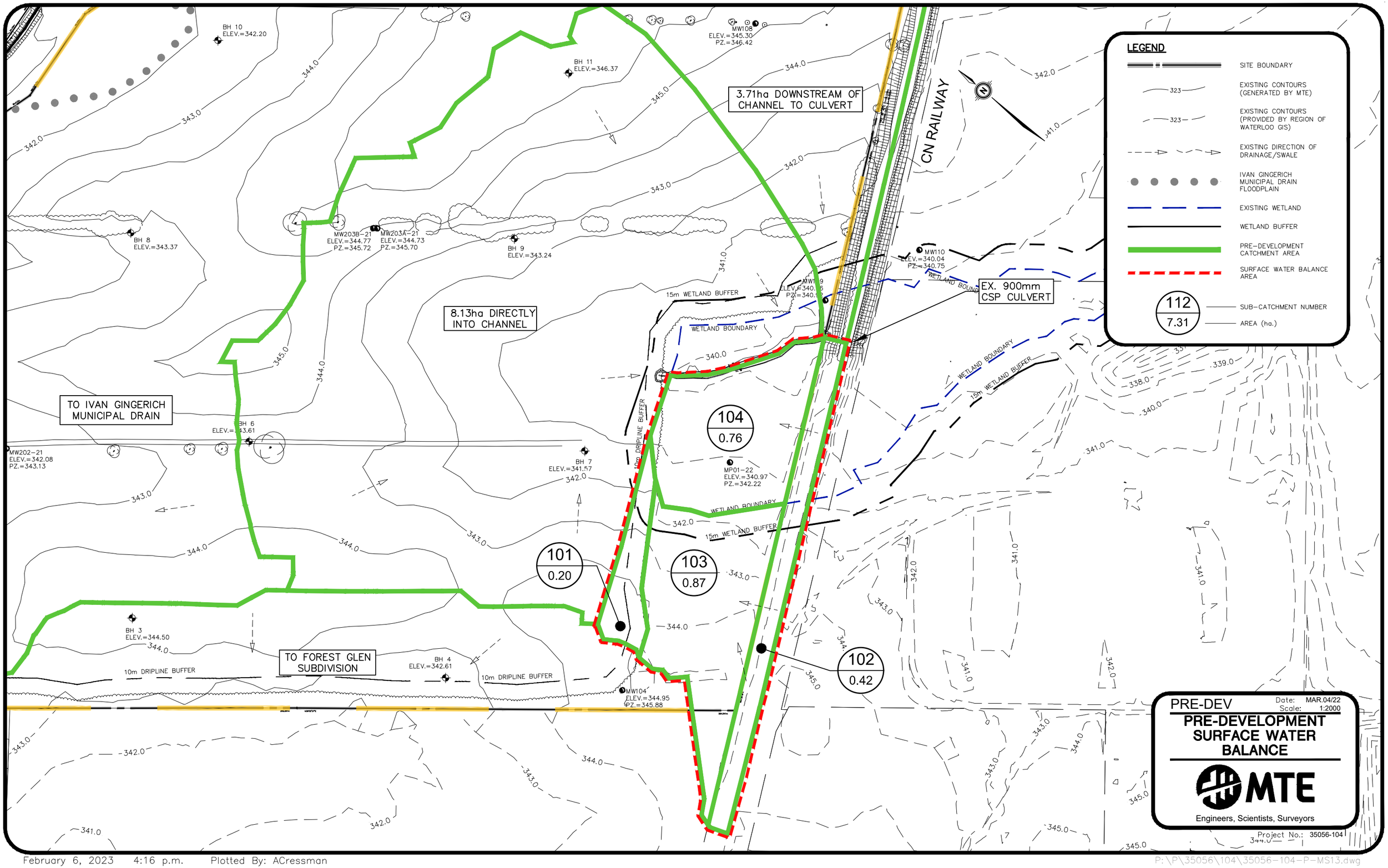
	Parameters				
	ET	Surplus	Runoff	Infiltration	Infiltration
	(mm/yr)				Factor
Hilly, Mature Forests, C	523	322	161	161	0.50
Hilly, Urban Lawn, C	510	335	218	117	0.35
Rolling, Urban Lawn, C	510	335	184	151	0.45
Hilly, Pasture, C	519	325	179	146	0.45

Pre-Development Catchment	Pre Location (Landuse, Topo, Soil)	Pervious: Runoff to Wetland			Post-Development Catchment	Pervious: Runoff to Wetland		
		Area of Runoff to Wetland (ha)	Runoff Rate (mm/yr)	Runoff Volume (m^3/year)		Area of Runoff to Wetland (ha)	Runoff Rate (mm/yr)	Runoff Volume (m^3/year)
101 (Pasture and Buffer)	Hilly, Pasture, C	0.20	179	**358**	201 (Rolling, Urban lawn, C)	0.37	184	681
102 (Railway Corridor and Embankments)	Hilly, Urban Lawn, C	0.42	218	**914**	202 (Hilly, Urban Lawn, C)	0.42	218	**914**
103 (Wooded Area)	Hilly, Mature Forests, C	0.87	161	**1,399**	203 (Hilly, Mature Forests, C)	0.87	161	**1,399**
104 (Wetland)	Hilly Mature Forsts, C	0.76	161	**1,222**	204 (Hilly, Mature Forests, C)	0.76	161	**1,222**
		2.25	173	**3,892**		2.42	174	**4,216**
Pre-Development Runoff to Wetland				**3,892**	**Post-Development Runoff to Wetland**			**4,216**

NOTES:

1. Soils based on the Geotechnical Investigation (Peto MacCallum Ltd., February 2022)
2. Annual precipitation taken from Waterloo Wellington Airport (1951-2005)

Wetland	
Pre-Development Runoff (m3/yr)	**3,892**
Post-Development Runoff (m3/yr)	**4,216**
Net (m3/yr)	**324**
Net Surplus to Wetland	**8.31%**



February 6, 2023 4:16 p.m. Plotted By: ACressman

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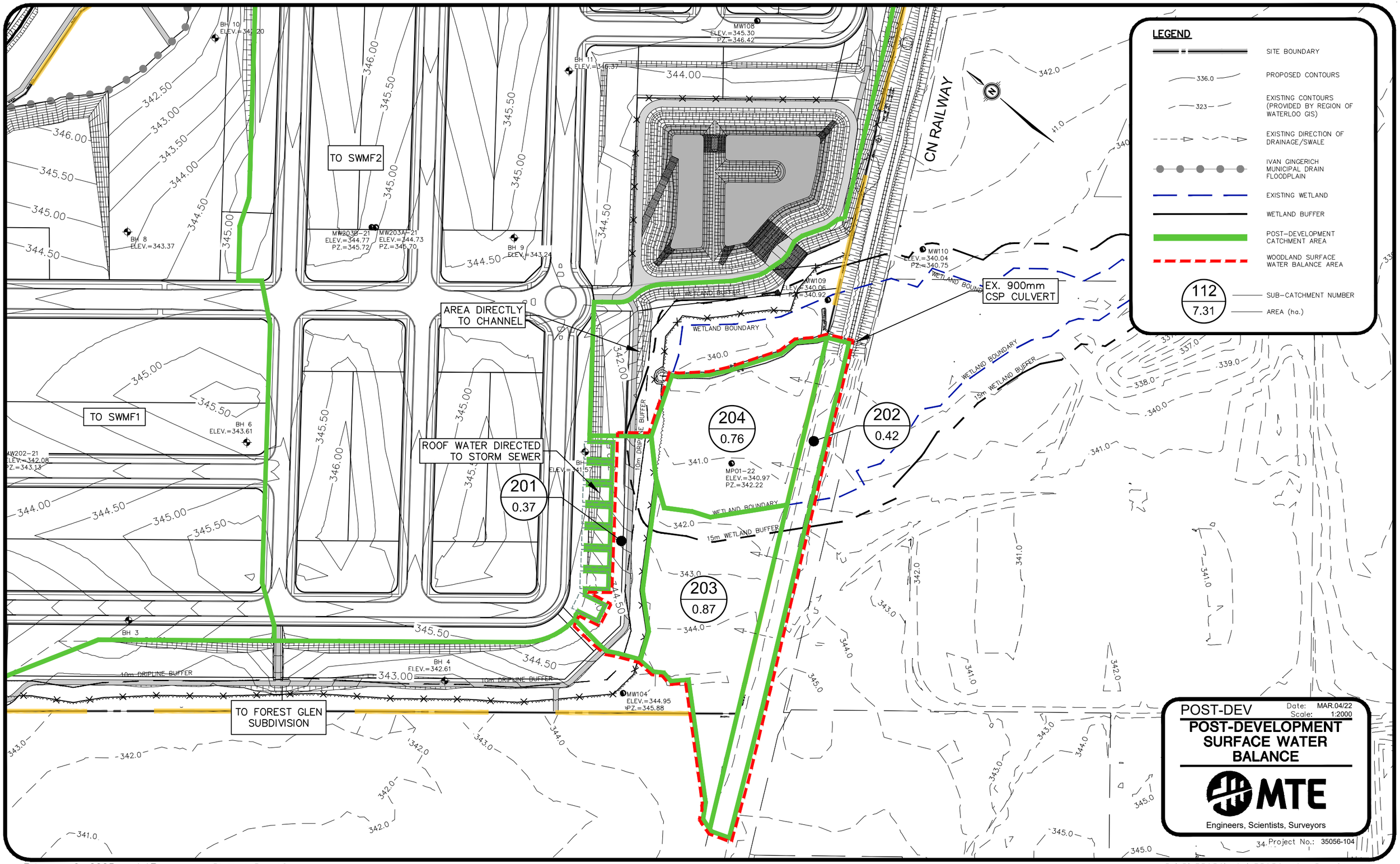
LEGEND
SITE BOUNDARY
PROPOSED CONTOURS
EXISTING CONTOURS (PROVIDED BY REGION OF WATERLOO GIS)
EXISTING DIRECTION OF DRAINAGE/SWALE
IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN
EXISTING WETLAND
WETLAND BUFFER
POST-DEVELOPMENT CATCHMENT AREA
WOODLAND SURFACE WATER BALANCE AREA
112
7.31
SUB-CATCHMENT NUMBER
AREA (ha.)
CN RAILWAY
TO SWMF2
TO SWMF1
AREA DIRECTLY TO CHANNEL
ROOF WATER DIRECTED TO STORM SEWER
TO FOREST GLEN SUBDIVISION
EX. 900mm CSP CULVERT
201
0.37
202
0.42
203
0.87
204
0.76
BH 10
ELEV.=342.20
BH 8
ELEV.=343.37
BH 9
ELEV.=343.24
BH 11
ELEV.=346.37
BH 6
ELEV.=343.61
BH 3
BH 4
ELEV.=342.61
MW108
ELEV.=345.30
PZ.=346.42
MW203B-21
ELEV.=344.77
PZ.=345.72
MW203A-21
ELEV.=344.73
PZ.=345.70
MW202-21
ELEV.=342.08
PZ.=343.13
MW110
ELEV.=340.04
PZ.=340.75
MW109
ELEV.=340.06
PZ.=340.92
MW104
ELEV.=344.95
PZ.=345.88
MP01-22
ELEV.=340.97
PZ.=342.22
WETLAND BOUNDARY
15m WETLAND BUFFER
10m DRIPLINE BUFFER
POST-DEV
Date: MAR.04/22
Scale: 1:2000
POST-DEVELOPMENT SURFACE WATER BALANCE
MTE
Engineers, Scientists, Surveyors
Project No.: 35056-104

Drawings

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March 7, 2023 - 10:47:19 AM - Plotted By: Alex Cressman

LEGEND

- PROPERTY BOUNDARY
- LIMIT OF SUBDIVISION
- EXISTING DIRECTION OF DRAINAGE/SWALE
- EXISTING CONTOURS (GENERATED BY MTE)
- EXISTING CONTOURS (PROVIDED BY REGION OF WATERLOO GIS)
- EXISTING SANITARY SEWER (Ex. 300mmø SAN, Ex. SAN MH)
- EXISTING STORM SEWER (Ex. 600mmø STM, Ex. STM MH)
- EXISTING WATERMAIN (Ex. 200mmø WTM, Ex. HYD, SCV)
- EXISTING DRIPLINE
- IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN
- EXISTING WETLAND
- WETLAND BUFFER
- DRIPLINE BUFFER
- PROPOSED RIGHT OF WAY
- EXISTING WATERCOURSE
- EXISTING RAILWAY
- EXISTING BOREHOLE (Ex. BH10, Elev=311.64)
- EXISTING MONITORING WELL (BH/MW302-D, Ground Elev=313.50, Top of Casing=314.45)

IVAN GINGERICH DRAIN

CN RAILWAY

WATERLOO STREET

CHARLES YOUNG AVE

INGOLD AVE

EX. 1750mm CSP
SE. INV.=337.54
NW. INV.=337.48

EX. 2.4m x 1.2m
BOX CULVERT
SE. INV.=338.09
NW. INV.=338.04

EX. SWM FACILITY

EX. 900mmø
CULVERT
N. INV.=339.503
S. INV.=339.304

MW101 ELEV.=339.20 PZ.=340.12
MW102 ELEV.=340.15 PZ.=341.11
MW103 ELEV.=340.08 PZ.=340.92
MW104 ELEV.=344.95 PZ.=345.88
MW105 ELEV.=341.08 PZ.=342.16
MW106 ELEV.=342.96 ELEV.=344.13
MW107 ELEV.=347.01 PZ.=348.06
MW108 ELEV.=345.30 PZ.=346.42
MW109 ELEV.=340.06 PZ.=340.92
MW110 ELEV.=340.04 PZ.=340.75
MW201-21 ELEV.=343.52 PZ.=344.38
MW202-21 ELEV.=342.08 PZ.=343.13
MW203B-21 ELEV.=344.27 PZ.=345.72
MW203A-21 ELEV.=344.73 PZ.=345.70
MP01-22 ELEV.=340.97 PZ.=342.22

BH 1 ELEV.=339.37
BH 2 ELEV.=341.42
BH 3 ELEV.=344.50
BH 4 ELEV.=342.61
BH 5 ELEV.=341.78
BH 6 ELEV.=343.61
BH 7 ELEV.=341.57
BH 8 ELEV.=343.37
BH 9 ELEV.=343.24
BH 10 ELEV.=342.20
BH 11 ELEV.=346.37
BH 12 ELEV.=346.22

10m DRIPLINE BUFFER
30m WETLAND BUFFER
15m WETLAND BUFFER
WETLAND BOUNDARY

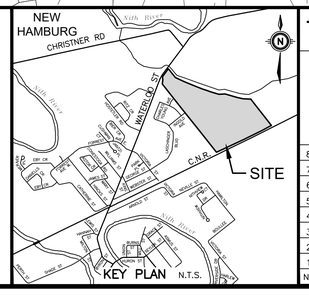
NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.



TOWNSHIP OF WILMOT

No.	REVISION	BY	DATE
8.			
7.			
6.			
5.			
4.			
3.			
2.			
1.	REVISED DRAFT PLAN SUBMISSION	JJC	MAR.6/23

GEODETIC BM ELEV. = 342.487m
TABLET IS SET HORIZONTALLY IN SOUTH FACE OF CONCRETE FOUNDATION, BEING 62m NORTH OF CENTRELINE OF HIGHWAY; 2.26m EAST OF SOUTHWEST CORNER AND 24cm BELOW THE FIRST COURSE OF BRICKWORK.

SITE BENCHMARK ELEV. = 339.773m
CUT CROSS SOUTHWEST CORNER CONCRETE BOX CULVERT ON SOUTH SIDE OF WATERLOO STREET PNO 9059

OWNER
WILMOT WOODS DEVELOPMENTS INC.
310 FAIRWAY ROAD SOUTH KITCHENER

PROJECT
WILMOT WOODS
NEW HAMBURG

DRAWING
EXISTING CONDITIONS PLAN

MTE
Engineers, Scientists, Surveyors
(519) 743-6500 www.mte85.com

Project Manager J.CABRAL	Project No. 35056-104
Design By AJC	Checked By GMK
Drawn By RXB	Checked By AJC
Surveyed By RLK/KPW	Drawing No. EC1.1
Date JAN.31/18	
Scale 1:1500	Sheet of

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March 7, 2023 - 11:06:52 AM - Plotted By: Alex Cressman

IVAN GINGERICH DRAIN

CN RAILWAY

STREET ONE

STREET TWO

STREET THREE

STREET FOUR

STREET FIVE

STREET SIX

STREET SEVEN

STREET EIGHT

STREET NINE

STREET TEN

WATERLOO STREET

CHARLES YOUNG AVE

INGOLD AVE

SWMF 1

SWMF 2

EX. SWM FACILITY

EX. 900mmø CULVERT

WETLAND BOUNDARY

30m WETLAND BUFFER

10m DRIPLINE BUFFER

LEGEND

- PROPERTY BOUNDARY
- LIMIT OF SUBDIVISION
- EXISTING CONTOURS
- EXISTING EMBANKMENT
- EXISTING DRIPLINE
- DRIPLINE BUFFER
- WETLAND BUFFER
- EXISTING WETLAND
- IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN
- PROPOSED SPOT ELEVATION
- PROPOSED CONTOURS
- PROPOSED EMBANKMENT
- MAJOR OVERLAND FLOW ROUTE
- EXISTING WATERCOURSE

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KEY PLAN N.T.S.

SITE

NEW HAMBURG

CHRISTNER RD

WATERLOO ST

C.N.R.

TOWNSHIP OF WILMOT

No.	REVISION	BY	DATE
8.			
7.			
6.			
5.			
4.			
3.			
2.			
1.	REVISED DRAFT PLAN SUBMISSION	JJC	MAR.6/23

GEODETIC BM ELEV. = 342.487m
TABLET IS SET HORIZONTALLY IN SOUTH FACE OF CONCRETE FOUNDATION, BEING 62m NORTH OF CENTRELINE OF HIGHWAY; 2.26m EAST OF SOUTHWEST CORNER AND 24cm BELOW THE FIRST COURSE OF BRICKWORK.

SITE BENCHMARK ELEV. = 339.773m
CUT CROSS SOUTHWEST CORNER CONCRETE BOX CULVERT ON SOUTH SIDE OF WATERLOO STREET PNO 9059

OWNER
WILMOT WOODS DEVELOPMENTS INC.
310 FAIRWAY ROAD SOUTH KITCHENER

PROJECT
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NEW HAMBURG

DRAWING
FINISHED GRADE CONTOUR PLAN

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Project Manager J.CABRAL	Project No. 35056-104
Design By AJC	Checked By GMK
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Surveyed By RLK/KPW	Drawing No. QU1.1
Date JAN.31/18	
Scale 1:1500	Sheet of